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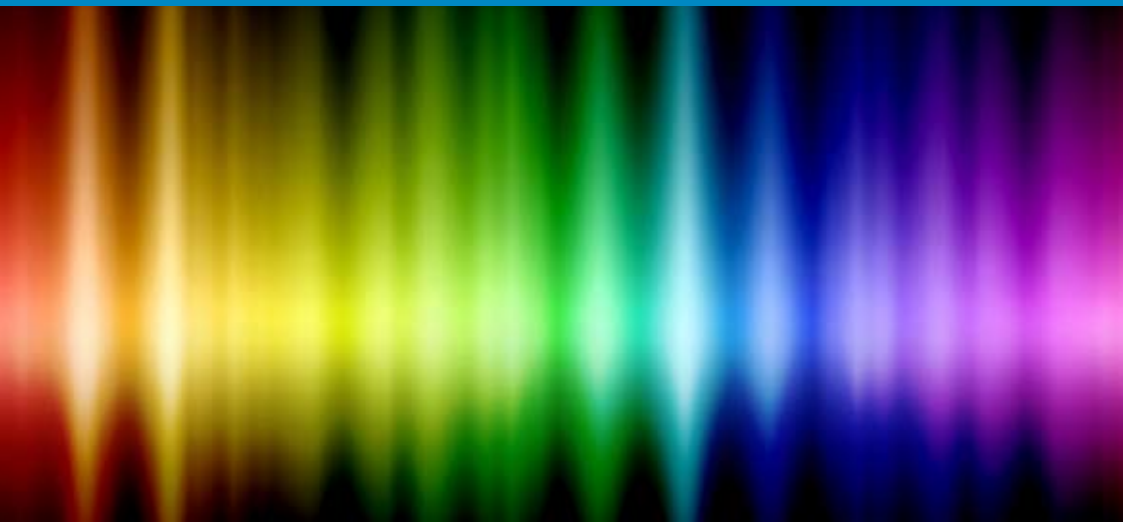

Promoting Industrial Diversification in Resource Intensive Economies

The Experiences of Sub-Saharan Africa and Central Asia Regions

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FOREWORD

The ongoing boom in commodity prices offers numerous opportunities for resource-rich low and middle income countries in sub-Saharan Africa and Central Asia. For one, commodity producers—both governments and firms—have gained access to growing financial surpluses which, in turn, provide funds for investment in industrial diversification to complement the resources sector. Both the direct and indirect income generated by the commodities sector furthermore has the potential to spur industrial development through the establishment of a domestic market and the generation of new export opportunities which facilitate employment creation and economic growth.

Even though it is likely that commodity prices will remain stable for some years to come, resource-rich low and middle income countries need to diversify their economic structures into industry and knowledge-intensive sectors on account of the long-term volatility of commodity prices and the capital intensity of producing many of the commodities found in these countries. However, there are numerous pitfalls in the road to industrial diversification through the use of resource rents which are often lost in inefficient investments. The key challenge these countries thus face is the development of policies and strategies for efficiently utilizing these rents to develop dynamic and sustainable industrial competences.

The opportunities for industrial diversification in commodity-intensive economies hinge on a combination of three factors. The first is the availability of resource rents to finance industrial development in sectors not related to commodity production (fiscal linkages from the resources sector). The second is the demand created for domestic manufacturing and services through the incomes earned in the commodities sector (consumption linkages). The third is associated with the production of inputs for the commodities sector (backward linkages) and the processing of commodities (forward linkages), as well as the production of related goods (horizontal linkages).

The countries concerned need to adopt an industrial policy approach that must be informed, i.e. be based on knowledge of the economy's detailed capabilities, and effective, i.e. built on a vision developed at the highest level of government. They

must also ensure that they have adequate capabilities to implement and enforce such industrial policies. UNIDO can play an important role in supporting actors in both the public and the private sectors to meet these requirements, by providing governments with a more informed knowledge base to develop and implement industrial policy, to promote alignment within government and with the private sector, and to enhance the capacity of governments and firms to perform the necessary tasks.

I sincerely believe that the analysis, inferences and recommendations presented in this report covers the key issues researchers, policymakers and industrial stakeholders need to be aware of to promote industrial diversification in resource intensive economies. It moreover provides practical insights on how to address the policy imperatives of many of these economies in order to foster economic and social development, and to meet the needs of their populations. I hope that the findings of this report will prove useful to policymakers as they grapple with the challenges of using their resources effectively for sustainable industrial development.

Kandeh K. Yumkella

Director-General, UNIDO

1. INTRODUCTION

In 2011, together with UNCTAD, UNIDO analysed the performance, trajectory and constraints Africa's industrial development faces. Amongst the issues addressed was the financing of industrial development:

> "In principle, African countries could finance their industrial development programmes through various sources: domestic savings; borrowing from banks and finance institutions; FDI; harnessing South–South cooperation as a potential source of development finance; and encouraging traditional donors to direct more official development assistance (ODA) towards promoting industrial development in the region. However, given the heterogeneity of African countries, there will be differences across countries in the degree of reliance on each of these potential sources of finance" (UNIDO, 2011, p 74).

The first of these sources of finance identified in the Report is domestic savings. Bearing in mind the heterogeneity of individual countries, this Report focuses on a particular set of domestic savings which provides a potential springboard for industrial development in a large number of low and middle income economies, not only in sub-Saharan Africa (SSA). These are the resource rents which accrue to governments in those countries benefitting from the post-2002 commodity price boom. These resource rents are unprecedented in terms of both their generalized nature across the families of commodities and in their duration. Furthermore, there are strong grounds for acting on the assumption that the high relative price of commodities will be sustained for some years to come. The challenge is thus to develop strategies and policies to enable resource rich, low and middle income economies to efficiently utilize these resource rents to develop dynamic and sustainable industrial competences.

In addressing this policy challenge, this Report begins by stating the case for developing linkages between the commodities and the industrial and services sectors. Despite the fact that commodity prices look likely to remain stable for some years to come, there remains a continuing need for resource rich economies to diversify their economic structures. Section 2 sets out a taxonomy of different types of linkages to the commodities sector as a framework for diversification, drawing on the early seminal analysis of Albert Hirschman. Section 3 shows the extent of dependence of SSA and Central Asian economies on commodity exports and the underdeveloped nature of their industrial sectors. This is followed in

Section 4 by an analysis of the extent of linkages in SSA and Central Asia, drawing on an augmented Hirschman framework. Annexes A and B contain detailed empirical material which supports this analysis. Section 5 analyses the drivers of linkages in SSA (and to a lesser extent Central Asia). The Report in Section 6 concludes with the identification of policies which might accelerate the development of efficient linkages from the commodities sector to the industrial and services sectors, and with a discussion in Section 7 of the need for stakeholder alignment for effective policy development and implementation.

1.1 The Post-2002 Commodities Price Boom

Three primary families of commodities can be identified (Figure 1). Broadly speaking, as a consequence both of their distinct production characteristics and primary users, they are associated with different degrees and types of linkages to the industrial sector. The primary sub-sectors of *soft commodities* include cereals (such as wheat and rice), beverages (such as tea and coffee), crops (such as cotton and timber), livestock (such as beef and pork) and fisheries. *Hard commodities* comprise precious metals (such as gold), ferrous metals (such as iron ore), non-ferrous metals (such as copper) and rare minerals (such as coltan). *Energy commodities* refer predominantly to oil, gas and coal. Each of these commodities feeds into a series of manufacturing sectors. With the exception of some industrial crops such as cotton and timber, agricultural commodities are predominantly used in the food sectors. Excluding precious minerals, the minerals group of commodities are generally incorporated as inputs into the industrial and construction sectors. Energy commodities are used across the spectrum, both as an intermediate and as a final consumption input.

Some large producers of commodities are also large consumers of commodities, that is, their industrial sectors transform the commodities listed in columns 1 and 2 of Figure 1 into the final products listed in columns 3 and 4. In most cases, particularly in that of low and middle income economies, commodities are most commonly exported in raw or thinly processed forms. Hence, the global price of commodities has an important bearing on the economic performance and prospects of resource-based economies, the more so when these economies are heavily dependent on resource exports as is the case for many low income economies in SSA, Central Asia and elsewhere.

Historically, the prices of globally traded commodities have not performed as well as those of globally traded manufactures, that is, the terms of trade have systematically turned against commodity exporting economies. There have been

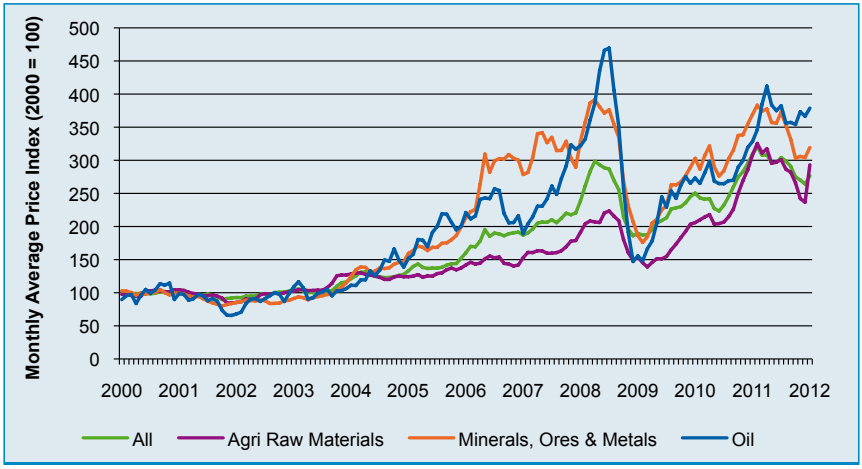
Figure 1: Three primary commodity families and their sector of use

Primary Sector	Category	Major Use	Examples
Soft Commodities	Industrial crops	Input in manufactures	Timber Cotton
	Fisheries	Final consumption (with limited processing)	Prawns, Cod
	Cereal		Rice, Wheat
	Beverages		Tea, Coffee, Cocoa
	Livestock		Cattle, Dairy products
Hard Commodities	Precious metals	Input in manufactures	Gold, Silver, Platinum
	Ferrous metals	Infrastructure and construction	Iron ore and Steel
	Non-ferrous metals	Input in Manufactures	Copper, Zinc, Lead, Aluminium
	Rare Metals	Input in manufactures	Molybdenum Plutonium Cobalt
Energy	Petroleum products Coal Nuclear Renewables	Fuel for industrial usage Final consumption	Oil, Natural Gas and Coal Nuclear power Renewable power

Source: Farooki and Kaplinsky, 2011

exceptions to these price trends, notably in the early 1950s and 1970s. But these two periods of commodity price surges were short-lived in nature (two to three years), and did not affect all three families of commodities simultaneously (for example, the 1950s price boom did not affect energy prices, and the 1970s boom saw little increase in the prices of soft commodities). However, since 2002 the global economy has witnessed the emergence of a more long-lived commodity price cycle (Figure 2). The price surge was initially limited to hard and energy commodities, but also began to affect the soft commodities sectors after 2005. Although commodity prices continued to be very volatile by comparison with the prices of manufactures, and saw a sharp (albeit temporary) price fall after the 2008 global financial crisis, they have been on a sustained upward trend for a decade, a unique trend compared with the economic history of the twentieth century.

Figure 2: United Nations Conference on Trade and Development (UNCTAD) monthly average price index, 2000=100 (2000 to Jan 2012)

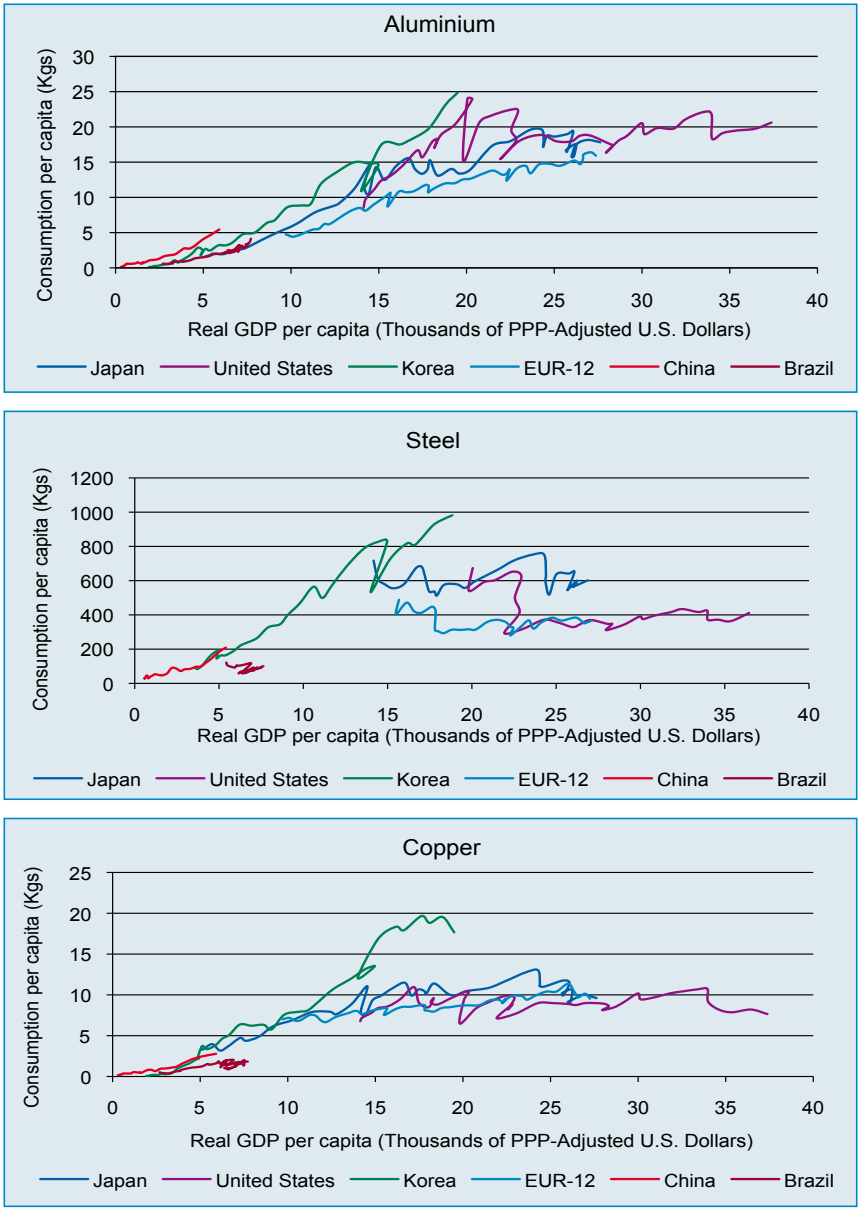


Source: Compiled from UNCTAD Stat. data. Online. http://unctadstat.unctad.org/ (accessed April 2012).

The short-lived commodity price booms of the 1950s and 1970s were based on a combination of temporary interruptions to supply (anticipated threats to supply from the Korean War in the 1950s and the surge in oil prices after the 1973 oil crisis) and unrealistic expectations of a sustained growth in demand. But neither of these circumstances endured. Supply threats from the Korean War failed to materialize in the 1950s, and global economic growth had adjusted to the higher oil prices by the early 1980s.

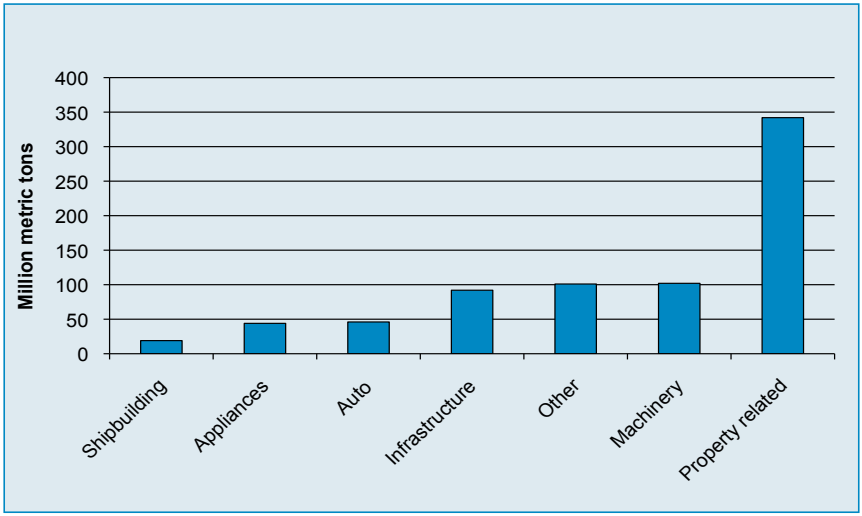
By contrast, the post-2002 commodity price boom has resulted from a combination of events which make it highly likely that prices will remain high and in many cases continue to rise for some years to come (Farooki and Kaplinsky, 2012, Chapter 4). On the demand side, China, India and other low and middle income emerging economies are at an early stage of per capita consumption of most hard and energy commodities (Figure 3). Although their demand growth is often thought to arise from their rapidly growing manufacturing sectors, much of their demand growth has in fact resulted from the massive investments made in infrastructure and construction, as was the case of China's consumption of steel in 2011 (Figure 4). The demand for soft commodities will also expand in the future, as incomes and per capita consumption of food (particularly animal proteins) continue to grow.

Figure 3: Per capita consumption of base metals



Source: IMF World Economic Outlook, September 2006

Figure 4: China's demand for steel by source (2011)



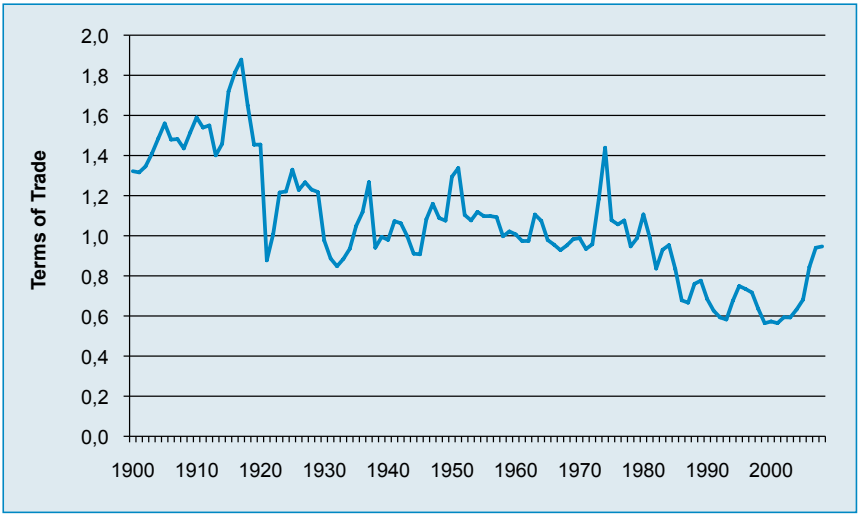
Source: Financial Times, 9 March 2012

On the supply side, there are constraints in each of the three families of commodities to the expansion of low cost supplies (Farooki and Kaplinsky, 2012, Chapter 5). In energy commodities, low cost deposits of oil have reached their limits and the marginal price of what are often substitutable sources of supply is set by the costs of deep-sea oil production and shale oil and gas production. The days of cheap energy are over. The supply response in soft commodities is limited by the high costs of investment in irrigation, slowing rates of productivity growth, the growing cost of hydrocarbon-based agrochemicals, the global shortage of water, and climate change and climate chaos. With regard to hard commodities, there are large unexploited deposits of most minerals, but these are generally in inaccessible areas and in countries of high political risk. Moreover, for a combination of reasons, exploration budgets have been low for much of the past two decades and mines have a long gestation period between exploration and production (frequently, this can be more than 20 years).

Thus, as a general phenomenon, the supply response of commodity production to the rise in demand from emerging economies is likely to be slow. Consequently, commodity prices are likely to consolidate their gains of the last decade and perhaps to also remain on a rising trend for some years to come. At the same time, the growing global diffusion of manufacturing capabilities has meant that competition in many manufacturing sectors, particularly in low technology

and labour intensive manufactures, has continued to grow. Hence, the declining commodities-manufactures terms of trade which bedevilled commodity producers for many decades has begun to shift in favour of commodities (Figure 5), a process which is likely to be sustained for some years to come.

Figure 5: The commodities-manufactures terms of trade, 1949-2008



Source: Compiled from data from Pfaffenzeller et al. (2007)

1.2 Resource Rents are Available to Promote Industrial Development

One consequence of the post-2002 commodity price boom has been a sharp increase in resource rents. These have accrued both to the private and public sectors. In the private sector, those firms involved in extracting and processing commodities and in providing inputs into the commodity sectors have seen a major rise in surplus. Table 1 shows the scale of the rents (that is, revenue minus costs) earned in the hard commodities sector by the world's 40 largest mining companies. Between 2002 (when the boom in mineral prices began) and 2008 (when the financial crisis struck), revenues increased by 357 percent. Operating expenses also grew, but at a lower rate (277 percent), and the consequence was a sharp rise in both operating margins and in net profit. A similar pattern emerged in the energy sectors. As can be seen from Table 2, the global revenues of the 100

largest oil and gas companies grew by almost 80 percent between 2006 and 2008 (before dropping sharply following the 2008 financial crisis).

Table 1: Revenue, operating expenses, margins and net profits of the 40 largest mining companies, 2002-2009

	2002	2003	2004	2005	2006	2007	2008	2009
Revenue (US$ billion)	95	114	178	213	249	312	349	325
Operating expenses (US$ billion)	75	85	125	134	141	176	208	217
Operating margins - costs as share of revenue (%)	79	75	70	63	57	56	60	67
Net profit (US$ billion)	4	12	27	44	66	80	57	49

Source: Farooki and Kaplinsky (2012)

Table 2: Worldwide revenues and results of operation for oil and gas – 100 companies (US$ million)

	2005	2006	2007	2008
Revenues	615,260	742,998	835,019	1,099,953
Pre-tax profits	371,548	437,560	456,655	571,170
Corporate taxes	193,063	220,678	240,037	299,154

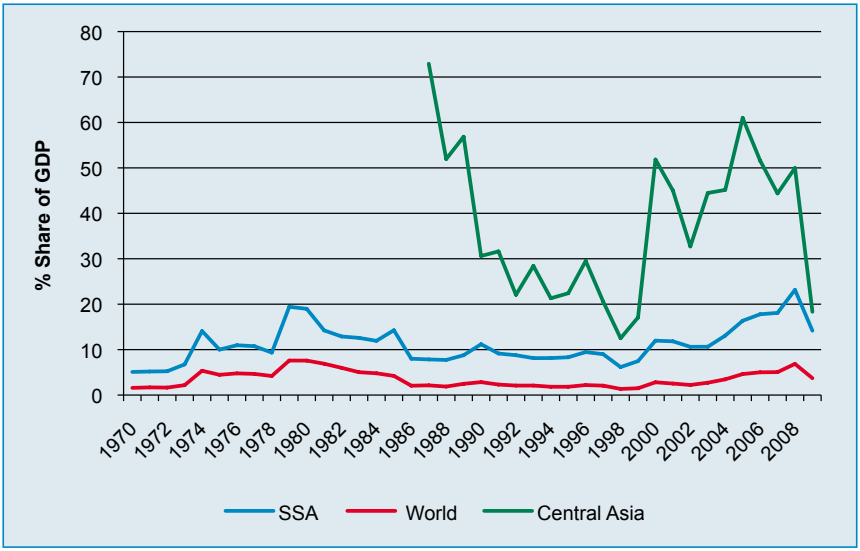
*DD&A: Depreciation, depletion and amortization

Source: 'Global E&P Benchmark Study', Earnest and Young (2010)

Many governments were able to increase their revenues from the resources sector during the commodities boom, in part by directly taxing these private sector surpluses. For example, aggregate corporate taxes paid to governments between 2005 and 2008 grew by 55 percent in the global oil sector, transferring some of the growing resource rents to government exchequers. In some countries, corporate taxes paid by commodity producers were complemented

by royalties on production and exports, resulting in a growth of state revenues.[1] Figure 6 illustrates the share of resource rents in GDP for the global economy and for SSA between 1970 and 2009, and for Central Asia between 1989 and 2009. The impact on revenues of the oil price booms of 1973 and 1979 can be seen in the early period. But unlike the boom of the 1970s, the post-2002 boom provided rents from a more diversified bundle of commodities, not just from energy commodities. The relative significance of resource rents as a share of GDP was much higher for SSA than for the global economy, and significantly higher for Central Asia. These resource rents declined after the short-lived collapse in commodity prices following the 2008 global financial crisis and have subsequently continued to grow.

Figure 6: Total natural resource rents as percentage of GDP (1970-2009)



Source: World Bank (2011): World Development Indicators (Edition: April 2011). ESDS International, University of Manchester. DOI: http://dx.doi.org/10.5257/wb/wdi/2011-04 (accessed April 2012)

Thus, commodity producers – both firms and governments – evidently have access to growing financial surpluses as a result of the 2002 commodity price boom. In principle, this provides the potential for supporting a programme of *investment* in industrial diversification, not necessarily at the expense of the resources sector

1 However, not all governments benefitted from the commodity price boom. For example, in Zambia the nature of the mining agreements reached during the structural reforms of the late 1990s meant that the government reaped little of the surplus generated during the post-2002 copper price booms (Bova, 2009; Lungu, 2008).

(since prices are likely to remain robust for some years), but as a complement to it. Industrial diversification has a central role to play in development strategy. Industry is much more labour intensive than the hard and energy commodities sectors, and the price of traded manufactures is much more stable than that of commodities. Many hard and energy "point commodities" (that is, extraction is geographically confined to the deposit) lend themselves to corruption and are often associated with conflict and poor governance. However, there are many pitfalls in the road to industrial diversification through the use of resource rents which are squandered in inefficient investments. Thus, the key challenge to diversification policy in resource rich economies is how these rents may be productively utilized.

2. HOW RESOURCE RENTS MAY BE USED TO PROMOTE INDUSTRIAL DIVERSIFICATION

In developing a framework for the use of resource rents to promote industrial deepening, it is helpful to draw on the thinking of one of the pioneers of development economics, Albert Hirschman. Elaborating the work of economic historians analysing industrial growth in Canada and the USA ("Staples Theory"), Hirschman proposed three major types of linkages from the commodities to the industrial sector (Hirschman, 1981). The first is fiscal linkages, the resource rents which the government is able to harvest from the commodities sectors in the form of corporate taxes, royalties and taxes on the incomes of employees. These rents can be used to promote industrial development in sectors unrelated to commodities. The second major category is consumption linkages, that is, the demand for the output of other sectors arising from the incomes earned in the commodities sector. The third form is production linkages, both forward (processing commodities) and backward (producing inputs into the commodities sector) linkages from the resources sector

Fiscal linkages: Hirschman was sceptical of the capacity of governments to generate industrial development through the use of fiscal linkages. He argued that the problem with fiscal linkages is that they did not provide any guidance on which sectors the commodity rents should be used to develop the "ability to tax the enclave is hardly a sufficient condition for vigorous economic growth. For the fiscal linkage to be an effective development mechanism, the ability to tax must be combined with the ability to invest productively. [But] here lies precisely the weakness of fiscal linkages in comparison to the more direct production and consumption linkages… [since] no… guidance [on which sectors to invest] is forthcoming when a portion of the income stream earned in an enclave is siphoned off for the purpose of irrigating other areas of the economy" (ibid: 68-69).

Consumption linkages: Hirschman was a little less sceptical of the impact of consumption linkages in promoting industrial development. He recognized that the demand generated by employees in the commodities sector had the potential to provide a major spur to industrial production as workers and capitalists spent their incomes earned in the resources sector. But since most resource rich developing economies had poorly developed manufacturing sectors, he determined that consumption linkages would occur abroad as the needs of domestic consumers would be met through imports. The import liberalization, which followed in the 1980s and 1990s after Hirschman had drawn this conclusion, have reinforced this trend for demand to "leak" abroad and for domestic manufacturing to be overwhelmed by imports.

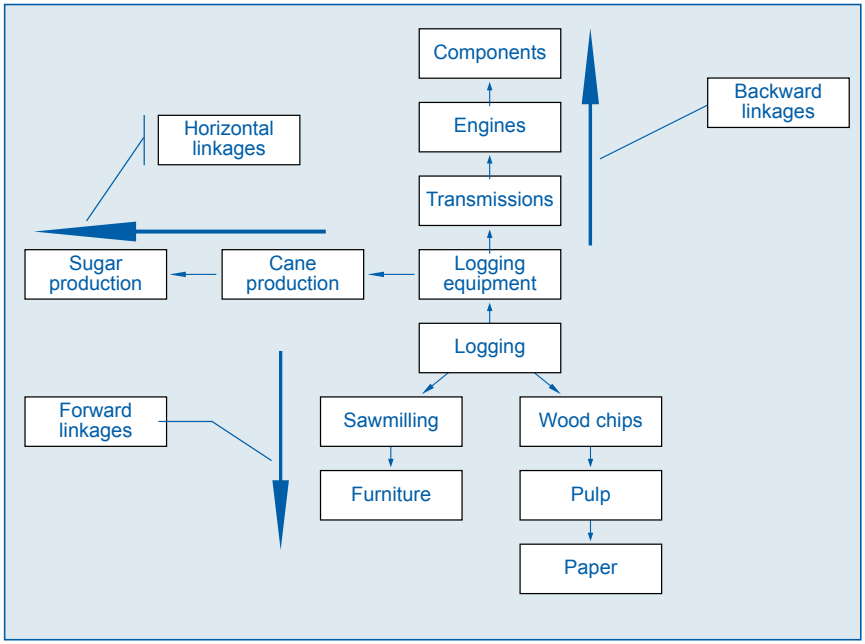
Production linkages: Hirschman believed that the most viable link between the commodities and the industrial sector was via production linkages, particularly backward linkages. He argued that unlike fiscal linkages where no guidance was provided for sectoral development, production linkages paved a path for industrial diversification. He characterized this development process "... as essentially the record of *how one thing leads to another*" (emphasis added) (1981:75). In other words, as recent commentators on industrial transformation have remarked, successful growth is inevitably an incremental (but not necessarily slow) unfolding of linkages between related economic activities. As asserted in a recent influential analysis of industrial development, "... there is always a slightly more advanced [traded] product, or just a different one, that countries can move to, disregarding product similarities when thinking about structural transformation and growth" (Hidalgo et al, 2007: 482). Hirschman saw production linkages as providing great potential for industrial development in previously enclave commodity dependent economies and believed that two factors influence the degree of these linkages. The first is scale, reflecting the size of demand from the commodities sector in relation to the minimum effective scale of production in backward linkages supplier firms and of output for forward linkage user firms. The second is "technological strangeness", that is, how similar the technology and processes are between the core resources sector and those in supplier and user firms. Here he argued that production linkages were generally "less strange" to the commodities sector than the transfer of resources via fiscal linkages to unrelated sectors.

Hirschman described two types of production linkages. The first are upstream, backward linkages providing inputs into the commodities sector. The second are downstream, forward linkages leading to the processing of commodities. In addition to these backward and forward linkages there is a third category, namely horizontal linkages. These are linkages specifically developed in relation to the commodities sector, which serve the needs of other sectors as well. As Hausmann

et al. observe, "the probability that a country will develop the capability to be good at producing one good is related to its installed capacity in the production of other similar, or nearby goods for which the currently existing productive capabilities can be easily adapted." (Hausmann et al., 2007: 13).

Figure 7 illustrates these various types of linkages through a schematic overview of the linkages in a soft commodities value chain, using the timber sector as a notional example. Feeding into the timber-logging link in the chain are a series of backward "upstream" linkages involving tiers of suppliers. The first tier in this notional example is logging equipment which is supported by second-tier suppliers of transmissions, third-tier suppliers of engines and fourth-tier suppliers of components. Complementing these backward linkages are a series of forward "downstream" linkages to first-tier processing firms (in this example, sawmills and woodchip producers) and second-tier firms which transform the timber into manufactures (furniture and pulp and paper firms). Figure 7 also illustrates first- and second-tier horizontal linkages on the supply side (logging equipment which is then used in sugar cane cutting which feeds into sugar production). Of

Figure 7: Backward, forward and horizontal linkages in the wood and timber sector



course, in the real world the nature and range of linkages feeding into the timber-logging sector is much more complex than the schematic illustration presented in Figure 7. But the essential characteristics of backward-, forward- and horizontal linkages and tiers of linkages are central to all value chains, including those in the commodities sectors.

3. COMMODITY DEPENDENCE AND THE UNDERDEVELOPMENT OF INDUSTRY IN CENTRAL ASIA AND SSA

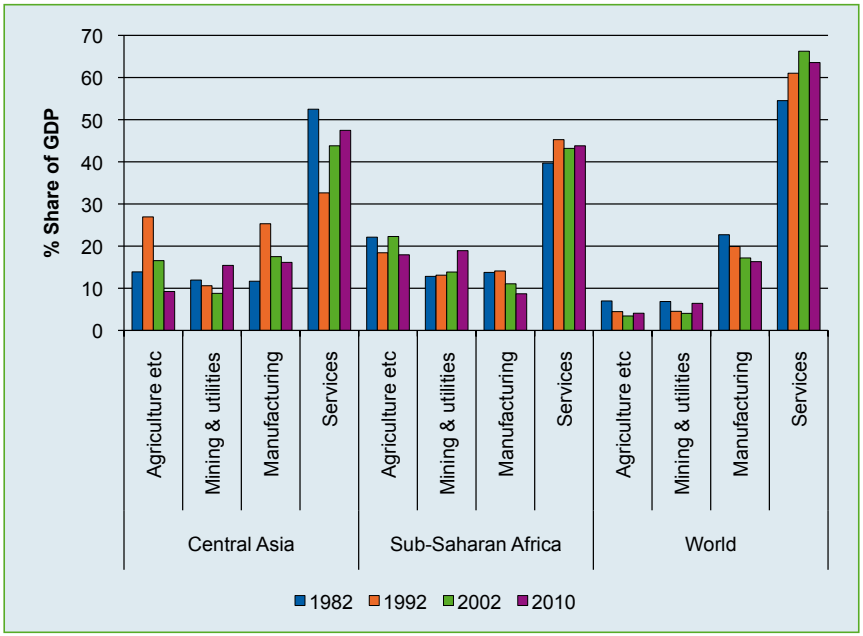
Central Asia and sub-Saharan Africa are two regions in the global economy characterized by relatively low per capita incomes and high levels of commodity dependence. Thus, their experience in industrial development provides a useful avenue to explore the general policy implications for industrial diversification in resource rich economies. We begin this by reviewing the nature and extent of their commodity dependence and follow with an analysis of the extent of fiscal, consumption and production linkages between their commodities and industrial sectors. (The detailed evidence to support this analysis is contained in Annexes A and B).

3.1 The Nature of Commodity Dependence in Central Asia and SSA

Both Central Asia and SSA exhibit high degrees of commodity dependence. This dependence surfaces in a number of ways. Beginning with the contribution of commodities to GDP, the share of soft commodities (agriculture) in output lies above the global average (4 percent) for both Central Asia (9 percent) and SSA (18 percent), although the contribution of the agricultural sector to GDP fell sharply in Central Asia between 1982 and 2010 (Figure 8). In both regions the contribution of mining--which includes utilities in this data set--is above the global average of 6 percent. In Central Asia the share of the sector increased from 11 percent in 1992 to 15 percent in 2010, while it grew from 13 percent to 19 percent over the same period for SSA. By contrast, the share of manufacturing

in GDP is below the global average in both regions and has fallen over time. Central Asia saw a decline from 25 percent to 16 percent, while its share in SSA dropped from 14 percent to 9 percent between 1992 and 2010. The share of the services sector in SSA has remained stable at around 44 percent over the last two decades, whilst the services sector's contribution to GDP in Central Asia increased from 33 percent to 47 percent. This expansion of services in Central Asia, particularly in Kazakhstan, is largely related to the growth of the banking sector in the region.

Figure 8: The sectoral composition of GDP in Central Asia and SSA (1982, 1992, 2002 and 2010)

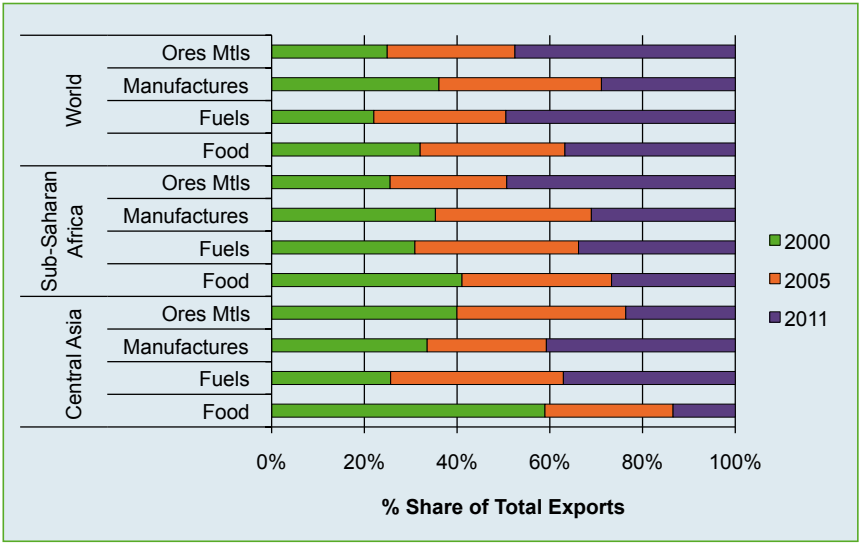


Source: Calculated from UNCTAD Stat Data. Online ‹···› http://unctadstat.unctad.org/ ‹···› (accessed April 2012)

The resource intensity of Central Asian and SSA economies is even more marked in the composition of their exports (Figure 9). At the global level, manufactures account for the dominant share (58 percent) of world exports. By contrast, manufactures make up a much smaller share of both Central Asian and SSA exports. For the former, the share of manufactures rose from 19 percent to 23 percent, while for SSA it decreased from 24 percent to 21 percent between

2000 and 2011. In both regions, hard and energy commodities account for a disproportionately large--and growing--share of exports. In Central Asia the share of fuel increased from 39 percent to 57 percent, while metal ores fell from 19 percent to 11 percent of exports. In SSA, the share of fuel in exports increased from 42 percent to 45 percent, while the share of ore and metal exports rose from 11 percent to 21 percent. As in the structure of GDP, the contribution of soft commodities to exports in both Central Asia and SSA dropped sharply between 2000 and 2011, from 7 percent to 2 percent for the former, and from 14 percent to 9 percent for the latter.

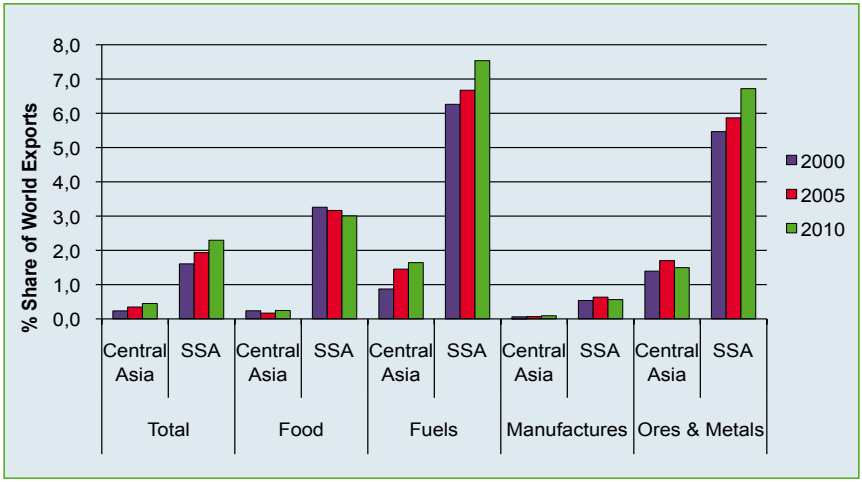
Figure 9: Percentage share of sector in total regional exports (2000, 2005 and 2011)



Source: Calculated from COMTRADE data. Online. ‹···http://comtrade.un.org/db···› (accessed April 2012).

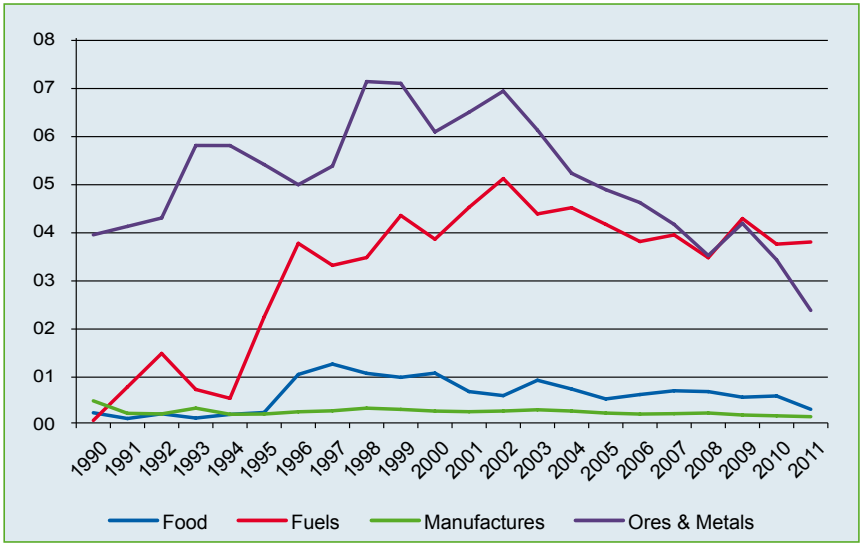
Despite the growing contribution of energy and hard commodities to these two regions' exports, the share of these regions in global trade of the three families of commodities is small (Figure 10). Although both regions accounted for a growing share of global exports in both fuels and minerals-ores, this was from a small base. Central Asia's share of global fuel exports rose from 0.9 percent in 2000 to 2 percent in 2010. Its share of minerals and ores was static (1.5 percent in 2000 and 1.6 percent in 2010). The equivalent figures for SSA were an increase from 5.5 percent to 6.7 percent for ores and from 6.5 percent to 7.5 percent for fuels.

Figure 10: Percentage share of region in global exports of sector (2000, 2005 and 2010)



Source: Calculated from COMTRADE data. Online. ‹···http://comtrade.un.org/db···› (accessed April 2012).

Figure 11: Revealed comparative advantage for Central Asia (1990-2010)

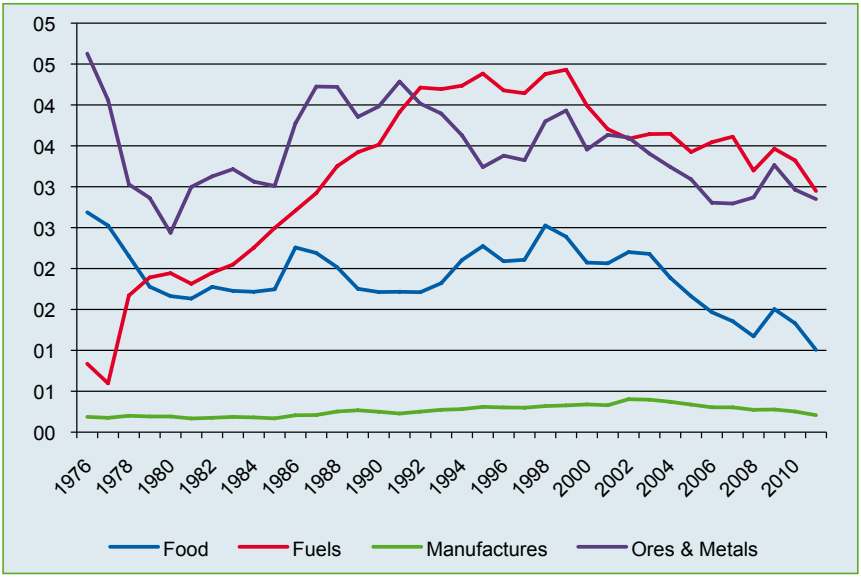


Source: Calculated from COMTRADE data. Online. ‹···http://comtrade.un.org/db···› (accessed April 2012).

A further indicator of resource dependence is the pattern of revealed comparative advantage (RCA) in these two regions[2]. The RCA measures the ratio of a commodity in each country's/region's total exports to the ratio of the same commodity in total global exports. Thus, an RCA value exceeding 1 indicates a comparative advantage for the country/region in the given commodity. Figure 11 presents the RCA values for each of the three families of commodities and for manufactures in Central Asia between 1990 and 2010. Central Asia displays a marked specialization in both hard and energy commodities, although the levels of RCA in ores and minerals fell sharply after 2002.

Figure 12 shows the RCA values for each of the three families of commodities and for manufactures in SSA between 1990 and 2010. The figure clearly indicates that SSA lacks a decisive specialization in manufactures, and whilst its relative specialization in soft commodities was visible between 1995 and 2001, it was short-lived. Similar to Central Asia, SSA also lacks a specialization in manufactures but has high RCAs in all three families of commodities, particularly in hard and energy commodities (Figure 12). However, these high RCAs began falling after 1998.

Figure 12: Revealed comparative advantage for SSA (1976-2010)



Source: Calculated from COMTRADE data. Online. ‹···http://comtrade.un.org/db···› (accessed April 2012).

2 RCA = $(E_{CA} / E_{TA}) / (E_{CW} / E_{TW})$ where E is exports, C is commodity, A is country, T is total exports and W is world.

3. 2 The Underdevelopment of Industry in Central Asia and SSA

Associated with these high levels of resource dependence in both Central Asia and SSA is the relatively small and declining contribution manufacturing makes to GDP in both regional economies, and the relatively low levels of technology in their industrial sectors.

As shown above (Figure 9), the share of manufacturing in Central Asia's GDP is both low and has fluctuated since the end of the Soviet era. The low levels of technological content in the manufacturing sectors of these economies is evidenced by the share of technologically sophisticated goods in total exports (Table 3). Measuring this sophistication through the use of the PRODY index (Hausmann, Hwang, and Rodrik, 2007)[3] the only technologically sophisticated export that is exported from the region in large quantities are passenger cars produced in Uzbekistan.

Table 3: Share of technologically sophisticated goods in total exports, %*

Country	2000	2010
Kazakhstan	1.3	0.5
Kyrgyz Republic	2.4	3.1
Mongolia	0.9	0.2[a]
Tajikistan	0.6	1.0
Turkmenistan	0.1	0.1
Uzbekistan	3.3	7.4[b]

*Based on PRODY index (Hausmann, Hwang, and Rodrik, 2007)

Sources: National statistical agencies, ADB, UN COMTRADE database, authors' calculations

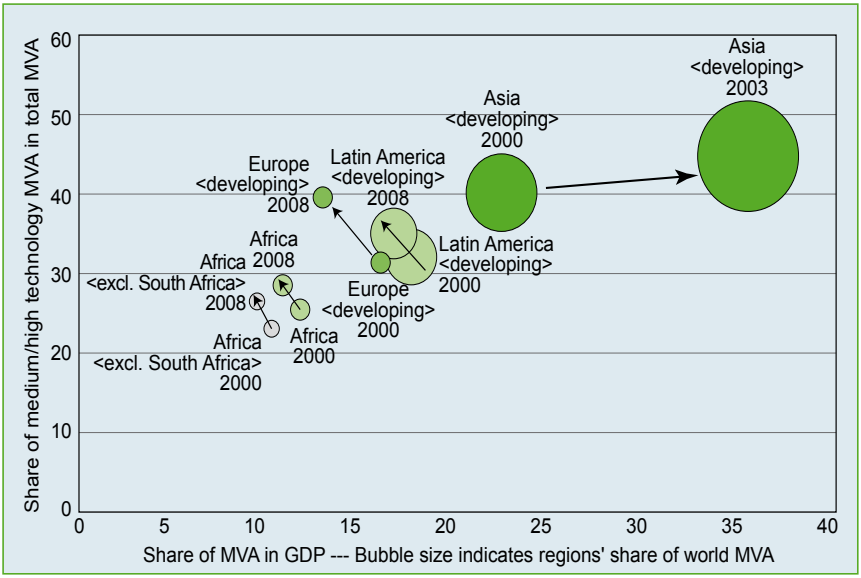
Notes: a – data for 2007, b – data for 2008

A similar story can be told for the African region's industrial performance and industrial structure. As Figure 13 shows, the share of manufacturing value added in GDP is lower for Africa than for any other region. If South Africa is excluded, this MVA share is even lower. Like for many other regions outside of developing Asia, the MVA-GDP ratio declined between 2000 and 2008. However, within this picture of relatively weak manufacturing a small structural change towards medium and

3 This index is a weighted average of per capita GDPs of countries exporting a given product; see concept of the index and discussion of the notion of technologically sophisticated products and their significance for economic development in Hausmann, Hwang and Rodrik, 2007.

high technology sectors is evident, but the contributions of these sectors to MVA was lower in Africa than in any other region.

Figure 13: Structural transformation of Africa's economy vis-à-vis other developing regions



Source: UNIDO (2011)

4. THE EXTENT OF COMMODITY-INDUSTRY LINKAGES IN SSA AND CENTRAL ASIA

In the context of the relative resource dependence of Central Asian and SSA economies and the weakness and lack of technological sophistication of their manufacturing sectors, what is the nature of the linkages between commodities and industry in these two regions? We begin with an analysis of fiscal linkages--as seen through the relative specialization of their industrial sectors in sub-sectors unrelated to the resources sector (Section 4.1)--and then consider the evidence for consumption linkages (Section 4.2) and production linkages (Section 4.3).

4. 1 Fiscal Linkages as Seen Through the Lens of "Normal Patterns of Industrialization"

How "normal" are the industrial structures of resource rich SSA and Central Asian economies? To the extent that individual economies deviate from what might constitute a "normal" progression of industrial development, this will both throw light on the way in which resource dependence may have biased the trajectory of past industrial development and, at the same time, suggest a path for future industrial development. Specifically, in this discussion of fiscal linkages the focus will be on industrial development in sectors that are not specifically related to the resources sector (production linkages).

But is there a "normal" pattern of development that suggests a broad evolutionary path which countries can use to guide their industrial development? The attempt to identify lead sectors based on the prior experience of other economies reflects a

long tradition of analysis of "normal" patterns of industrialization.[4] This approach works on the premise that the share in GDP of manufacturing in general, and specific industries in particular, rises as incomes increase, then stabilizes and subsequently falls. However, given the nature of demand as incomes change and the technological specificities of individual sectors, the growth-stabilization-decline industry life curve will vary between sectors. Different sectors begin and end their growth contribution at different levels of GDP per capita, and the slope of this evolution also differs between sectors. Initial attempts to plot this path of "normal" industrial development treated all economies as similar entities. But in later refinements, Chenery (who pioneered this analytical approach) and his colleague (Syrquin) deepened the analysis to show that important differences arise depending on the size of the economy and the extent to which the economy specialized in natural resources.

Drawing on UNIDO's unique database, it is possible to provide an updated and augmented account of the general patterns emerging from the Syrquin-Chenery studies by expanding both the sample of countries and the time period of analysis and using a longer time span of data (Haraguchi and Rezonja, 2010a).[5] Drawing on this larger and more disaggregated database, it is possible to estimate a "normal" pattern of development for the manufacturing sector as a whole and more detailed pictures of "normal" development for individual sub-sectors.

Focusing in the first instance on the trajectory of the manufacturing sector as a whole, Figure 14 illustrates how this relationship is affected by the economy's resource intensity.[6] Resource intensity clearly affects the contribution of manufacturing and there is a discernible difference between resource intensive economies and those with poorly developed resources sectors. Resource intensive economies not only have a smaller share of manufacturing in GDP (except at very low levels of per capita income), the pace of tailing off is also faster. Moreover, they experience a major decline in the share of manufacturing in GDP after the middle range of per capita income is reached (that is, beyond US$ 8,000 per capita). It is important to bear in mind that these data refer to the share of manufacturing in GDP rather than to the absolute

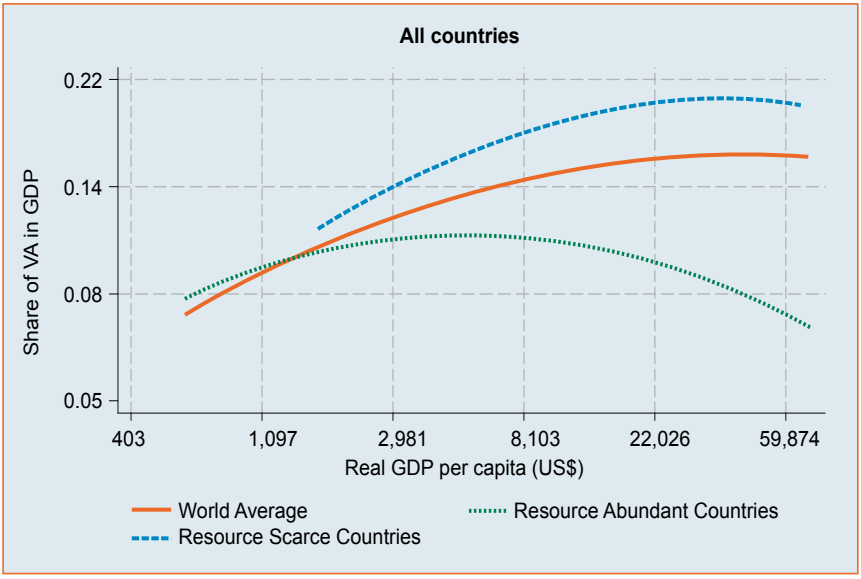
4 The quest to determine a "normal" pattern of structural change draws on the early writings of Kuznets (1957), Fisher (1939) and Clark (1940), each of whom sought to plot a path of structural change from the primary through the secondary to the tertiary sectors as economies grew in size and income levels. Subsequently, more detailed investigations by Chenery (1960), Chenery and Taylor (1968), Chenery and Syrquin (1975), Kader (1985) and others focused on a more thorough analysis of structural transformation, searching for the evolution of sub-sectors as per capita incomes rose and cognisant of the shifting growth trajectories of individual sectors (see also UNIDO, 1983).

5 In Syrquin-Chenery, the pattern of manufacturing transition was estimated for 108 countries for the period 1953 to 1983. The UNIDO database utilized by Haraguchi and Rezonja (2010a) includes a larger sample (135 countries) and covers a much longer period (1963 to 2006). Whereas Syrquin-Chenery calculated trends for 9 ISIC branches of manufacturing (rev 2), Haraguchi and Rezonja (2010b) used 18 manufacturing sectors at the two digit ISIC (rev 3) code (Table 6).

6 Resource intensive economies are defined as those in which net exports of unprocessed resources per capita are above the median for all economies. This distinction means that economies such as Australia and Canada are both identified as resource intensive, while Côte d'Ivoire and South Africa are not considered resource intensive. The virtue of this measure of resource intensity (as opposed to a measure of resource dependence such as the share of resources in exports) is that it avoids the problem of a circularity of argument, since resource dependence is generally greater in low per capita income economies.

level of manufacturing output. Thus, for example, a resource intensive economy may simultaneously witness growth in both the resources and the manufacturing sectors, but the rate of growth of manufacturing value added may be lower than the rate of value added growth in the resources sectors.

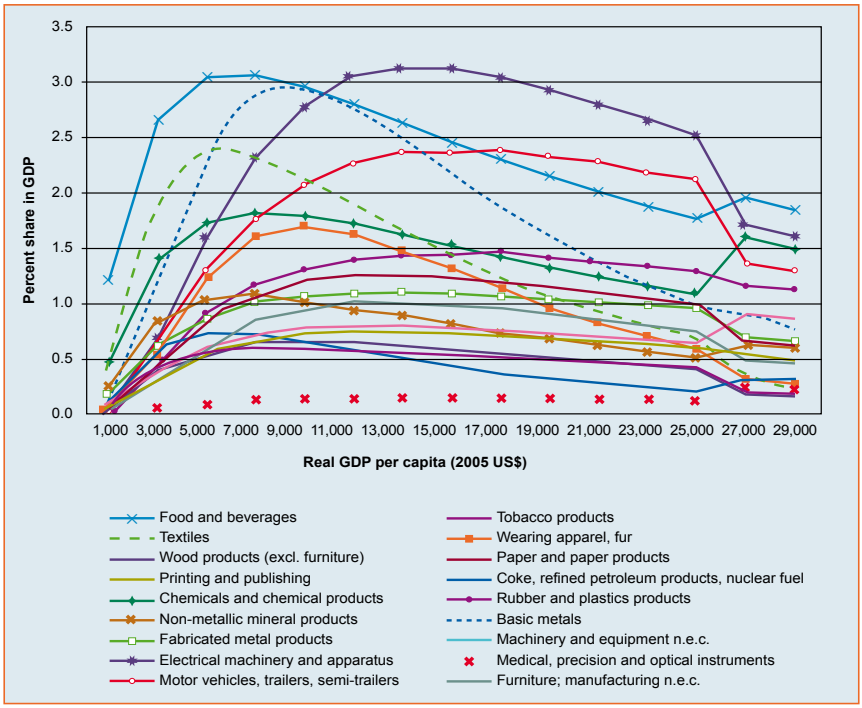
Figure 14: Share of MVA in GDP



Source: Authors' calculations from UNIDO ISIC 2 data

Turning to individual sub-sectors we can observe a broadly similar general pattern, but with substantial inter-sectoral differences. Figure 15 presents the share of the 18 different sub-sectors in GDP at different levels of per capita income in large countries (with a population of more than 15 million in 1983). All sectors experience an initial period of rapid rise, but their share of GDP subsequently declines as per capita incomes rise. Sectors such as food and beverages (ISIC15), textiles (ISIC17), chemicals (ISIC24) and basic metals (ISIC27) show a sharper initial growth trajectory at low levels of per capita income up to US$ 3,000 (all these estimates are in 2005 prices). Beyond US$ 3000, the share of wearing Apparel and footwear (ISIC18 and ISIC19), electrical machinery (ISIC31) and motor vehicles and transport (ISIC34 and ISIC35) accelerates. Refined petroleum products (ISIC23) reach their peak at around US$ 5,000, non-metallic products (ISIC26) at US$ 7,000 and fabricated metals (ISIC28) and furniture (ISIC36) at around US$ 13,000. Machinery and equipment (ISIC29 and ISIC30) develop at the highest levels of per capita income, reaching their peak at US$ 27,000.

Figure 15: Change in share of manufacturing sub-sectors in GDP at selected per capita income levels for large countries



Source: Haraguchi and Rezonja (2010)

Table 4 shows, in ascending order, the GDP per capita levels at which the share of individual sectors peak in terms of share of GDP. This table needs to be read in conjunction with Figure 15, since in some cases, sectoral peaks fall off rapidly (for example, basic metals) whereas in other cases sectors (such as electrical machinery and apparatus) sustain a share of GDP at or near their peak across a range of per capita incomes.

Drawing on this analysis, it is possible to generate a more detailed picture of the pattern of "normality" in resource rich Central Asian and SSA economies. Given data limitations, this analysis is limited to three Central Asian economies (Kazakhstan, Mongolia and Tajikistan) and twelve SSA economies (Botswana, Cameroon, Côte d'Ivoire, Gabon, Gambia, Mozambique, Nigeria, Senegal, South Africa, Sudan, Tanzania and Zambia). In each case, the analysis identifies those sectors in which each country is below the norm, those in which the economy is close to the norm and

Table 4: Sectoral peaks and GDP per capita income levels

ISIC description	ISIC abbreviation	ISIC code	Peak Income level range
3. Textiles	Textiles	17	5000
8. Coke, refined petroleum products and nuclear fuel	Coke and refined petroleum	23	5000
1. Food and beverages	Food and beverages	15	7000
11. Non-metallic mineral products	Non-metallic minerals	26	7000
9. Chemicals and chemical products	Chemicals	24	7000
2. Tobacco products	Tobacco	16	7000
12. Basic metals	Basic metals	27	9000
5. Wood products (excluding furniture)	Wood products	20	9000
4. Wearing apparel, fur & leather products and footwear	Wearing apparel	18 & 19	9000
7. Printing and publishing	Printing and publishing	22	11000
6. Paper and paper products	Paper	21	13000
13. Fabricated metal products	Fabricated metals	28	13000
18. Furniture; manufacturing n.e.c.	Furniture, n.e.c.	36	13000
15. Electrical machinery and apparatus, radio, television and communication equipment	Electrical machinery and apparatus	31 & 32	13000
10. Rubber and plastic products	Rubber and plastic	25	15000
17. Motor vehicles, trailers, semi-trailers & other transport equipment	Motor vehicles	34 &35	15000
14. Machinery and equipment n.e.c. & office, accounting, computing machinery	Machinery and equipment	29 & 30	27000
16. Medical, precision, and optical instruments	Precision instruments	33	27000

Source: Based on Haraguchi and Rezonja (2010a)

those sectors which have a disproportionately large share of GDP in the individual economy. In addition, the data in these country profiles also plot the dynamic paths of these sectors in each of the countries to illustrate how their relative role has changed between 1990 and 2008.

This analysis is undertaken for the resource-dependent economies in Central Asia and SSA where the share of hard and energy commodities comprised more than 10 percent of exports in 2006. The detailed evidence for individual countries in these two regions is presented in Appendix A. In each case, the data chart key economic parameters and the changing patterns of sectoral specialization between 1993 and 2007, and then identify those sub-sectors in which the economy is below or near to the pattern of "normality" at the country's level of per capita income. An example of the underperforming and near-to-normal performing sub-sectors is shown for two SSA economies in Table 5, Botswana (with a weakly developed industrial sector) and South Africa with a well developed industrial structure.

The deviation from this pattern of sub-sectoral normality provides the missing

Table 5: Below-the-line and at-the-line of "normal" sub-sectoral structures*, Botswana and South Africa (2008)**

Country	Below "normal" share in GDP	Near "normal" share in GDP
Botswana	Textiles Food and beverages Apparel and footwear Paper and paper products Printing and publishing Chemical and chemical products Non-metallic mineral products Basic metals Fabricated metal products	Rubber and plastic products Motor vehicles
South Africa	Non-metallic mineral products Tobacco products Apparel and footwear Textiles	Electrical machinery and apparatus Machinery and equipment Medical, precision and optical instruments Printing and publishing Wood products

* Detailed analysis of other SSA and Central Asian economies is provided in Appendix A.

** Sectors in this list are ordered in relation to their distance from the "normal curve", that is, the higher the sector on the list, the further it is from the "normal" pattern.

signposts for industrial diversification through fiscal linkages, which so troubled Hirschman. It is an approach that builds on the "flying geese" models of industrial development which informed Japanese industrial strategy in the pre- and post-war period, north East Asian industrial strategies in the 1960s, 1970s and 1980s, as well as the Chinese industrial strategy after the mid-1980s. This evolutionary path suggests that countries should concentrate on those sectors which lie below the norm in terms of their per capita incomes, consolidate those which have reached the norm and be wary of those that lie above the norm.

4.2 Consumption Linkages

In some economies which specialize in resource extraction, not only are the incomes generated in the commodities sector sizeable, but given the relative underdevelopment of the industrial sector, they may account for a substantial share of domestic cash incomes. Even where this share is small, the absolute levels of income generated in the resources sector may be large. For example, in Kazakhstan in 2007, wages and salaries (excluding the income earned in the form of profits) were valued at US$ 811 million in the basic metals sector and US$ 117 million in petroleum refining.

But it is not just the incomes earned in the extraction of commodities that provide for consumption linkages. Incomes are also generated indirectly through the provision of inputs purchased domestically by the resources sector and earned when commodities are processed. For example, in the Ghanaian gold mining industry in 2008, US$ 465 million (that is 20 percent of the total spent) was directed towards locally acquired inputs, excluding fuel and power (Bloch and Owusu, 2011). In turn, many of these local suppliers had their own local suppliers, and there was thus a multiplier effect as incomes generated in the gold mining sector fed into the domestic economy. Added to this US$ 465 million spent locally was the payment of a further US$ 175 million in wages and salaries to mining employees. Again, as in the case of locally acquired inputs, these incomes have a multiplier effect as the consumption by workers leads to employment in the retail and services sectors.

The incomes generated by the commodities sector--both direct and indirect incomes--have the potential to spur industrial development through the creation of a domestic market. However, when Hirschman identified the importance of consumption linkages during the 1960s and 1970s, he was operating in a world of widespread import-substituting industrialization, supported by active industrial policies and tariffs and quantitative controls which limited imports. Thus, the

idea that incomes generated in the exploitation of commodities would spur a domestically oriented industrial sector made a great deal of sense then, even though, as Hirschman observed, some of the traditional artisanal producers might be displaced by the growth of modern industry.

Since then, most developing economies have introduced major programmes of liberalization and trade policy reform. This reform programme has reduced the incentive for domestic industry to take advantage of consumption linkages from the commodities sector in two respects. On the one hand, the trend towards liberalization has led to a winding down of active measures supporting industrial development. On the other hand, trade policy reform has reduced the protection provided to domestic industry. Table 6 presents the decline in the average tariff levels in SSA, showing that in four key sectors the rate of tariff protection (disregarding the removal of non-tariff barriers) fell significantly between 1990 and 2010. For example, it decreased from 26.2 percent to 15.2 percent in the food sector, and fell from 21.8 percent to 12.4 percent across manufacturing as a whole. In Central Asia, where no data prior to 1995 is available, protection in the pre-1990 era was at very high levels and currently stands at only 6.4 percent for manufacturing as a whole.

Table 6: Average tariff levels for imports from world (%)

Category	Central Asia			Sub-Saharan Africa				
	1995	**2005**	**2010**	**1990**	**1995**	**2000**	**2005**	**2010**
Food	NA	5.1	10.2	26.1	25.4	25.4	18.2	15.3
Fuels	NA	5.0	4.2	10.9	10.3	17.6	7.7	5.4
Manufacturing	NA	4.1	6.4	21.8	21.9	18.8	13.9	12.4
Ores and metals	NA	5.0	6.1	15.3	12.1	14.3	6.8	5.9

Source: TRAINS accessed via WITS online ⟨ https://wits.worldbank.org/WITS ⟩ (accessed July 2011)

The consequence of this drop in support for domestic industry has been a rapid rise in import intensity in virtually all commodity exporting low- and middle-income economies. Table 7 shows the changing share of imports in domestic supply (that is, imports plus domestic production) for a selection of SSA commodity exporting countries for which data is available, and Table 8 presents the same data for Central Asia. In both regions, import intensity rose sharply in most sectors between 1992 and 2007.

Table 7: Imports as a share of domestic supply in SSA, 1992, 2000 and 2007 (%)

	ISIC	Sector	1992	2000	2007
Ethiopia	15	Food and beverages	12	16	19
	17	Textiles	17	24	58
	18	Wearing apparel, fur	18	56	45
	21	Paper and paper products	53	42	39
	22	Printing and publishing	18	24	28
	1920	Footwear	3	13	19
	3610	Furniture	13	23	19
Kenya	15	Food and beverages	2	10	13
	17	Textiles	17	30	64
	18	Wearing apparel, fur	2	10	33
	21	Paper and paper products	13	22	29
	22	Printing and publishing	12	13	17
	1920	Footwear	100	4	44
	3610	Furniture	100	13	27
Mauritius	15	Food and beverages	11	21	24
	17	Textiles	57	58	57
	18	Wearing apparel, fur	1	2	5
	21	Paper and paper products	48	57	48
	22	Printing and publishing	12	30	20
	3610	Furniture	100	11	13
South Africa	15	Food and beverages	2	8	11
	17	Textiles	8	28	38
	18	Wearing apparel, fur	1	15	35
	21	Paper and paper products	5	9	11
	22	Printing and publishing	4	13	24
	1920	Footwear	3	27	39
	3610	Furniture	2	8	17
Tanzania	15	Food and beverages	13	30	29
	17	Textiles	14	48	64
	18	Wearing apparel, fur	68	27	99
	21	Paper and paper products	7	33	54
	22	Printing and publishing	11	20	45
	1920	Footwear	100	100	78
	3610	Furniture	100	100	33
Botswana	15	Food and beverages		38	48
	17	Textiles		17	15

Source: Authors' calculations from UNIDO (Rev 3) ISIC data

Table 8: Imports as a share of domestic supply in Central Asia, 1992, 2000 and 2007 (%)

	ISIC	Sector	1992	2000	2007
Kazakhstan	15	Food and beverages	10	28	34
	17	Textiles	3	51	89
	21	Paper and paper products	9	96	82
	22	Printing and publishing	2	24	28
	1920	Footwear	11	99	98
	3610	Furniture	3	80	83
Kyrgyz Republic	15	Food and beverages	4	16	55
	17	Textiles	1	66	99
	18	Wearing apparel, fur	3	74	96
	21	Paper and paper products	1	92	89
	22	Printing and publishing	4	45	60
	1920	Footwear	6	98	100
	3610	Furniture	0	43	74
Mongolia	15	Food and beverages	8	47	47
	17	Textiles	14	43	29
	18	Wearing apparel, fur	7	41	67
	21	Paper and paper products	100	99	73
	22	Printing and publishing	10	24	29
	1920	Footwear	2		72
	3610	Furniture	8	83	92

Source: Authors' calculations from UNIDO (Rev 3) ISIC data

Moreover, resource intensive economies face an additional problem in generating consumption linkages. At a macroeconomic level, notwithstanding the growth in incomes arising from increasing commodity prices, resource intensive economies face volatile export receipts. This volatility also applies to wages and salaries, such that domestically oriented industry is frequently undermined by volatile consumer purchasing power. For example, despite the prudent "storing" of oil rents in Kazakhstan's Oil Fund, the failure to curb risk taking behaviour in the private sector contributed to an unsustainable consumption boom and when commodity prices collapsed in 2008, Kazakhstan's banking and industrial sectors were hard hit (Esanov and Kuralbayeva; 2009).

The consequence of these various factors is that in resource rich economies with poorly developed industrial structures, consumption demand leaks abroad via imports to feed the industrial sectors in other countries. The degree of this leakage depends on the extent to which a sector produces traded goods or services. Some products benefit from various forms of natural protective barriers. Many services must be locally produced and are defined as exchanges which involve simultaneity of production and consumption. This in large part explains the rapid growth of the services sector in both Central Asia's and SSA's resource-based economies. Other products are characterized by a large, but not absolute, measure of natural protection. For example, some foodstuffs degrade very rapidly and are best produced close to the point of production. Similarly, other products such as bricks have a high transport to value ratio, again favouring local production. Nevertheless, despite these examples of natural protective barriers, most sectors of final consumption have become increasingly traded in recent decades, in some cases (as in the introduction of flat-pack furniture) arising as a direct consequence of product redesign.

4.3 Production Linkages

The extent of linkages into and out of the commodities sector reflects a number of factors. The first is the *breadth* of linkages. On the input side, this refers to the share of inputs acquired locally. On the output side, it is the proportion of commodity production processed by local firms. The second factor is the *depth* of linkage, that is, the extent of domestic value which is added to locally acquired inputs or locally processed outputs. There are a great many cases where what appears to be a "local product" is in fact merely an input imported by a local trader rather than by the lead commodity firm. Third, there is the need to assess the extent of *linkages in the whole value chain*, that is, how far down and up the chain the linkages are created. Fourth, and finally, is the question of depth and breadth of *horizontal linkages*, that is, the extent to which--as a direct consequence of linkages from the commodity sector--domestic value is added into inputs for or outputs from other related sectors. Figure 16 provides a graphical representation of these four linkage issues. It shows that there are tiers of firms in both vertical and horizontal links. It also shows, notionally, that the degree of domestic value added in individual links varies and can often be a small share of total output value.

The evidence on linkages from the commodities sector in developing economies (particularly backward linkages) is anecdotal. There have been very few systematic studies to measure the breadth and depth of linkages, and much of the available

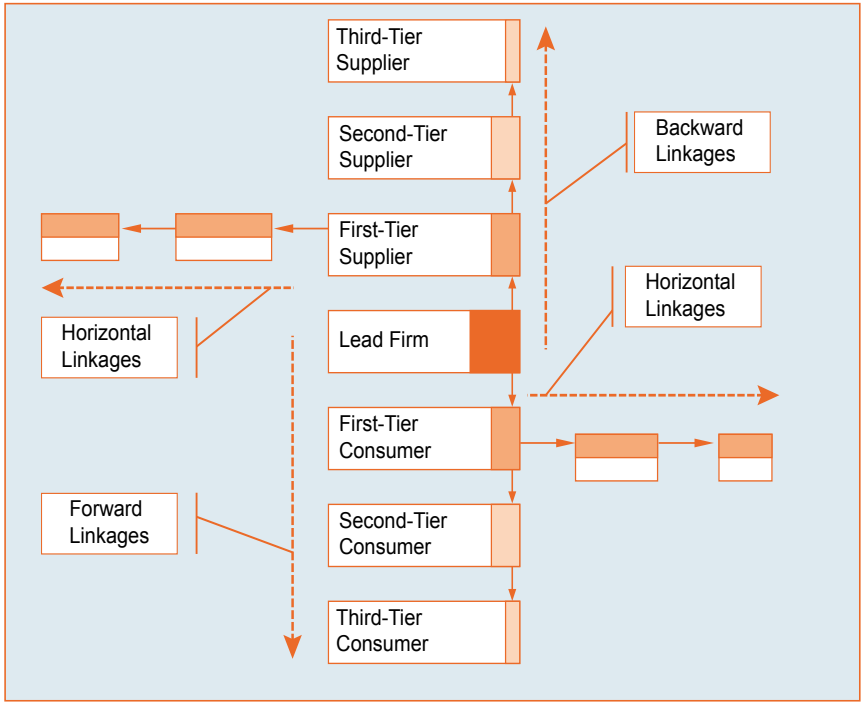
material is either based on prejudicial conjecture or public relations statements of lead commodity producing firms and governments seeking to burnish their image as a site for foreign investment.

A recent research programme on linkages from the commodities sector in eight African countries provides empirical material to explore linkages into and out of the resources sector in SSA (Morris et al., 2011a). These case studies investigated the equipment provided to the offshore oil industry in Angola; the cutting and polishing of diamonds in Botswana; inputs into and the processing of copper in Zambia; inputs into the gold mining sector in Tanzania and Ghana; the processing of timber in Gabon; the sourcing of fabrication and construction, well construction and completion and control systems and information and communication technology in the Nigerian oil industry; and mining equipment and services in South Africa. This sample represents a cross-section of sectors and countries and includes sectors in which production occurs in more than one country, thus providing insights into the country-specific determinants of linkage development.

A detailed country-by-country performance with regard to linkage development is provided in Appendix B. In summary, a number of general trends emerge from this detailed analysis (Table 9). First, beginning with the breadth and depth of linkages, Angola, Botswana and Tanzania lie at the one extreme. In each of these countries linkages are very limited, although there seems to be a more positive trajectory in Angola and Botswana than in Tanzania. At the other extreme is South Africa, where there is a very broad spectrum of linkages, in some cases with a globally leading character. There are also less substantial but nevertheless well-developed linkages in Gabon, Ghana, Nigeria and Zambia.

It is notable that the extent of the depth was thinner than the breadth of linkages. In an era of international specialization and globalization this is a near universal phenomenon, since suppliers invariably import some of their own inputs. But the shallowness of linkages in SSA is probably more evident than in most other regions of the global economy. In Angola, Botswana and Tanzania, the only effective addition to value was the labour content, although in two of these countries (Angola and Botswana) there was an increase in the level of skills employed. In Nigeria and Zambia and especially in South Africa--all economies where the depth of linkages was greatest--there is also evidence of horizontal linkages, that is, competencies developed to meet the needs of the commodities sector are also applied to serve the needs of other sectors.

Figure 16: Backward, forward and horizontal linkages from the commodities sector*



* Shaded area reflects share of domestic value added in locally acquired inputs and locally processed outputs.

The duration of commodity exploitation emerges strongly as an important factor in this summary table. South Africa, where large-scale mineral exploitation stretches back more than a century, is a clear indicator of this. The depth and breadth of linkages in Zambia and Nigeria (particularly when contrasted with the pattern of linkages in the same sector in Angola) also show a positive association with time, as do the respective patterns of linkages in the gold sector of Ghana (relatively high) and Tanzania (relatively low). Gabon, too, reflects the deepening of linkages over time. On the other hand, despite the 50-year history of the diamond industry in Botswana, linkages only really began to develop after 2005. Thus, whilst the age of the sector may have an important role to play in linkage development, it will not in itself lead to an optimal unfolding of linkages.

In all countries there are important capability gaps which hinder the extension of linkages. This is a natural characteristic of production in virtually all sectors and countries. But the nature of this gap differs across our sample of countries. In some cases, such as South Africa and to a lesser extent Nigeria and Ghana, this capability gap is reflected at a relatively high level of knowledge intensity. In other cases, such as Angola and Tanzania, the gap surfaces at very basic levels of industrial and knowledge capabilities.

Finally, the trajectory of linkages was not always positive. In some countries--Angola, Botswana, Ghana and Nigeria--there is linkage growth (with varying degrees of local content). By contrast, in other countries the degree of linkages is static. This is the case for Tanzania as well as Gabon (where the shallowing of linkages came to an end in 2011 when the government limited the export of logs). In the two most advanced cases of linkages--South Africa and Zambia--there is evidence of a shallowing of linkages.

Little is known about the nature of production linkages in Central Asia. However, they appear to be weak. In Kazakhstan, by far the largest of the regional economies and with a historically well-developed industrial sector during the Soviet era, the only sectors significantly linking to the oil production sector are transportation and communications (IMF, 2011).

These production linkages reflect Hirschman's belief that the evolution of industrial development may in part be described as "one thing leads to another". That is, the commodities sector requires inputs and produces outputs as intermediate products for other sectors. The resulting supply and demand response flows directly from the resources sector and, in turn, creates its own supply needs and output which feeds into other sectors. But Hirschman also observed that the degree of production linkage development reflects the scale and technological intensity of production and the degree of strangeness between the linking sectors. Thus, the depth, breadth and pace of production linkage development are uneven and open to policy development. They provide a potential path for industrial diversification through the use of resource rents, but not an inevitable path of diversification.

Table 9: Summary of findings on the breadth, depth and trajectory of linkages from commodities to other sectors in eight SSA economies.

Country	Sector	Linkage type	Breadth of linkage	Depth of linkage	Horizontal linkages	Maturity of the commodity sector	Gap between capabilities, sectoral complexity and capital cost	Trajectory of linkages
Angola	Offshore oil	Backward	Thin	Thin (labour only)	None	Mid-1990s	Complex and capital intensive sector vs low domestic capabilities	Increasing depth
Botswana	Diamonds	Forward	Thin	Thin (largely labour)	None	1960s	Craft intensive processing and weak skills	Increasing breadth and depth
Gabon	Timber	Forward	Thick	Transformation of commodities	None	Early 1960s	Capital intensive processing, weak skill and supplier base	Resistance to shallowing
Ghana	Gold	Backward	Beyond thin	Some transformation of inputs and knowledge intensive services	Not fully known, but probable	Late 19th century	Capital intensive processing, moderate skill base	Increasing breadth and depth
Nigeria	Oil	Backward	Approaching thick	Knowledge intensive services	Not fully known, but probable	1950s	Capital intensive processing, improving skill base	Increasing breadth and depth
South Africa	Mining capital equipment and specialist services	Backward	Thick	Transformation of inputs and considerable knowledge intensive services	Substantial	1880s	Knowledge and capital intensive, well-developed industrial skill and knowledge base	Becoming shallower?
Tanzania	Gold	Backward	Thin	Thin	Unlikely	1998	Capital intensive processing, weak skill base	Static
Zambia	Copper	Backward	Approaching thick, but diminishing	Approaching thick trans-formation of inputs and outputs, but diminishing backward linkages	Not known, but probable	Early 20th century	Capital intensive processing, moderate industrial base	Shallowing

5. WHAT DETERMINES THE DEPTH AND BREADTH OF PRODUCTION LINKAGES WITH THE COMMODITY SECTOR?

Later in this Report a framework for the promotion of industrial diversification through the use of fiscal linkages in resource intensive economies will be considered. This is a framework which reflects industrial policy in general, in this case funded by the rents accruing as a consequence of the commodities price boom. In this section the Report addresses the specific nature of the opportunities and challenges opened to industrial diversification through the extension of production linkages. Less is known about this path of industrial development than in the case of fiscal linkages, and it is therefore necessary to analyse the drivers of production linkage development in a little more detail.

There is widespread belief that the hard and energy commodities sectors operate as enclaves with limited spillovers to the local economy. This perception has deep roots in development strategy thinking, going back to the famous economist Hans Singer who observed the virtual absence of linkages from these commodity sectors in the decades after the Second World War (Singer, 1971). This view has been reinforced by studies of corporate strategy which show why a series of market failures have led firms to internalize the greater part of their value chains. However, in recent decades there has been a sea-change shift in the corporate strategy of leading global firms, and this has substantially altered the pattern of linkage development across industrial, agricultural and sevices sectors as well as in the commodities sector.

The deepening of globalization after the 1970s led to intensified competition as firms with became subject to a larger pool of competitors. One of the most important responses to this was the drive by firms to concentrate on their core

competences, namely those activities in which they had distinctive competences, where there were barriers to entry and which were valuable in the marketplace (Hamel and Prahalad, 1994). As a consequence there was a growing trend for non-core activities to be outsourced to low cost suppliers and for firms and economies to specialize in capabilities rather than wholly manufactured products (Kaplinsky and Morris, 2001; Gereffi, Humphrey and Sturgeon, 2005).[7] This is the antithesis of the pressures for internalization which had previously played an important role in driving foreign direct investment in integrated value chains (Dunning, 2000, Williamson, 1985).

Once the lead firm has, in principle, made the decision to outsource non-core activities, the first task is to find the lowest cost suppliers who can produce to the required quality and meet delivery schedules reliably. Suppliers who are able to offer unique technological competences are particularly attractive, especially in the first tier of suppliers. However, the logic, wherever possible, is for these suppliers to locate production and service delivery close to the doorstep rather than abroad or only some distance from the lead firm's activity. An efficient proximate supplier has the capacity to provide flexible and tailored responses to the needs of the lead firm, allows for the reduction of value chain inventories and removes uncertainties associated with extended logistics. This unfolding process of initial outsourcing to seek the lowest cost supplier ("global sourcing") extends to requiring the supplier to locate proximate to the factory ("follower supply") and was initiated in the automobile industry (Barnes and Kaplinsky, 2000). Global value chains now dominate most manufacturing sectors and many service sectors.

The global mining and oil and gas industries are relatively late followers of the specialization and outsourcing trend. Although undocumented as a general phenomenon, there is evidence that this has been occurring across a range of commodity sectors. Mines have moved away from a high level of vertical integration towards outsourcing in nearly every stage of the mining process to independent firms, including the provision of capital goods and intermediate inputs, such as chemicals (Urzua, 2007). The desirability of finding an efficient local supplier is particularly attractive in Africa and Central Asia. The reason for this is because transport and logistics are poorly developed, as goods brought in from outside may be subject to long and unpredictable delays and because government policies have often mandated the deepening of local value added. Supplier firms have responded to these opportunities to be incorporated in the

7 As a UNIDO study shows, the share of intermediate products and services in global trade has grown sharply in many sectors (Sturgeon and Memodovic, 2010), as companies specialize in niches of global value chains. A particularly graphic example is the iPhone. China's exports of iPhones at a unit value of US$ 178.96 represent only US$ 6.50 of local content (Xing and Detert 2010)).

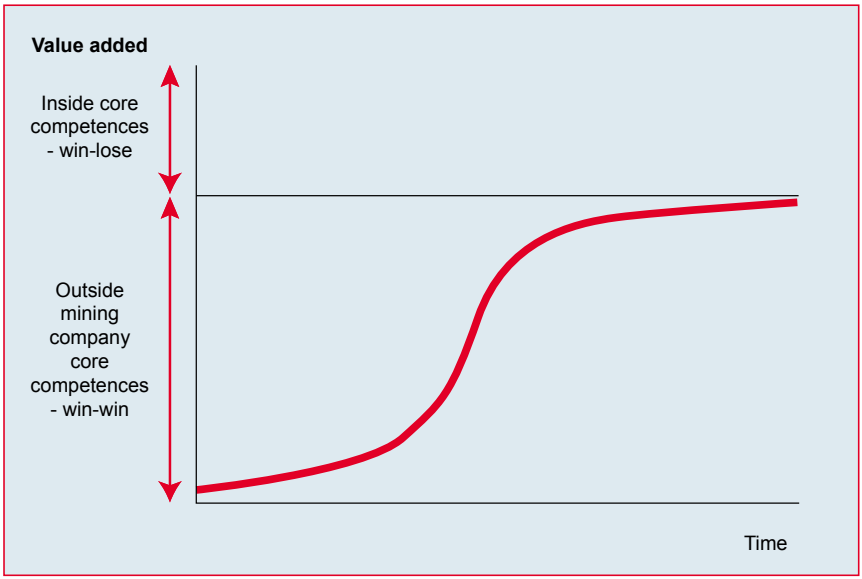
chain. For example, Bell Equipment in South Africa built competences in the domestic mining sector, and then became a supplier of these machines into a number of global markets, including the mining, construction, sugar and forestry sectors (Kaplinsky and Mhlongo, 1997, Walker and Jourdan, 2003). There has also been growth in the outsourcing of knowledge intensive services, and this has led to the emergence of specialized knowledge intensive mining services providers (SKIMS), offering not only specialized services but also other high technology inputs. Companies such as SRK in South Africa, which started as a service provider to Anglo American, have grown into global mining consulting firms. The development of local suppliers is more advanced in Chile where global mining companies are actively involved in building capabilities in their suppliers. BHP Billiton, for example, has an extensive supplier development programme in Chile (Barnett and Bell, 2011). In Ghana, there is an increasing trend for knowledge intensive service providers to the gold sector to also sell these services to the emerging gold industry in neighbouring West African economies.

Although all of the above examples relate to the hard and energy commodities sectors and primarily involve backward linkages, there have also been important linkage developments in the soft commodities sectors and in the extension of forward linkage processing industries. Many agricultural commodities are being increasingly processed in commodity producing economies (such as timber being converted into veneer and plywood in Gabon and into pulp in South Africa), new plants are under construction to process copper in Zambia, a new refinery and a liquid gas plant are under construction in Angola and diamonds are being cut and polished in Botswana.

It is possible to thus construct a general model of linkage development (Figure 17) taking account both of the localization of what was previously imported and the growing trend towards outsourcing by lead commodity firms. The vertical axis in Figure 17 represents the accretion of value added in the provision of inputs into the production of a commodity. Based on the insights drawn from the core competences framework we can distinguish, on the one hand, inputs which the lead commodity producers have no intrinsic interest in maintaining in-house since they do not reflect their core competences. We characterize these as win-win linkages where lead commodity producing firms and local suppliers and customers have a common interest in developing local linkages. On the other hand, there are a range of inputs which are central to the firm's competitiveness and which it is reluctant to see undertaken by a competitor. We consider these to be win-lose linkages. We can take the diamond value chain as an example to illustrate these two categories of inputs into a commodities value chain. The cutting and polishing firms may actively want auditing, office provisions and utilities to be

provided by outsiders, undertaken in the best of all cases, by reliable and low cost suppliers based as close to their operations as possible. On the other hand, they are very reluctant and have to be forced to allow customers to participate in the cutting and polishing of diamonds, and in the logistics, branding and marketing which guarantee their control over the profitable segments of the diamond value chain. These are their core competences. The horizontal axis of Figure 17 reflects the passage of time. The curve shows that, as a general consequence of the outsourcing of non-core competences, there is a market-driven process of linkage development. Initially, the pace of outsourcing is low, it then speeds up and subsequently tails off as the easy hits are exhausted.

Figure 17: Market-driven linkages over time



There are a number of factors which determine the nature, extent and the location of these outsourced linkages. It is helpful to distinguish between intrinsic and contextual determinants of linkage development, although of course these are not watertight distinctions.

5.1 Intrinsic Determinants of Outsourcing and Linkage Development

There are four intrinsic factors which reflect the technological specificities of the sector in question, namely (a) the imperatives of achieving lean production (b) the specificity of resource deposits (c) the technological intensity of extraction and processing and (d) the shelf life of the commodity and the weight loss in processing.

Lean production techniques provide firms with the capacity to meet differentiated final customer needs cheaply, at higher levels of quality and often by reliably delivering smaller batches of customized products. Central to lean production are low inventories, "zero defect" suppliers who can be trusted to deliver reliably in smaller batches. Although affected by the nature of inputs, this places a premium on *near-sourcing* within the outsourcing process. Further to this logistical imperative to local sourcing, a key characteristic of virtually every mining or energy resource is that it is location specific. No two deposits will be identical. The technology and the accompanying knowledge and skill inputs required for efficient identification and exploitation of the resource must, therefore, of necessity be applied locally on site. This provides the possibility of drawing on local skills and knowledge as well as the local presence of technology spill-overs. But, third, these imperatives to local sourcing are, of course, circumscribed by the technological and scale complexity of the commodity sector. In general, technological barriers to entry are less evident in the soft commodities sectors, where technological complexity and learning spill-overs are less limited than in the hard and energy commodities sectors. Yet, even in the scale and technology intensive hard and energy commodity sectors there are multiple inputs which are relatively low in technological content and with few barriers to entry. At the most basic level this includes the provision of food and accommodation for the workforce, transport and logistics, security, some utilities and simple maintenance and repair. How feasible low cost and flexible local supply is will of course reflect not only the intrinsic technological complexity of the resources sector in question, but also the extent of capabilities in the local economy, that is, the technological gap. Finally, many soft commodities (such as sugar) have a short shelf life after extraction and require rapid processing, providing strong incentives for the localization of these activities. Other soft commodities, as well as many hard and energy commodities, involve significant weight and volume loss in processing, and this, too, predisposes them to local processing.

Beyond these intrinsic sectoral drivers to linkage development, there are a series of contextual.factors which determine the economic feasibility of local linkage development. These reflect a series of social and political factors as opposed to technical determinants of linkage development and are, as a consequence, more open to the influence of policy. These are the (a) capabilities in the local economy relative to the complexity of the sector (b) the ownership and firm strategies of lead commodity producing and linkage firms (c) the nature and quality of infrastructure, and (d) the efficacy of the policy environment itself.

Domestic capabilities and systems of innovation

Effective commodity extraction, and even more so the supply of inputs, requires a range of skills. Even the basic commodities, such as foodstuffs, require some level of skills and technological knowledge. As linkages develop further--as more products are supplied by local producers (breadth of linkage) and also as products that are supplied locally increase in local content (depth of linkage)--so will the demand for skills and for product and process development capabilities increase. Increasing the skills and enhancing technological capacities of commodity producers and especially of firms supplying inputs will therefore be critical to enhancing the breadth and depth of linkage.

Both SSA and Central Asia are characaterized by significant skills gaps, particularly of skills relevant to the industrial sector. Thus, whilst the Central Asian region has high literacy levels (at 99 percent, adult literacy is nearly universal) a persistent skills gap has been identified as one of the major reason for the region's low competitiveness in global markets. Although labour productivity has increased, this has been on the basis of a shift from agriculture and manufacturing to the services sector (OECD; 2011). Skills development is thus a key challenge for the extension of production linkages from the commodities sector. Here there are a number of challenges which affect linkage outcomes.

The first is that the most critical skills shortages are in engineering and technical skills (Lall; 1992, Bell, 2006). Second, whilst skills development should also address higher level tertiary skills (particularly at advanced stages of linkage development), it is often at least as critical to provide a supply of trained vocational skills. Third, skills development needs to produce capabilities which are relevant to the local environment. There is a long and unfortunate history of low income countries training institutions producing skills more relevant for industrially advanced country settings than for the local economy, although considerable progress has been made in recent years in rectifying this misfit. Kazakhstan, for

example, like other former Soviet Union states, inherited strong institutional capacity in the sciences, which could contribute to trained managers and engineers to the energy sector. However the link between academic institutions and the industrial sector appears to be weak (Domjan, 2004). The World Bank has also found that in many Central Asian countries the local institutions have little experience of international equipment and standards, and are therefore unable to train labour for the requirements of the large TNCs that are investing in these regions (in Domjan, 2004). Fourth, beyond the production of adequately trained skills lies the capacity of firms to use these skills productively, that is, to develop the routines required for effective production. Moreover, since technologies are changing rapidly, firms also require the capacity to identify, effectively assimilate and improve new technology, and this often happens as a precursor to firms developing their own innovative technologies.

This agenda of capability building requires more than the expansion of a training infrastructure and the development of firm-level routines which allow for the effective deployment of skills. It also requires research and technology institutions to support the development of sector-specific knowledge and the enhancement of the technological milieu, particularly as the technological intensity of linkages increases. These supporting institutions may be very local in nature and comprise a "regional system of innovation" (Braczyk et al, 1998). They also often have sectoral specificities (a "sectoral system of innovation", Malerba, 2004). But most typically, they are assembled on an economy wide basis and comprise a "national system of innovation", (Lundvall, 1992, Freeman, 1995).

All of these factors determining skills development, the effective use of skills and innovation are subject to market failure. Thus, to the extent that they support the localization of input provision and processing, their availability is a function of the effectiveness of the policy environment.

Ownership

The firm is a heterogeneous entity, and although each firm is individual with particular competences and business strategies, there are important structural features which influence the behaviour of firms in general, and with regard to linkage development in particular. Here we can distinguish three different ownership attributes.

The first is the origin of ownership and place of incorporation of the lead commodity exploiting firm. A widely held view (not always supported by evidence) is that

locally owned and/or locally incorporated lead firms are more deeply embedded in the local economy, have greater familiarity with local suppliers and customers, know their way around the institutional infrastructure and, crucially, that they are more committed to local development than footloose, foreign owned firms. Each of these characteristics has a potential effect on domestic linkages, with the likely outcome that locally owned and incorporated firms are more prone to participate in linkage intensive chains. Beyond the ownership and incorporation attributes of lead commodity firms is the ownership of their suppliers and customers. Their horizons, too, may be affected by their origins and their embeddedness in the local economy.

Second, the particular nationality of foreign ownership may have implications for linkage development. For example, the nature of equity markets in the home countries may predispose firms to operate with particular time horizons and attitudes to risk. Firms which are affected by shareholder value structures or which raise their funds on short-term markets may have little patience with long-term local supplier or customer development. By contrast, firms with greater access to patient capital, with higher internal savings rates and which are supported and "guided" by their governments, are more likely to be involved in long-term and risky resource extraction than are their northern competitors (Farooki and Kaplinsky, 2012), and may also have more patience with local linkage development. Patient capital is widely argued to be characteristic of Chinese firms in the resource and infrastructure sectors (Fessehaie, 2011, Perkins and Robbins, 2011). But, despite the fact that, at least in the African case, linkage development may be strengthened through support from the Chinese government which is engaged in the construction of industrial processing zones in six African countries[8], the general view is that Chinese firms import a disproportionate share of their inputs from China, or where they use locally sourced inputs, they bring their suppliers with them, leaving little space for local supplier development (Corkin, 2012; Fessehaie, 2012; Suliman & Badawi, 2010). Another element of nationality of ownership is that northern-based firms are often subject to intense pressure from civil society organizations to implement Corporate Social Responsibility (CSR) programmes to introduce supplier development schemes to spread the benefits of commodity extraction to communities living close to resource extraction. This is often an important driver of backward linkages. Firms with their bases in low income countries such as China and India face fewer pressures of this sort, and consequently may be less likely to promote backward linkages as a response to CSR imperatives.

8 China's Ministry of Commerce (MOFCOM) is supporting the development of seven economic and trade cooperation zones in Zambia, Egypt, Nigeria, Sierra Leone, Mauritius, Uganda and Ethiopia

Third, and beyond the nationality of ownership, are a series of firm-specific attributes. The importance of this factor was prefigured by theories of imperfect competition in the 1930s (Chamberlin, 1933), developed further by Hymer (1976), and elaborated subsequently in the widely used OLI (**O**wnership, **L**ocation and **I**nternalization) framework in Dunning's eclectic theory of foreign direct investment (Dunning, 2000). Individual firms act in very different ways even though they may operate in the same industry and same environment. This individual behaviour will reflect a number of conditioning factors, including the firm's pioneering or follower position in the industry, the firm's particular bundle of competences and the strategic visions of firm leadership, each of which affect their propensity to develop linkages.

The impact of individual firm strategies on local input provision is evident in the gold mining industry in Tanzania (Mjimba, 2012) and the DRC (Hanlin and Hanlin, 2012). In Tanzania, in the first instance, although all of the major gold mining companies have expressed strong commitment towards linkage development, in reality linkages are both narrow (only a few inputs are procured locally) and thin (with low degrees of value added). Yet, within this general trend, each of the three firms performs differently with regard to linkages, and in some cases where firms own more than one mine, the linkages also differ between mine sites. However, the contrast is more marked by comparison to the ongoing construction of a new gold mine in the DRC by a Canadian firm. This firm has recognized that linkage development in large mines may often be critically determined at the mine development stage where core decisions are made which affect the ongoing sourcing of inputs in the future. Thus, before mining operations start, the firm assesses and enhances the capacity of local and regional suppliers to provide inputs into the mine. Their procurement officers engage with local suppliers and have, for example, travelled to each of the regional urban areas to determine the availability and quality of products they will require during the operational cycle of the mining operation. Thus, 100 percent of the fresh produce used to feed its mine staff will be obtained from local producers in South Kivu Province, which is not the case in the adjacent Tanzanian gold mines despite their decade-long operating history.

Infrastructure

Infrastructure can take various forms, both physical and social. It can be "physical", embodied in road and rail transport, utilities and telecommunication networks. In each of these cases the effectiveness of infrastructure development is a function of reliability, quality of provision and the cost to the user. But there is also a compendium of "social" infrastructures. These reflect the efficiency and cost of the administrative and regulatory regime which supports the productive sector. These characteristics of efficient infrastructure bind all economic activity, but they are particularly important not just for exporters of commodities, but also for their local suppliers and processors. Four sets of factors are important in determining the role played by infrastructure in the development of linkages into and out of the commodities sector.

First, the nature of the commodity has a significant impact on the development of infrastructure in a number of ways. Commodities produced and exported in bulk and in great volumes (such as coal or iron ore) require large-scale transport infrastructure to move their mined outputs. This may have externalities for the local economy, including for suppliers and processors. Lead commodity firms in these sectors are often able to cover the costs of these infrastructural investments--where governments are responsible for infrastructure provision, fiscal constraints may slow down these investments. Second, and related, the nature of the infrastructure has important implications for the development of linkages. Some infrastructure is highly specific to a particular commodity producer and has very low potential for positive spill-overs which might facilitate the growth of backward and forward linkages (for example, oil pipelines). By contrast the development of road and rail infrastructure as proposed in the corridor infrastructure development programmes in East and Central Africa have the potential to lower logistics costs for suppliers and processors. Third, if infrastructure in a commodity exporting developing country is primarily or solely focused on meeting the requirements of the lead commodity extracting firm, then it is likely to result in enclave infrastructural development, which will hamper the ability of local suppliers or processors to link with and participate effectively in the country's commodities value chains.

The policy environment

Policy is demonstrably a critical factor in the development of production linkages. In some respect, policy is the single most important factor, at least in relation to linkage development, in SSA's resources sector. It is important to distinguish

between policies which are directly targeted at the resources sector itself, and policies which are of relevance to a wider set of sectors, but which have important implications for the resources sector, including with regard to the extrinsic factors of ownership, infrastructure and capabilities.

Effective state policy development and implementation with regard to linkages involves six sets of overlapping factors. In the first instance, government needs to develop a realistic strategy for the resources sector's development in general, and for linkage development in particular. This needs to steer a path between over-ambition (setting unrealistic objectives) and the absence of ambition (an entirely laissez faire attitude to the resources sector and to linkage development). Second, this strategic vision needs to be accompanied by specific policy instruments (for example, local content policy and capability building of supplier firms' production competences). Third, these policy instruments need to move beyond exhortation to embody positive and negative incentives and sanctions. Fourth, these policies need to align and to be mutually reinforcing. For example, there is a widespread tendency for FDI in mining to be accompanied by exemption from import duties on inputs, whereas domestic suppliers are expected to pay duty on their imported inputs (Mjimba, 2011). This trade policy undermines other government policies designed to promote backward linkages. Fifth, governments will need to possess and develop the capabilities to implement their strategic vision and the accompanying policies, as well as the will and legitimacy to do so.

Finally, governments are only one actor in the policy chain. They are often also not the most important actor in the development of linkages into and out of the resources sector. Successful policy development and implementation, therefore, requires an alignment of visions and capabilities between the state and the private sector and in some cases (since linkage development often reflects pressures for Corporate Social Responsibility, CSR) also with civil society organizations often operating in adjacent local communities.

Related to the need for effective state policy development and implementation are complementary requirements at the corporate level. In the same way that governments may have visions without backing policies or capabilities, or policies which do not align, or where they lack the capacity and will to implement visions and policies, so the corporate sector faces similar challenges. The corporate sector is unlikely to be able to implement its vision unless it is able to develop a coherent alignment and cooperative interactions with state policymakers and, often, also with civil society organizations.

6. PUTTING THE PUZZLE TOGETHER: A COORDINATED POLICY FRAMEWORK FOR LINKAGE DEVELOPMENT IN RESOURCE INTENSIVE LOW AND MIDDLE INCOME ECONOMIES

The ongoing boom in commodity prices provides a respite for many low and middle income economies which have hitherto been confronted by an enduring decline in their terms of trade. The likelihood that commodity prices will remain firm for some years to come does not reduce the imperative for economic diversification into industry and knowledge intensive services because of the continued volatility of commodity prices and the capital intensity of many hard and energy commodities sectors.

As we have seen, the possibilities opened for industrial diversification in commodity intensive economies reflect a combination of three factors. The first is the availability of resource rents which can be used to fund the development of industry in sectors unrelated to commodity production. These are referred to as fiscal linkages from the resources sector. The second is the demand created for domestic manufacturing and services through the incomes earned in the commodities sector--the consumption linkages. Third are the production linkages which arise in producing inputs for the commodities sector (backward linkages), in the processing of commodities (forward linkages) and in the horizontal linkages, whereby forward and backward linkages generated in meeting the needs of the commodities sector also meet the needs of other sectors (horizontal linkages).

As has been shown in the analysis of production linkages in SSA (and, to a lesser extent, Central Asia), much of the industrial diversification arising out of commodity production occurs as a natural outcome of market forces. This market-led linkage development has confounded the expectation of many policymakers and observers who are steeped in an enclave mentality, which has long characterized the operations of the resources sector in low and middle income economies. But notwithstanding market-led linkage development, there remains considerable scope for enhancing the structure and pace of production linkages through effective policy development and deployment. In addition, there remains the challenge of utilizing rents effectively to ensure that the bounty of nature is not squandered in the pursuit of inefficient industrial diversification.

Building on the insights of the foregoing detailed analysis of fiscal, consumption and production linkages in SSA and Central Asia, this Report now turns to the challenge of policy design and deployment. It is necessary to preface the discussion of the specific implications for linkage development with a brief review of two sets of key issues which affect industrial policy in general--the different levels of industrial policy and different approaches to industrial policy.

6.1 Different Levels of Industrial Policy

It is helpful to distinguish three levels of policy which affect the rate and trajectory of industrial growth. At the highest level of action are macro-level policies. These include policies which define and protect property rights, policies of macro-economic management, which ensure some measure of stability against sudden surges in prices and in upward and downward cycles of growth, and policies which provide for efficient financial intermediation between savings and investment. Macro-level policies also provide an exchange rate set at levels which reflect the industrial sector's capabilities and skill endowments, and which determine the sector's capacity to compete with other economies. The central characteristic of these macro-level policies is that they are sector-neutral, that is, they are generic to all sectors in the economy, including the industrial sector. Without these basic conditions provided by appropriate and effective macro-economic policies, investment in the economy at large will be threatened, including in the industrial sector.

For much of the 1980s and 1990s, the "orthodoxy" was that if these macro-objectives were achieved and were appropriate to an economy's endowments, this in itself would suffice to promote industrial development. This was a primary thrust in the Structural Adjustment Policies implemented in many African and Latin

American economies during the 1980s and 1990s. However, a closer reading of the experience of successful late industrializing economies (World Development, Special Issue, 1994) and of the historical development of the now high income economies (Chang, 2002) showed that whilst getting the macro-economic parameters right was an important contributor to industrial development, it was by no means a sufficient one. It has become increasingly clear that a series of market failures are endemic in industrial development, notably with regard to capabilities development, infrastructure and innovation. The inability to appropriate the full fruits of investment, the non-exhaustibility of the outcomes of investment and the existence of systems-gains lead to sub-optimal rates of investment in each of these areas. These market failures affect all sectors, including the industrial sector (Lall and Teubal, 1998). Therefore, even the proponents of mainstream economic thinking have come to recognize that the macro-level policy agenda necessarily needs to focus not just on macro-economic management, but also on pervasive cross-sectoral market failures (Page, 1994).

Important as this support to compensate for cross-sectoral market failures is, it is widely accepted that this alone does not meet the challenge of industrial development in a competitive globalizing economy. Drawing on the historical experience of virtually all successfully industrializing economies, there has been widespread recognition of the role selective policies can play--which we can term meso-level policies--to promote industrial growth and diversification. These intermediate-level meso policies address both the promotion of key sectors and particular regions and industrial clusters. (There is more ambivalence around the notion that successful industrial policy should also “pick winners”, that is, support particular firms). The argument for focusing on key sectors is to achieve dynamic comparative advantage in a world of intense competition (Amsden, 1989; Wade, 1990). The support for industrial clusters is designed to reap inter-firm externalities and learning (Schmitz and Nadvi, 2000).

A third level of policy are micro-level industrial policies. These are aimed at addressing firm-level failures. The critique of industrial policy frequently focuses on the weaknesses in governments to promote industrial competitiveness. But the truth is that in most sectors, there is a very long tail of competitiveness and this suggests that many firms, and many lead firms in coordinated value chains, operate sub-optimally. This results from a range of factors, including poor levels of knowledge, weak and inappropriate business models, underinvestment in skills, inefficient routines (not just inside the firm, but also in supply chain management programmes which affect the value chains within which lead firms operate), insertion in unprofitable markets, weak product design and the use of outdated or inappropriate process technologies. Because of the widespread nature of this

gap between best performers and the long tail, many countries have introduced micro-level policies to support enterprise efficiency in the recognition that market forces alone will not reduce the size of the tail of competitiveness.

Thus, the co-existence of state failure--weak, poorly informed, under-skilled and rent-seeking governments--and private sector failure (firms operating at some distance from the efficiency frontier) reflects the need for a series of initiatives designed to meet weaknesses in both realms. Critically, as Rodrik points out (Rodrik, 2004), it is necessary for the private sector to rrecognize not just weaknesses in the state sector, but also in the private sector itself. Vice versa, the state sector needs to be cognisant not just of the weaknesses of the private sector, but also of its own inadequacies. Except in exceptional circumstances, it is only when both of these key parties in industrial development have crossed this bridge and recognized that each has something to offer and to learn and that they must climb the hill together that rapid industrial growth and diversification can occur. The need for collaboration between the private and public sectors also arises from the inappropriability of some investments (such as in the case of infrastructure). This means that however rational and competent individual actors may be, acting on their own, this is unlikely to result in a socially and economically optimal pattern or rate of investment. For all these reasons, an industrial policy requires coordinated action by both the private and the public sectors, acting within their spheres and in collaboration with each other.

6.2 Three Different Approaches to Industrial Policy for Linkage Development

A focus on the extension of linkages from the commodities sector is thus understood as an extension of meso-level sectoral policy. Here, three broad overlapping approaches to selective industrial policies can be identified--the capabilities approach (“learning to dance”), the evolutionary approach (“flying geese”) and the externalities model (“monkeys in trees”). In each case it is obvious that complementary policies are required at the macro-level (to ensure property rights, a stable economic environment and a competitive exchange rate, efficient financial intermediation, and to address generic market failures which cut across sectors), at the micro-level (to facilitate enterprise and value chain upgrading), and in some cases also at the regional level.

The capabilities approach to industrial policy: learning to dance

The last quarter of the twentieth century witnessed a structural shift in the nature of globalization. In earlier decades (and indeed in the nineteenth century when trade integration levels were very similar to those of the late twentieth century), cross-border trade had largely been in finished products. The transition in corporate strategies to a focus on core competences led to the very rapid growth of fragmented, vertically-specialized global value chains (GVCs), and these have become the primary drivers of global integration in virtually all economic sectors. This GVC-dominated trade has meant that individual firms and countries have developed specific capabilities, and it is these capabilities (rather than final products) which are increasingly traded across borders.

In the case of many low income countries, the traded capability is unskilled labour, where the barriers to entry are low and where competition is high. For example, in the early 1990s, the unit value added in a "shoe export" from the Dominican Republic was only 23 US cents. In reality, it was not shoes that were being exported, but unskilled labour. The same observations apply to African clothing exports to the US under the African Growth and Opportunities Act (Kaplinsky, McCormick and Morris, 2010). This reliance on low-cost labour also reflects the trajectory of China's insertion into the global economy for the two decades after opening up in 1985.[9] But other countries have adopted a more ambitious programme of capability building. For example, Taiwan invested heavily in semiconductor expertise, initially through the construction of silicon foundries and subsequently in chip design (Amsden, 1989; Mathews and Dong-Sung Cho, 2000). Singapore has aimed to become a centre of financial expertise, Dubai and the Emirates have focused on developing capabilities in logistics, and the UK aims to take a lead in stem cell research. This specialization in function is also reflected in the positioning of private sector firms. Indian companies (such as WIPRO and Tata Consulting) have focused on developing skills in back-office support to firms in high income countries, and these skills have been marketed across a range of industrial and service sub-sectors. As a consequence, a growing number of northern TNCs are subcontracting parts of their knowledge intensive activities (including R&D) to Chinese and Indian firms (Bruche, 2009), as well as relocating parts of their own R&D efforts to these economies (Immelt et al., 2009).

In each of these cases, it is as if the key actors have learned a new dance, moving from the simplicity of the "twist" to the complex and subtle gyrations of the

9 The value added in a "China-produced", i.e. China-assembled, Apple iPhone is US$ 6.50 out of a total product cost of US$179 – Xing and Detert (2010).

"marimba", or shifting competences from ballroom dancing to the rumba, samba and the tango. A critical component of this approach to industrial growth and transformation is thus the development of functional, generic capabilities (in the case of dancing, rhythm and the capacity and persistence to learn). These capabilities can cut across sectors and sub-sectors. In the realm of industrial policy, this agenda is informed by evolutionary economics (Nelson and Winter, 1982) and capabilities theory (Lall, 1992). Evolutionary economic theory recognizes that firms are characterized by bounded rationality, that is, they make intelligent decisions but these are biased by their partial knowledge and influenced by their trajectories. Their evolution is thus path-dependent. Capability theory draws on the tradition of core competences and reflects the fact that firms have bundles of capabilities which may be applied beyond the products which they manufacture at any one time. However, the new applications must draw on the same or closely-related competences. Although both the evolutionary economics and capabilities literatures were developed to explain the development of firm-level competences, they also apply at the level of economies (where there are National Systems of Innovation; Lundvall, 1992) and at the sectoral level (where there are Sectoral Systems of Innovation; Malerba, 2004).

The evolutionary approach to industrial policy: flying geese

Much of the attention given to industrial policy has reflected an approach in which a country seeks to model itself on a higher income and more industrialized role model. It is based on the idea that particular industries are appropriate to particular levels of per capita income. These rewards will be eroded through competition, and as per capita incomes and capabilities grow, comparative advantage will change. Hence, the industrial structure needs to evolve if income growth is to be sustained.

There are a variety of lineages which support this model of dynamic industrial policy. During the 1930s Japan sought to apply these ideas to mirror the industrial specialization of the US and European economies, and during the 1960s and 1970s the same framework was applied to the newly industrializing economies in Asia which modelled themselves on Japan's successful emulation of the West. This came to be referred to as the "flying geese" strategy, with countries seeking to fill the gaps left by the swarm leader that was migrating to less competitive and less labour intensive industrial sectors (Akamatsu, 1962). However, the same principle was developed by Chenery and colleagues (Chenery, 1960; Chenery and Taylor, 1969; Chenery and Syrquin, 1975; Syrquin and Chenery, 1989) who sought

to capture a "normal" pattern of industrial structure, and to thereby map which industries are dominant at particular levels of per capita income (taking account of country size and resource dependence). More recently, Haraguchi and Rezonja have updated this analysis with an analysis of a patterns of industrial growth in a larger number of countries and over a longer time period (Haraguchi and Rezonja, 2010a and 2010b) This enables an individual economy to move through a path which has an established successful trajectory, or even to "leapfrog" and jump to a point further up the scale of "normality". A similar approach has recently been suggested by the Chief Economist at the World Bank, who proposes that each developing country identify a list of tradable goods produced some two decades ago in dynamically growing countries with similar endowment structures and a per capita income that is about 100 percent higher than their own (Lin, 2011). These are the sectors which an economy should seek to enhance and hence to provide a focus to its industrial policy.

Each of these "flying geese" models assumes that the past is a good guide to the future, and that countries will essentially follow the same path as similarly endowed countries have in the past.

The externalities approach to industrial policy: monkeys in trees

A third approach towards industrial policy is that which draws on patterns of trade specialization and which has much in common with the "learning to dance" capabilities school. It argues that a country's growth is determined not only by the *level* of its exports, but also by the *composition* of its exports. The more sophisticated a country's exports, the more rapid will be its growth. Therefore, the industrial policy agenda is to grow through a strategy of export diversification in which the economy seeks to move into more income elastic and technology intensive sectors which draw on competences related to existing capabilities. This provides a metaphor in which a product is a tree with its particular fruit, the forest represents all trees and all products, and each firm is a "monkey on a tree" (Hidalgo et al., 2007). Growth is achieved by moving from a tree with less fruit to a tree with more and richer fruit. The forest is not homogenous, and the ability of the firm to jump products is dependent on the proximity of the other trees and the jumping skills of the monkey. The further away the product tree, the more difficult it is to jump; the weaker the monkey, the less far it can jump.

6.3 An Eclectic and Inclusive Approach to Industrial Policy

To a greater or lesser extent, each of these approaches to a selective meso-level industrial policy are heavily "branded", seeking to carve out distinctive approaches. But in reality, they have much in common. The "learning to dance" and the "monkeys in trees" frameworks both recognize that the global division of labour is increasingly focused on competences and capabilities rather than on sectors, and that sustainable and high incomes result from moving into areas which are protected by innovation rents. They also share Hirschman's comments that industrial development in which "one thing leads to another", reflecting the lack of "strangeness" between the existing and emerging sectors of competence, is the easier path to tread. The evolutionary approach to industrial policy overlaps with both the capabilities and externalities models by showing how individual countries can learn from the prior experience of more industrialized economies.

Given the commodities price boom, the resultant rents and demand which arise from the expansion of the commodities sectors, and coupled with the insights gleaned from these different approaches towards industrial development, what lessons are there for policies designed to promote industrial growth and diversification in low and middle income resource intensive economies, including those in SSA and Central Asia?

Policies to promote fiscal linkages

Fiscal linkages comprise the use of rents generated in the resources sector to develop industries which are either unrelated to the resources sector or only marginally related to it. As such they, mirror the policy challenges facing industrial policy in all economies. In the context of a commodities price boom, the rents available for promoting existing industries and for diversifying into new industries may be large. However, there are some resource-specific issues to be resolved.

The generic macro-policies designed to institute effective property rights will be common across all sectors. However, the achievement of macro-economic stability may be especially difficult to achieve in the context of price volatility which characterizes the resources sector (Farooki and Kaplinsky, 2012). Similarly, resource intensive economies are often beset by high exchange rates, and this may have adverse consequences for the industrial sector, both in relation to competing in export markets and in withstanding challenges from imports, the

so-called Dutch Disease. Both Brazil and Australia are currently grappling with this particular problem.

Macro-policies to support industrial development with regard to fiscal linkages will need to address the prevalence of market failure with regard to skills and capability building (including support for the National and Sectoral System of Innovation) and for the development of the hard and soft infrastructure required by all industries. Resource sectors can often be particularly demanding of physical infrastructure. Similarly, micro-level policies will need to be instituted which cut across sectors and which help to reduce the length of the competitive tail in the private sector, and the development of appropriate strategies in lead firms in their value chains which play a critical role in supplier and customer upgrading.

There are a number of routes whereby governments may gain access to a share of the resource rents which can be utilized to promote a selective, meso-level industrial policy. One set of measures arises from the capacity of governments to charge for exploration and site licences and to impose royalties on production. Another source of rents arises from the state's participation as an equity holder, either through exclusive ownership of resource extraction or through joint ventures with private sector partners. Beyond this are a variety of taxation measures, including corporate taxes, direct and indirect taxation on incomes generated in the commodities sectors, value added taxes on purchases by the commodities sectors (including those generated by first-second and other-tiers of suppliers and consumers of commodities), and tariffs on imports and exports.

Once harvested, these resource rents can be directed to the industrial sector over time. In the more prudent cases (such as Botswana and Norway), or where resource rents are so large that they exceed the absorptive capacity of the economy, rents may be stored in a "heritage fund", perhaps in sovereign wealth funds (which are typically invested in equities and bonds in other countries), or as liquid assets (or in a combination of these funds). In other cases, resource rents may be utilized in "real time", that is, during the period in which they are earned.

Insofar as these resource rents are utilised in the promotion of industrial growth and structural change, this may involve direct equity holding by the state, including through joint ventures with the private sector. Beyond direct equity holdings, the state may direct resource rents to the industrial sector through loans, including micro-enterprise loans to SMEs which may be viable third- and fourth-tier suppliers in commodity value chains. Resource rents may also be utilized to develop state capacities to upgrade suppliers and processors of commodities (often through Investment Promotion Agencies), or to subzidise support provided to linkage

firms by the business services sector. Allied to this is the investment of resource rents in institutions in the National and Sectoral Systems of Innovation, as well as in training and education. An important avenue for the expenditure of resource rents which, has particular relevance for the commodities sector, and which has important externalities for linkage firms, is the provision of infrastructure.

The meso-level targeting policies to be used in the pursuit of structural change through industrial diversification represent more of a challenge, since, as we saw in the previous section, this is not only a difficult challenge (where uncertainty is compounded by knowledge gaps and the changing division of labour in the global economy), but there is not widespread agreement in how these lead sectors should be identified. Drawing on UNIDO's unique and detailed 40-year data set on manufacturing value added, a methodology was developed for identifying those sectors in which a particular economy is at the anticipated level of specialization (given its per capita income), where it exceeds the expected level of industrial development, and where it underperforms. The policy agenda here should be to leave undisturbed those sectors which display "normal" levels of specialization, to interrogate whether the "over-performing" sectors have benefited from particular incentives which have the effect of reducing output in other sectors, and then to examine why the "underperforming" sectors are doing so poorly. The bulk of policy attention should be given to these "underperforming" sectors, and then to those sectors on the horizon at per capita income levels somewhat above a country's existing level of per capita income. The rationale for this is that the barriers to entry in relatively poorly performing sectors will be lower than those involved in a country attempting to leapfrog its way to "super-normal" performance, in other words, countries should seek to pick the low hanging fruit first. When the appropriate sectors are identified, complementary meso-level policies will need to be developed to ensure that effective sectoral systems of innovation are established domestically (or identified abroad) to support these targeted sectors.

Figure 18 summarizes the industrial policy implications for the development of these fiscal linkages. Micro-level policies agenda includes a combination of macro economic policies and policies designed to address generic cross-sectoral market failures. The micro-level policies address policies designed to assist firm upgrading and, again, are largely generic across all sectors. The distinctive character of fiscal linkage industrial policy arises from the capacity to identify lead sectors and to effectively direct resource rents to promote these lead sectors.

Figure 18: Policies to promote fiscal linkages

Macro-policies	Property rights, stability, exchange rate, skills and National System of Innovation, infrastructure, innovation
Meso (targeting) policies	Identifying new sectors of activity based on analysis of industrial structure by comparison with other economies at similar or somewhat higher levels of per capita income. Support for sector-specific Systems of Innovation based on identification of emerging sectors of significance
Micro-firm level policies	Value chain and firm level efficiency and upgrading targeted at the efficiency of all firms and chains in the economy

Policies to promote consumption linkages

Hirschman's linkage taxonomy was developed during a phase of widespread import-substituting industrialization. At the time when he wrote, most economies were inward-focused and the infrastructure which serviced imports and exports were poorly developed. The industrial sector thus benefitted from a combination of policy-induced and natural protection. Moreover, scale economies in industry were relatively muted by comparison with the current era. In those circumstances, consumption linkages were a viable spur to industrial development in resource intensive economies.

The reality today is however very different. Protection for import substituting industry has fallen sharply in most economies, particularly in contexts where it was high in the past. At the same time, not only has the import-export infrastructure in resource intensive economies improved, but logistics costs in cross-border transport have fallen sharply with containerization and other innovations (such as flat-pack furniture). Compounding this, scale economies have grown rapidly in most industries, and domestic manufacturers face a hard battle competing with global brand names. In these circumstances, consumption linkages represent relatively few opportunities for linkages from the commodities sectors.

This does not rule out consumption linkages as a source of industrial development, it merely observes that this is unlikely to be a major source of industrial potential. Nevertheless, it does have policy implications for industrial policy, but these are not resource-sector specific. They include the macro-agenda of policies which

support industrial policies in general (Figure 18 above on fiscal linkages). In addition, a number of low income country regions are developing preferential trade areas, and this provides the capacity for developing consumption linkages which cut across individual economies (such as in the case of Kenyan firms supplying consumer goods to Tanzanian gold-mining workers, South African firms serving the consumption needs of commodity producers throughout Africa and Nigerian, Côte D'Ivoire and Ghanaian firms meeting consumption needs in other West African economies. The policy implications in this case apply more to regional policymakers than to national level policymakers. Micro-level policies address policies designed to assist firm upgrading and, again, are largely generic across all sectors. The specific challenge to promoting consumption linkages arises from the capacity to identify sectors focusing on basic needs and with a low trade intensity (since they benefit from natural protection), and to effectively direct resource rents to promote these lead sectors.

Figure 19: Policies to promote consumption linkages

	Consumption linkages
Macro-policies	Property rights, stability, exchange rate, skills and National System of Innovation, infrastructure, innovation
Meso (targeting) policies	Identify and target sectors meeting basic needs, and with low trade intensity. Back these sectors with relevant Sectoral Systems of Innovation
Micro-firm level policies	Value chain and firm level efficiency and upgrading

Policies to promote production linkages

The policy framework to promote production linkages from the commodities sector, both backward to suppliers and forward to users, will necessarily involve attention to the macro-policy environment. As observed above, macro-economic stability and a competitive exchange rate are issues which are particularly critical in resource intensive economies, and which affect production linkages into the commodities sectors as in all other sectors in these economies. Linkage sectors will also benefit from economy-wide support for two key areas of market failure--skills and capabilities development and innovation. Macro-policy support is especially indicated for a third area of market failure, notably infrastructural development. The commodities sectors, particularly those in low income economies where most hard and energy commodities are intensively traded, require infrastructure, since

most deposits are "fixed" by location and are often in inaccessible places. This inaccessibility and transport intensity will have implications for linkages into and out of the resources sector, as well as for the resources sector itself.

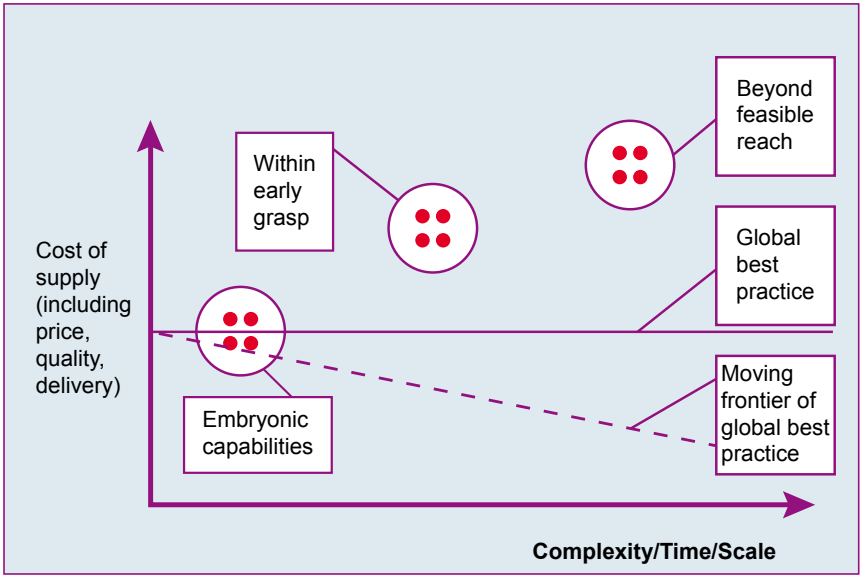
Similarly, the micro-policies required to promote efficiency at the firm level and within value chains, are of generic relevance to all industrial sectors, and apply equally to suppliers into the resources sector and users of the resource-sector output. This may involve policies designed to promote SME capability, to alert suppliers to World Class Manufacturing techniques, to promote capabilities to enhance process and product standards and other similar determinants of firm-level capabilities. Each of these will be relevant, to a greater or lesser degree, to the commodities-linkages sectors.

However, it is in regard to the meso-level policies where a distinctive policy framework is indicated to promote production linkages. This involves targeted policy support. Working closely with the lead commodities producing firms, it will be necessary to identify three sets of linkage opportunities (Figure 20). The first are the "low hanging fruit" where domestic capabilities are such that local firms can produce competitively, close to the global cost frontier. This may involve labour intensive sectors where low wages are a competitive advantage. It may also involve sectors with a high degree of natural protection. This natural protection may reflect sectors where there is rapid degradation of the product (for example, in the sugar cane sector and other soft commodities sectors), where there is extensive processing loss (that is, where the commodity is thinly distributed in the mined/harvested commodity), and where transport-to-value ratios are high. Beyond this "low hanging fruit" are a second set of linkages where embryonic capabilities exist and which are within the potential reach of local linkage firms. The primary barrier in this category of domestic linkage development will be technological in nature. Another factor promoting backward linkages in this embryonic linkage category is where inputs are of critical importance to the lead commodity firms, such as the refluting of rollers and grinders. The third category of sectors--those beyond feasible reach because of a combination of technological and scale barriers to entry--are also worthy of attention. But in this case, the required attention is to find a way of dampening unrealistic expectations about linkage development.

Where appropriate, it will also be necessary to ensure that appropriate support is provided for the relevant sectoral systems of innovation, including those which are optimally based locally, in close proximity to resource extraction. For example, the key capability required in Angola for deepening inputs into the offshore oil sector are metalworking skills, and the second-tier domestic suppliers seeking to deepen backward linkages identify this lacuna in the economy as a major

weakness in deepening domestic value added (Teka, 2011). Similarly, there is a dearth of specific training institutions which are required in Botswana to promote forward linkages into cutting and polishing diamonds (Mbayi, 2011).

Figure 20: Meso-linkages into and out of the resources sector



Source: Morris, Kaplinsky and Kaplan, 2012

Figure 21 summarizes the key macro-, meso- and micro-level policies which are appropriate for developing production linkages in low and middle income resource intensive economies. As in the case of fiscal and consumption linkages, the macro-policy agenda includes a combination of macro-economic policies and policies designed to address generic cross-sectoral market failures. Similarly, micro-level policies address policies designed to assist firm upgrading and, again, are largely generic across all sectors.

There are a number of components to this selective policy. The first is to develop an informed picture of industry dynamics, evolving technologies and key industry players. Following this, policy needs to target the linkages where local production is either already potentially competitive or might become so in the near future (as in Figure 20 above). Then, an informed analysis of the structure of the global value chain in the key sectors will identify lead commodity firms whose strategies

are most likely to lead to linkage development.[10] Finally, and partly as a carrot to attract these lead firms, support is required for sector-specific interventions in relevant areas of market failure, such as with regard to skills development, the National Systems of Innovation and infrastructure.

Figure 21: A summary of macro-, meso- and micro-policies to promote production linkages to the resources sector

	Production linkages
Macro-policies	Property rights, stability, exchange rate, skills and National System of Innovation, infrastructure, innovation
Meso (targeting) policies	Based on an informed analysis of different commodities sectors and their linkages, to identifying feasible backward and forward linkages through the involvement of value chain restructuring consortia involving key players in the sector. Analysis of global value chains in each commodity sector to develop a strategy to selectively source key technologies and to engage with the most cooperative global firms whose strategies lend themselves to linkage development. Sector-specific support for key market failures, notably with regard to capabilities and skills, the National System of Innovation and infrastructure.
Micro-firm level policies	Lead firm strategies, supply chain and customer development strategies, firm-level upgrading

10 For example, as can be seen in Annex B, in the Angolan offshore oil sector, linkage development was speeded up by the strategic need of one global supplier to enter a market in which it was otherwise excluded by virtue of the internationalization strategies of the oil majors. Forming a joint venture with a state-owned subsidiary as a means of forcing market entry, this foreign firm pioneered the local production of sub-sea control lines.

7. ALIGNMENT: MOVING BEYOND PAPER

Industrial policies have a high failure rate, that is, the results achieved are either much lower than those which could have been achieved, or, in some cases, policies have actually had a negative impact. Instead of promoting industrial growth and diversification, policy structures have held the industrial sector back.

There are a number of factors explaining this sub-optimal policy performance: first, policies may be uninformed. Governments may have little knowledge of the detailed capabilities in their economy, let alone be aware of the rapidly changing global frontier of technological capabilities. They may consequently mis-direct their efforts, incentivizing industry into inappropriate activities. Second, governments may fail to develop a vision or an effective policy framework to support their ambitions with regard to industrial development. Third, even where governments have appropriate knowledge and an effective vision, they may lack the capabilities to execute these industrial policies. And, fourth, there is often a misconception in which policy support is confused with paper, that is, where an admirable vision and appropriate policies are set out on paper, but that is where it stops--with the paper. It looks good on the surface, but scratch a little, and there is little below the shiny exterior of glossy documents.

These weaknesses of government policy are widely observed and are ascribed to the public-sector nature of these activities. However, the reality is that these very same weaknesses are often also prevalent in the private sector. Many firms, particularly those operating in a protected environment or benefitting from monopoly power, may be poorly informed, may have poor or mis-specified visions, may lack the capabilities to implement their visions and show little action beyond glossy public brochures. These corporate level weaknesses are often as evident and damaging in the specific case of developing linkages from the resources sectors in many low income economies, as is the failure of government policy to effectively promote these linkages (Morris, Kaplinsky and Kaplan, 2012).

Given these failures of public and private policy to promote linkages effectively, what corrective measures can be indicated? Here we can identify seven key linked steps to deliver a better outcome--strategy development, policy development, policy incentives and sanctions, policy alignment, capability building and policy

will. Beyond all these lies stakeholder alignment, a common theme running through these seven steps of effective policy design, delivery and implementation.

7.1 Strategy Development

Without a vision, it is unlikely that detailed policies can be developed to effectively support the development of linkages into and out of the resources sector. This vision is required at the highest level of government, since it involves the mobilization of adequate resources, the development of joined-up policies which span a variety of ministries and the capacity to get all key stakeholders on board. It is imperative that this vision goes beyond resource extraction to explicitly address the development of linkages, particularly production linkages into and out of the commodities sector. In the case of the public sector, and especially in resource intensive economies, this strategic vision needs to originate with the highest levels of government. It also needs to span administrations, and so policies must be applied by successive governments, which is why societal buy-in to the vision is so critical.

In the private sector, since the lead commodity producing firm almost certainly has a vision for its resource-extracting operations, the firm has to develop an explicit and long-term strategy to promote the development of linkages.

To achieve this, both governments and lead commodity producing firms need an informed knowledge base which enables them to map out a medium- and long-term future for their investments in the resources sector and for the development of linkages. The types of information required include questions such as how long will the deposit be viable? How close to the global cost frontier can the resources be exploited? What cluster of inputs will be required to effectively exploit these resources? What are competitor countries and firms planning to do? Who are the key actors in both the resources sector itself and in linkage firms and what capabilities do they possess? Beyond this knowledge of the basic resource itself is matching knowledge which addresses the key linkages into and out of the resources sector, their skills and training needs, their infrastructural requirements and the influence which particular patterns of ownership have in their industrial evolution. Crucially, this knowledge base needs to be informed by detailed research and to be updated frequently, since the global competitive environment which informs all of these decisions is changing rapidly. Similarly, firms will need to be aware of the government's strategy and its thinking on policy development, as well as to have an informed map of existing and potential local suppliers and customers. It will also need to have an informed view of the strategic locational

strategies and supply chain development capabilities of its first-tier suppliers and customers.

7.2 Policy Development

Beyond the development of strategy lies the crafting of policies. Typically, this will involve the introduction of policies in a range of different ministries. These will include the ministries responsible for the resources sector itself, for the development of industry, for trade policy, for the development and regulation of infrastructure, for skills development, capability building and innovation and for the environment.

Whilst in resource intensive economies the development of these policies ideally needs to be coordinated and supervised at the highest level of government, there will also be a need for a specific ministry to be primarily responsible for linkage development. In the case of soft commodities, the lead ministry may be the Ministry of Agriculture, but more typically it will optimally be based in the Ministry of Industry. However, in practice there are a number of cases where this responsibility is placed in the hands of the ministry responsible for the resources sector itself (as in the Angolan oil industry and the Ghanaian gold industry, Teka, 2011; Bloch and Owusu, 2011). This will generally be unsuitable for the specific challenge of developing linkages in and out of the resources sector. Whoever takes responsibility, the key challenge is policy coordination and a common, cross-ministerial buy-in to the vision. It will also be critical for the lead ministry to liaise extensively with the private sector.

A similar set of challenges confronts the private sector. The CEO and his/her colleagues may have developed a clear vision for the promotion of linkages from their resource operations, but this needs to be backed by specific policies. Notably, in the case of backward linkages is the need for structured policies towards supply chain development, particularly those which go beyond the first and second tiers of suppliers. These structured policies need to be reflected in institutional design with the establishment of supply chain management and customer development divisions. Optimal supply chain and customer support divisions target seven steps – the rationalization of the supplier/customer base, the establishment of key performance indicators for suppliers and customers, monitoring their performance, communicating their relative performance to suppliers and customers, sanctioning poor performance and rewarding good performance, and then aiding suppliers and customers to improve their performance (Bessant, Kaplinsky and Lamming, 2003).

7.3 Policy Incentives and Sanctions

Policies without incentives and sanctions have no teeth and are unlikely to lead to improved outcomes. Policies which merely exhort increased local content may not only have little impact but may also be counterproductive, leading to an atmosphere in which policies are not taken seriously. Good performance should be encouraged with rewards (the carrot) and poor performance with sanctions (the stick).

However, these incentives and sanctions need also to be fit-for-purpose. For example, in many countries local content policies are confused with indigenization policies. Thus, in the Zambian copper industry, policies to promote Zambianization led to the growth of an army of "suitcase businessmen". Substituting for in-house purchasing by the lead commodities producers and their suppliers, they made their profits by importing inputs. This not only led to domestic value diminution (since they were often less efficient than the previous mechanisms for importation), but also to the erosion of the position of some domestic suppliers into the copper sector (Fessehaie, 2011).

Again, a similar story of the importance of incentives and sanctions can be told for the private sector. In many cases, the basic tenets of supply chain management--informing suppliers of their comparative performance, rewarding performance with bonuses and penalties and assisting poorly performing suppliers with their manufacturing processes--are not practised. Moreover, individual purchasing officers are generally offered bonuses which reward short-term costminimisation and revenue maximization rather than medium- and long-term supplier and customer development. Additionally, in countries where commodities are mined in distant locations, procurement staff often work on short rotation cycles, and, compounding this, they may not speak any of the local languages (Hanlin and Hanlin, 2012). All of these factors come together to militate against linkage development as is clearly evidenced in the case of Tanzania's gold mines (Mjimba, 2011).

7.4 Policy Alignment

Typically, there will be a multiplicity of policies directed towards the resources sector in general, and to the development of linkages into and out of the resources sector in particular. There will also be other policies--such as tariffs on trade--which are aimed at industrial development in general, but which also affect the resources sector and the firms' linking with the resources sector. Without

strategically-driven coordination, these various policies can easily counteract each other.

For example, in much of Africa and Central Asia, attempts to speed up the exploitation of the commodities sector have led to a policy environment in which FDI is encouraged by the offer of duty-free imports of inputs. At the same time, local suppliers into the commodities sector are required to pay import duty on their inputs. Thus, not just is the ensemble of policies failing to promote backward linkages (by providing for duty-free importation of inputs), but they may in fact actively disfavour local linkages (since they penalize the costs of domestic suppliers). A similar story can be told with regard to non-price at-the-border customs procedures, where imports for the lead commodity producers are often processed more rapidly and at lower costs than imports of inputs by suppliers to the commodities sector.

Corporations, too, have a multiplicity of policies directed at their procurement practices and their supplier development programmes. Foremost amongst these are the standards which they set for suppliers, including in their design and commissioning stages. These standards (for example, even simple issues such as electrical fittings) may reflect the global sourcing standards of the firm or its primary contractors, rather than those which exist in the local economy. Much of SSA's new mines are constructed by Australian and Canadian firms, each of which works to the specific standards of their home countries, thereby creating difficulties for local suppliers in supplying inputs, since they work to different (albeit equivalent) standards reflecting their specific colonial heritage (Hanlin and Hanlin, 2012).

7.5 Policy Capabilities

Underlying all of these policy-related issues are the capabilities of government employees and the routines which back their behaviour. Governments may have local content policies which are wildly ambitious in relation to the capabilities to implement these policies. In some cases, they may specify local content in detail without any clear knowledge of the technologies that are involved. This is the case in Angola where there are three lists "mandating" local content in the supply of inputs, but which are inconsistent in that the technological content of which item is placed in which list follows no clear logic. It is also not clear how, or on what basis, these lists were compiled. Most of the mandated items are beyond the feasible competences of local suppliers and are ignored, undermining the credibility of local content policy (Teka, 2011). By contrast, the Chamber of Mines

in Ghana, working with the mining companies, has compiled a list of inputs which is believed to be within the reach of local suppliers (Bloch and Owusu, 2011). Another problem is that specific incentives are established but are inadequately monitored, not just making the policy ineffective, but undermining the credibility of the policy and related policies at the same time.

Again, similar problems can be observed in the corporate sector, specifically with regard to supplier development. An increasing number of lead commodity producing firms have committed themselves to increasing local content, including through the extension of Corporate Social Responsibility programmes. Yet the staff tasked with implementing these policies are not up to the challenge, and opportunities for increasing linkages are thus lost.

7.6 Policy Will

Underlying all of the issues of strategy and policy discussed above is the question of "policy will". Beyond rhetoric, do governments and firms actually want to execute their policies? That is, beyond exhortation, are they prepared to put real resources behind linkage development? This is especially a problem in countries which are fiscally constrained and firms which are under financial pressure.

Moreover, and this is an unfortunate fact of life, both in the public and private sectors, the very existence of incentives and sanctions can promote corruption, as individual officers are given the power to make decisions on the disbursement of funds. This is not just a problem besetting low income countries or the state sector. Government officers act in less-than-acceptable ways across the range of per capita income, and the corruption of purchasing and supply officers is widespread across the global corporate spectrum.

This of course is not to say that all governments and all firms show an absence of political will in the implementation of industrial policy. But it is prudent to recognize that this can often be a problem, and transparency and monitoring are essential components of effective policy delivery.

7.7 Stakeholder Alignment

Ultimately, industrial policy in both the public and private spheres is a social process. To be successful, it requires buy-in from the stakeholders involved in allocating resources, in exploiting the commodities and in developing linkages

into and out of the resources sector, and in other industrial sectors as well. Inevitably there will be conflicts of interest--this is an unavoidable fact of economic and political life. Yet, conflict can be moderated by social glue, and the development of a shared vision is a necessary component of successful industrial policy. Leadership is key to the development of this shared vision.

It is also crucial that industrial policy be seen as a "live animal"--dynamic and evolving--rather than a stuffed museum piece presented in an attractive cabinet in glossy colours. It needs to steer a course between having a vision and being flexible enough to alter the course. As the management strategy specialist Mintzberg observed, strategy can be "emergent" and benefit from this flexibility (Mintzberg, 1994). But at the same time, by failing to be explicit, an emergent strategy can lead to ineffective and inconsistent policies.

The key to addressing these linked preconditions for a successful industrial policy is a dynamic alignment within and between three sets of stakeholders. The first are the stakeholders in government and in quasi-public institutions. They need to march to a common drumbeat and to be marshalled by a coordinated and monitored vision. This is the key to an effective machinery of government.

The second set of stakeholders are those in the private sector. This requires an effective alignment not just between the internal divisions of the firm itself, but also in its value chain between the lead firm and its various tiers of suppliers and customers. These firm-level alignments are the critical characteristic of the world's most profitable and competitive firms. Third, where relevant, there is the need to align the public and private sectors with civil society. This is particularly relevant in the commodities sector where Corporate Social Responsibility and environmental impacts have become very prominent as driving forces for linkage development. However, there is an important distinction to be made between policy stakeholders and those with an interest in the outcome of policy. The former allocate resources and determine the efficiency of use--commitment and alignment is critical for effective implementation. By contrast, those with an active interest in policy may also have an important social role to play and may be very vocal, but lacking command over resource allocation, their actions are less central to the effective development of linkages from the resources sector.

Finally, there is also a role to be played by facilitating institutions such as UNIDO in supporting actors in both the public and the private sectors and in promoting alignment between these actors. For example, UNIDO's Strategic Industrial Intelligence and Governance Programme seeks to promote capabilities in government, to provide governments with a more informed knowledge base to

develop and execute industrial policy, to promote alignment within government and the private sector, and to enhance the capacity of government officials to perform these tasks. The World Bank, UNDP, the IFC and many bilateral overseas development aid agencies are similarly involved in supporting industrial development and structural change, and it is imperative that their actions support rather than undermine the process of industrial restructuring.

7.8 Driving, Prioritizing and Sequencing

Baking a cake requires a set of well-defined actions. The recipe specifies the required ingredients, defines their amount, indicates the sequencing and intensity of mixing, and then provides a guide for the optimal time of baking.

If only industrial policy formation were that simple! It is possible to define the "ingredients"--the necessary components of successful policy--and these are set out above. But that is as far as the baking analogy goes. Each situation of industrial policy formulation and implementation is contextual, varying in time and place. The relative weight of each of the seven steps outlined above will vary, the sequencing may diverge widely, and the identity of the mixer will also not be constant, either between locations or within a specific location over time. It is not easy, therefore, to provide a tight specification of which actors should drive the process, which steps should be prioritized and how they should be sequenced.

Nevertheless, three broad conclusions can be drawn from comparative experience. The first and most important is the identity of the "chef", the driver of industrial policy. This is critical, since without this role there is a danger that the unfolding process of policy formulation will be without clear direction and will lack the sanctions and incentives which make policy bite. Whilst there is some variation around the mean, in general, successful industrial policies are characterized by commitment at the highest level of government and the firm, a commitment which is backed by legitimacy within the relevant constituencies. It is also important that the driver of industrial policy should "bake the cake" for some time, transcending specific administrations and corporate boards in contexts where these change frequently, and also "adjust the temperature" as appropriate. Moreover, he or she (or they) must have the resources, legitimacy and authority to implement the vision. Because of the prevalence of both public and private sector failure and the long "baking period" involved, it is likely that the most effective drivers may not be an individual, but rather comprise a small group of people, who share a common vision and ideally come from both the public and private sectors.

The second critical factor is that policies require sanctions and incentives if they are to be effective. There will need to be a component of moral suasion in effective industrial policy, building and reflecting its legitimacy to a variety of constituents. But without resources to provide the carrot and some measure of sanction to wield the stick, it is unlikely that policy will move beyond the drawing board. Third, industrial policy--in both the public and private sectors--must be attuned to capabilities. An industrial policy backed by the grandest of visions, constructed with the highest levels of support and providing ample incentives and sanctions will founder if the implementing staff lack the capabilities to drive it forward. These capabilities are not just technical in nature, but also reflect the "will" and integrity of the implementing staff.

Beyond these three requirements, the sequencing and ingredients of industrial policy may be fluid. A vision is required, but a rigid adherence to this vision will generally be disastrous. Fundamentally, industrial policy which is confined to paper and which is static is not even worth the paper it is written on.

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APPENDIX A

Each case study in this appendix includes a table for economic and trade indicators, structural change within the manufacturing sector, and the manufacturing pattern in relation to the global average.

Economic Indicators show the contribution of major economic sectors to GDP, per capita incomes and population levels. The data for economic indicators is drawn from World Development Indicators, World Bank Data Online http://data.worldbank.org/data-catalog/world-development-indicators (accessed June 2011).

Trade Indicators show the contribution of individual commodity groups to a country's exports and imports. The data for trade indicators is drawn from UN COMTRADE via WITS Online https://wits.worldbank.org/WITS/WITS/Restricted/Login.aspx (accessed June 2011).

Structural Change shows the share of sector in total manufacturing output for each country. It is calculated from UNIDO (Rev 3) ISIC 2 digit database (available from UNIDO). The data reflect the first and last year of data available for each individual country.

Manufacturing Patterns shows manufacturing patterns for each country in relation to global averages. 'Normal' is estimated by creating a regression line using panel data for 136 countries, using per capita income levels and share of sector in GDP. For each country, the sectors are ranked by their proximity to below or on the global average line, based on an eyeballing rather than statistical estimations. These calculations are made from UNIDO (Rev 3) ISIC 2 digit database (available from UNIDO). The data reflect the last year of data available for each individual country. Manufacturing is calculated as a share of GDP. The preferable ratio would have been as a share of Manufacturing Value Added (MVA), but the absence of detailed data does not make this possible.

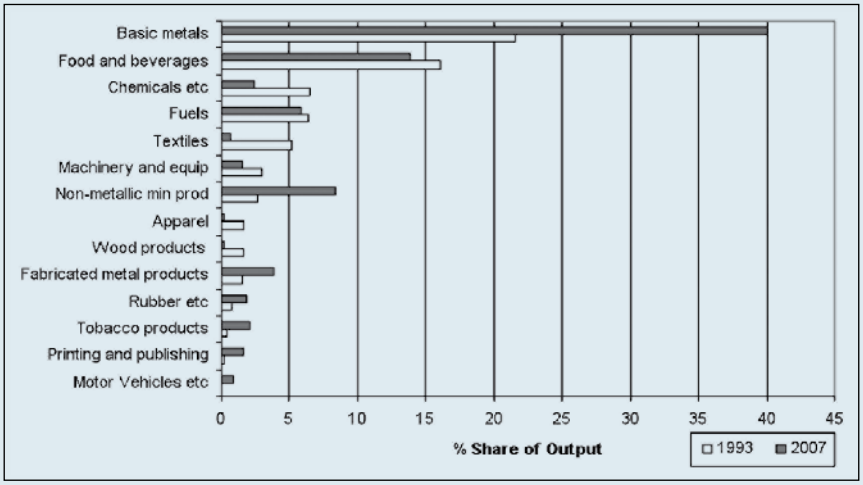
For UNIDO data, particularly for Central Asia and SSA regions, individual country data for all sectors and total manufacturing output for all years is not available.

Kazakhstan

Economic Indicators (2009)	GDP (US$ mn)	Population (mn)	GDP per capita (current US$)	% Share of GDP		
				Agriculture, etc	Manufacturing	Mining & utilities
	109,200	15.89	7,257	6	11	18

Trade Indicators (2010)	Total Exports (US$ mn)	Agriculture	Fuels	Manufactures	Ores & Metals
		% Share of Exports			
	42,211	2.6	69.1	6.2	15.8
	Total Imports (US$ mn)	% Share of Imports			
	24,705	6.9	7.3	76.1	0.8

Structural Change, Share of Sector in Total Manufacturing Output



Source: Calculated from UNDIO ISIC 2 database.

Manufacturing Pattern:

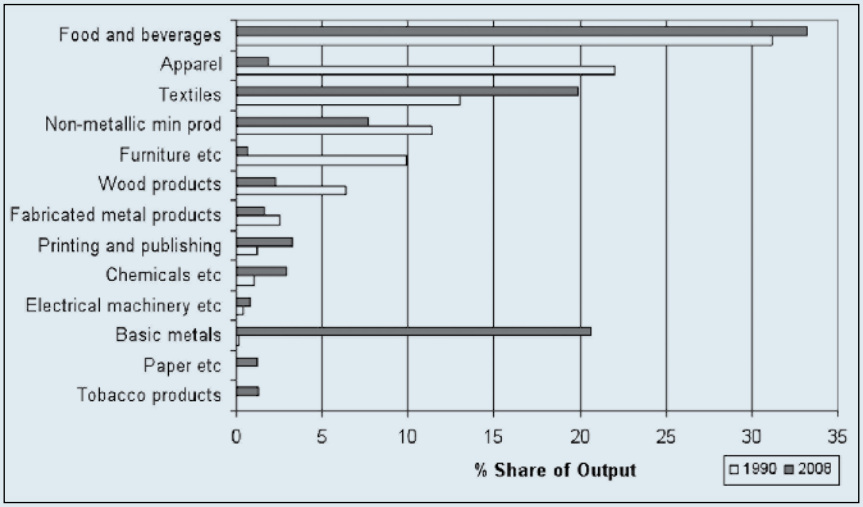
Below "Normal"	At "Normal"
Textiles Tobacco products Food and beverages Apparel and footwear Paper and paper products Printing and publishing Chemical and chemical products Rubber and plastic products Non metallic mineral products Fabricated metal products Machinery and equipment Electrical machinery and apparatus Medical, precision and optical instruments Motor vehicles Furniture and other manufactures	Coke and refined petroleum

Mongolia

Economic Indicators (2009)	GDP (US$ mn)	Population (mn)	GDP per capita (current US$)	GDP Growth (2000-2009)	% Share of GDP		
					Agriculture etc	Manufactures	Mining & utilities
	4,200	2.67	1,573	7	21	4	24

Trade Indicators (2010)	Total Exports (US$ mn)	Agriculture	Fuels	Manufactures	Ores & Metals
		% Share of Exports			
	3,000	5.1	40.3	1.9	44.8
	Total Imports (US$ mn)	% Share of Imports			
	3,186	9.6	20.6	63.5	0.3

Structural Change, Share of Sector in Total Manufacturing Output



Manufacturing Pattern:

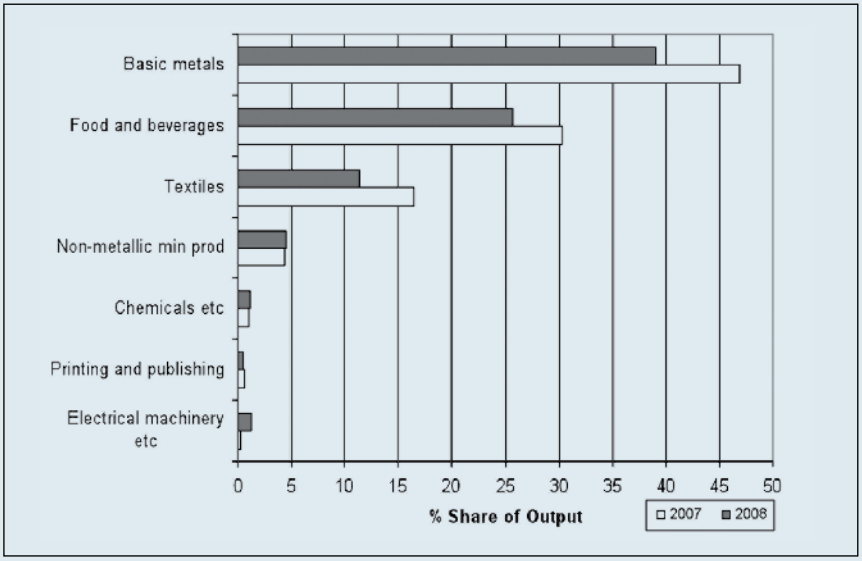
Below "Normal"	At "Normal"
Basic metals Machinery and equipment Furniture and other manufactures Electrical machinery and apparatus Motor vehicles Paper and paper products Chemical and chemical products Fabricated metal products Non metallic mineral products	Food and beverages Printing and publishing Wood products

Tajikistan

Economic Indicators (2009)	GDP (US$ mn)	Population (mn)	GDP per capita (current US$)	% Share of GDP		
				Agriculture, etc	Manufacturing	Mining & utilities
	5,000	6.95	716	25	26	5

Trade Indicators (2010)	Total Exports (US$ mn)	Agriculture	Fuels	Manufactures	Ores & Metals
		% Share of Exports			
	796	42.3	0.1	7.1	49.5
	Total Imports (US$ mn)	% Share of Imports			
	2,822	16.4	12.8	62.6	1.2

Structural Change, Share of Sector in Total Manufacturing Output



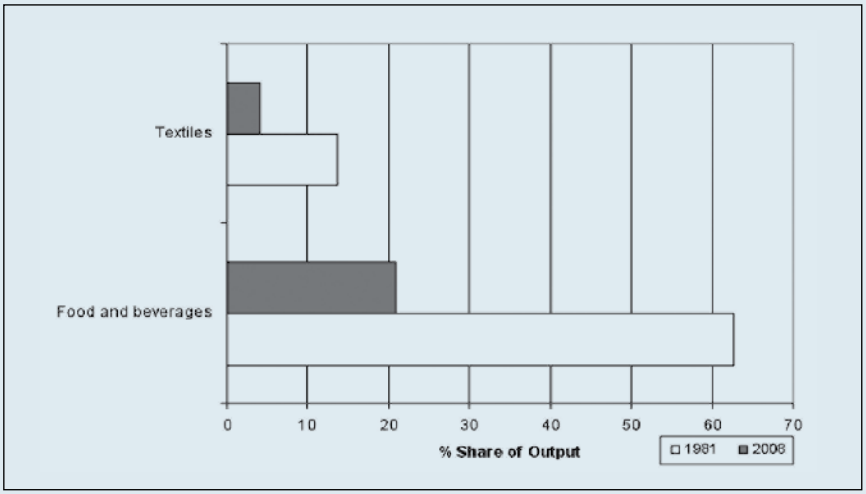
Source: Calculated from UNDIO ISIC 2 database.

Botswana

Economic Indicators (2009)	GDP (US$ mn)	Population (mn)	GDP per capita (current US$)	% Share of GDP		
				Agriculture, etc	Manufacturing	Mining & utilities
	11,600	1.95	6,064	3	4	29

Trade Indicators (2010)	Total Exports (US$ mn)	Agriculture	Fuels	Manufactures	Ores & Metals
		% Share of Exports			
	2,726	4.7	1.1	65.7	25.1
	Total Imports (US$ mn)	% Share of Imports			
	2,770	5.0	45.8	46.6	0.4

Structural Change, Share of Sector in Total Manufacturing Output



Source: Calculated from UNDIO ISIC 2 database.

Manufacturing Pattern:

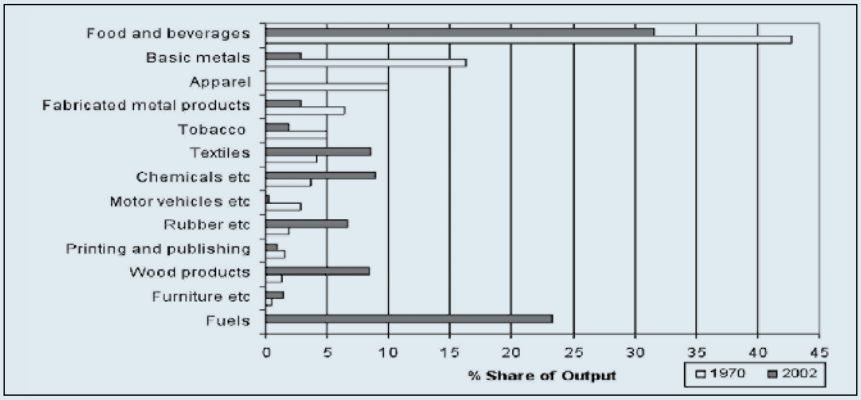
Below "Normal"	At "Normal"
Textiles Food and beverages Apparel and footwear Paper and paper products Printing and publishing Chemical and chemical products Non metallic mineral products Basic metals Fabricated metal products	Rubber and plastic products Motor vehicles

Cameroon

Economic Indicators (2009)	GDP (US$ mn)	Population (mn)	GDP per capita (current US$)	% Share of GDP		
				Agriculture, etc	Manufacturing	Mining & utilities
	22,200	19.52	1,136	21	15	11

Trade Indicators (2010)	Total Exports(US$ mn)	Agriculture	Fuels	Manufactures	Ores & Metals
		% Share of Exports			
	2,480	51.1	37.6	3.6	4.0
	Total Imports (US$ mn)	% Share of Imports			
	3,390	19.9	16.0	50.4	1.6

Structural Change, Share of Sector in Total Manufacturing Output



Source: Calculated from UNDIO ISIC 2 database.

Manufacturing Pattern:

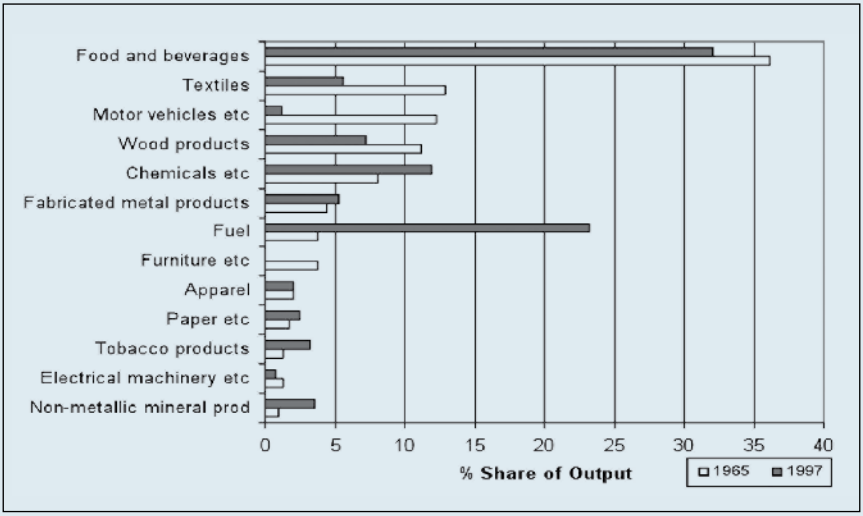
Below "Normal"	At "Normal"
Basic metals Furniture and other manufactures Paper and paper products Electrical machinery and apparatus Non metallic mineral products Printing and publishing Motor vehicles Textiles Fabricated metal products Tobacco products Apparel and footwear Food and beverages	Machinery and equipment Chemical and chemical products

Côte d'Ivoire

Economic Indicators (2009)	GDP (US$ mn)	Population (mn)	GDP per capita (current US$)	% Share of GDP		
				Agriculture, etc	Manufacturing	Mining & utilities
	23,000	21.08	1,106	23	15	6

Trade Indicators (2010)	Total Exports (US$ mn)	Agriculture	Fuels	Manufactures	Ores & Metals
		% Share of Exports			
	7,165	71.4	21.7	3.4	0.5
	Total Imports (US$ mn)	% Share of Imports			
	5,471	21.8	30.0	34.8	0.9

Structural Change, Share of Sector in Total Manufacturing Output



Source: Calculated from UNDIO ISIC 2 database.

Manufacturing Pattern:

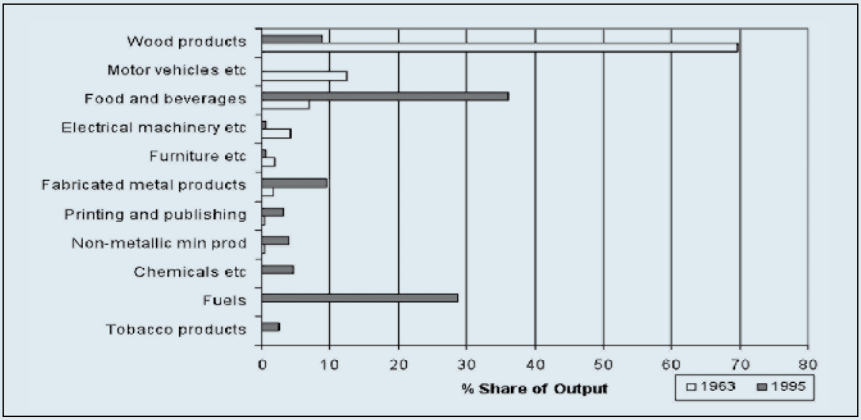
Below "Normal"	At "Normal"
Electrical machinery and apparatus Machinery and equipment Printing and publishing Basic metals Furniture and other manufactures Apparel and footwear Non metallic mineral products Rubber and plastic products	Fabricated metal products Food and beverages Motor vehicles Paper and paper products Textiles Tobacco products

Gabon

Economic Indicators (2009)	GDP (US$ mn)	Population (mn)	GDP per capita (current US$)	% Share of GDP		
				Agriculture, etc	Manufacturing	Mining & utilities
	11,300	1.47	7,502	4	4	52

Trade Indicators (2010)	Total Exports(US$ mn)	Agriculture	Fuels	Manufactures	Ores & Metals
		% Share of Exports			
	5,282	8.7	74.1	3.3	13.4
	Total Imports (US$ mn)	% Share of Imports			
	2,030	17.6	1.7	70.2	0.8

Structural Change, Share of Sector in Total Manufacturing Output



Source: Calculated from UNDIO ISIC 2 database.

Manufacturing Pattern:

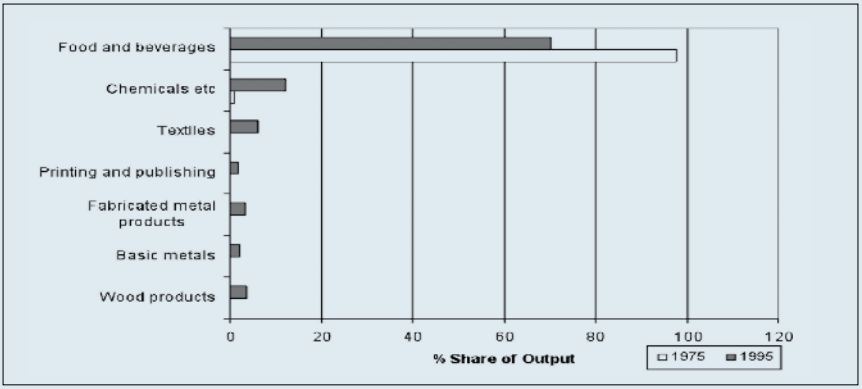
Below "Normal"	At "Normal"
Medical, precision and optical instruments Basic metals Printing and publishing Tobacco products Machinery and equipment Furniture and other manufactures Paper and paper products Rubber and plastic products Electrical machinery and apparatus Fabricated metal products Motor vehicles Chemical and chemical products Non metallic mineral products Textiles and Apparel and footwear Food and beverages	Coke and refined petroleum Wood products

The Gambia

Economic Indicators (2009)	GDP (US$ mn)	Population (mn)	GDP per capita (current US$)	% Share of GDP		
				Agriculture, etc	Manufacturing	Mining & utilities
	900	1.71	430	26	5	2

Trade Indicators (2010)	Total Exports(US$ mn)	Agriculture	Fuels	Manufactures	Ores & Metals
		% Share of Exports			
	51	61.5	3.6	5.7	23.8
	Total Imports (US$ mn)	% Share of Imports			
	612	39.6	2.5	49.4	0.8

Structural Change, Share of Sector in Total Manufacturing Output



Source: Calculated from UNDIO ISIC 2 database.

Manufacturing Pattern:

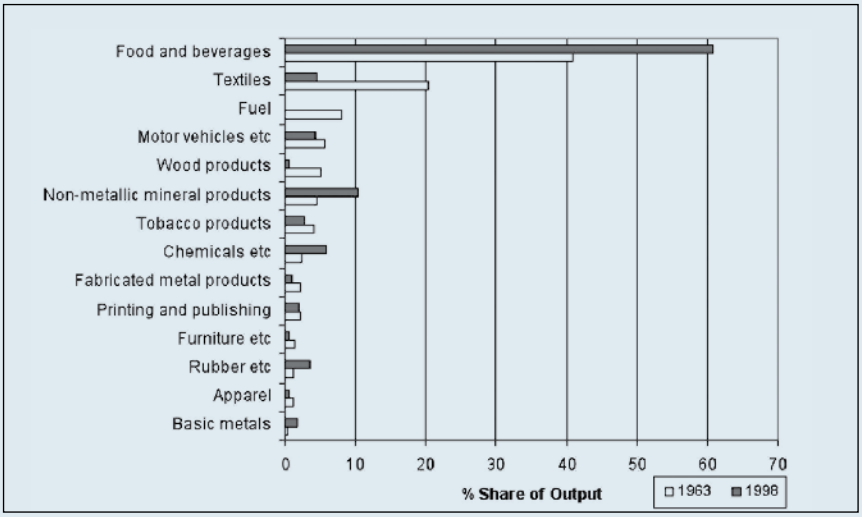
Below "Normal"	At "Normal"
Textiles Food and beverages Apparel and footwear Printing and publishing Chemical and chemical products Rubber and plastic products Non metallic mineral products Basic metals	Fabricated metal products

Mozambique

Economic Indicators (2009)	GDP (US$ mn)	Population (mn)	GDP per capita (current US$)	% Share of GDP		
				Agriculture, etc	Manufacturing	Mining & utilities
	9,600	22.89	428	26	14	6

Trade Indicators (2010)	Total Exports(US$ mn)	Agriculture	Fuels	Manufactures	Ores & Metals
		% Share of Exports			
	3,130	20.4	19.6	2.9	56.4
	Total Imports (US$ mn)	% Share of Imports			
	4,332	19.1	13.6	51.7	0.7

Structural Change, Share of Sector in Total Manufacturing Output



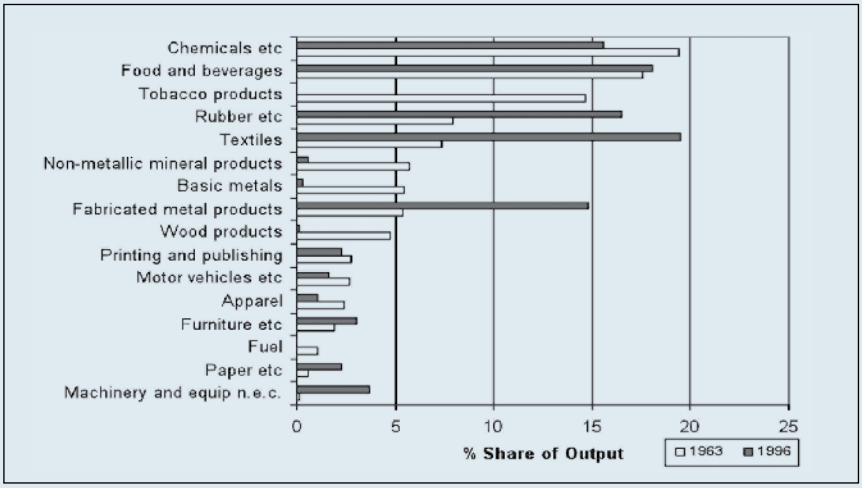
Source: Calculated from UNDIO ISIC 2 database.

Nigeria

Economic Indicators (2009)	GDP (US$ mn)	Population (mn)	GDP per capita (current US$)	% Share of GDP		
				Agriculture, etc	Manufacturing	Mining & utilities
	173,800	154.73	1,118	36	2	29

Trade Indicators (2010)	Total Exports(US$ mn)	Agriculture	Fuels	Manufactures	Ores & Metals
		% Share of Exports			
	58,713	1.7	96.2	0.6	0.4
	Total Imports (US$ mn)	% Share of Imports			
	26,271	14.7	12.9	58.1	2.1

Structural Change, Share of Sector in Total Manufacturing Output



Source: Calculated from UNDIO ISIC 2 database.

Manufacturing Pattern:

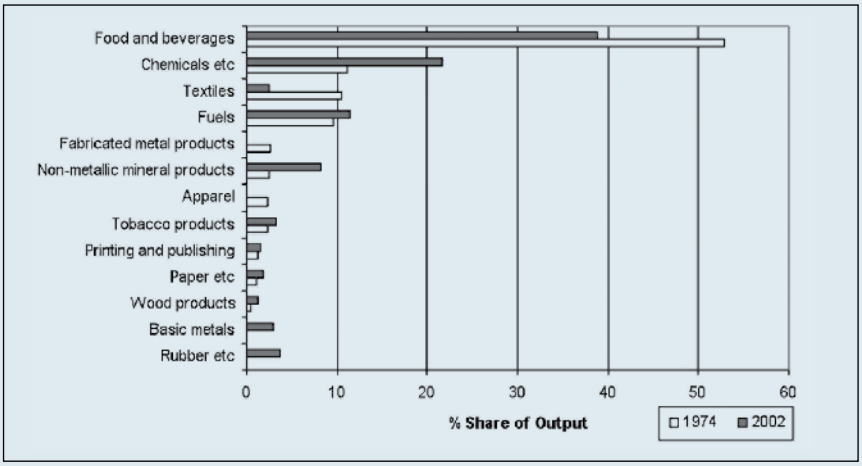
Below "Normal"	At "Normal"
Medical, precision and optical instruments	Basic metals
Wood products	Non metallic mineral products

Senegal

Economic Indicators (2009)	GDP (US$ mn)	Population (mn)	GDP per capita (current US$)	% Share of GDP		
				Agriculture, etc	Manufacturing	Mining & utilities
	12,800	12.53	1,023	16	11	3

Trade Indicators (2010)	Total Exports(US$ mn)	Agriculture	Fuels	Manufactures	Ores & Metals
		% Share of Exports			
	1,258	33.5	33.0	16.9	4.1
	Total Imports (US$ mn)	% Share of Imports			
	4,218	20.9	30.0	38.4	1.0

Structural Change, Share of Sector in Total Manufacturing Output



Source: Calculated from UNDIO ISIC 2 database.

Manufacturing Pattern:

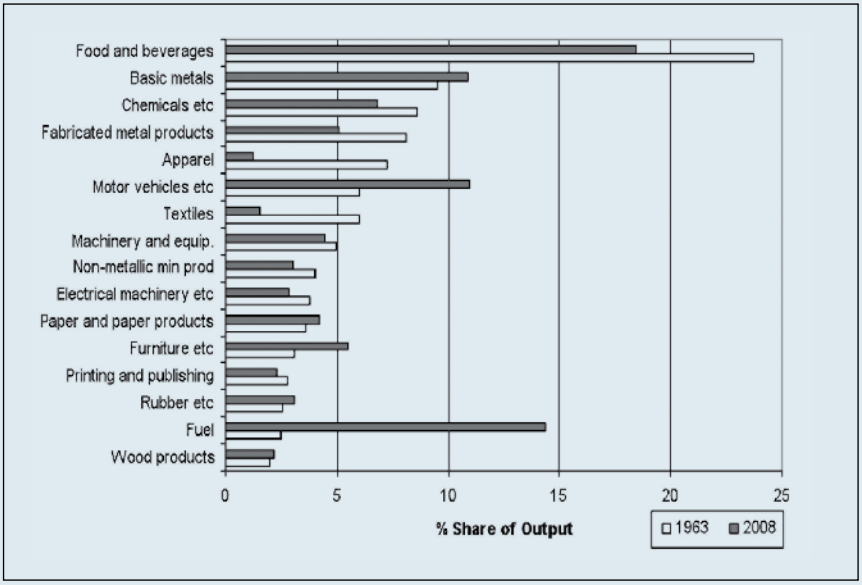
Below "Normal"	At "Normal"
Motor vehicles Electrical machinery and apparatus Medical, precision and optical instruments Machinery and equipment Apparel and footwear Wood products Furniture and other manufactures nec Tobacco products Coke and refined petroleum Textiles	Basic metals Food and beverages Paper and paper products Printing and publishing Rubber and plastic products

South Africa

Economic Indicators (2009)	GDP (US$ mn)	Population (mn)	GDP per capita (current US$)	% Share of GDP		
				Agriculture, etc	Manufacturing	Mining & utilities
	286,000	49.32	5,786	3	14	11

Trade Indicators (2010)	Total Exports(US$ mn)	Agriculture	Fuels	Manufactures	Ores & Metals
		% Share of Exports			
	77,251	9.7	7.2	37.4	31.0
	Total Imports (US$ mn)	% Share of Imports			
	62,471	6.9	7.6	63.4	3.1

Structural Change, Share of Sector in Total Manufacturing Output



Source: Calculated from UNDIO ISIC 2 database.

Manufacturing Pattern:

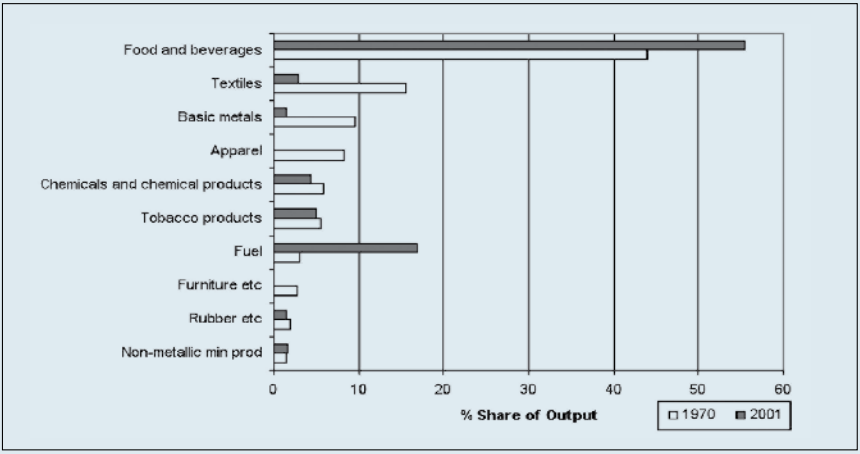
Below "Normal"	At "Normal"
Non metallic mineral products Tobacco products Apparel and footwear Textiles	Electrical machinery and apparatus Machinery and equipment Medical, precision and optical instruments Printing and publishing Wood products

Sudan

Economic Indicators (2009)	GDP (US$ mn)	Population (mn)	GDP per capita (current US$)	% Share of GDP		
				Agriculture, etc	Manufacturing	Mining & utilities
	55,200	42.27	1,294	28	6	15

Trade Indicators (2010)	Total Exports (US$ mn)	Agriculture	Fuels	Manufactures	Ores & Metals
		% Share of Exports			
	9,881	3.0	81.8	0.3	0.4
	Total Imports (US$ mn)	% Share of Imports			
	5,985	26.5	1.2	59.7	1.1

Structural Change, Share of Sector in Total Manufacturing Output



Source: Calculated from UNDIO ISIC 2 database.

Manufacturing Pattern:

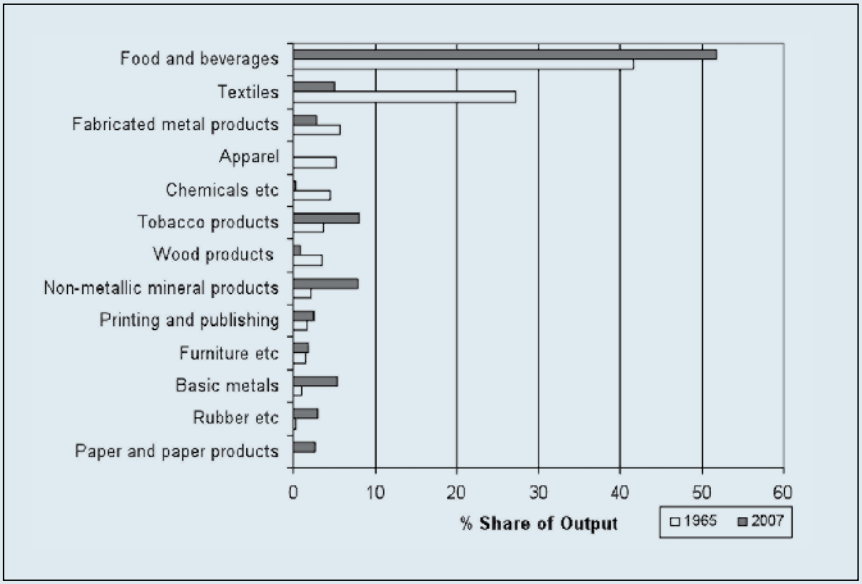
Below "Normal"	At "Normal"
Electrical machinery and apparatus Basic metals Wood products Textiles Tobacco products Furniture and other manufactures	Apparel and footwear Chemical and chemical products Fabricated metal products Non metallic mineral products Paper and paper products Printing and publishing Rubber and plastic products

Tanzania

Economic Indicators (2009)	GDP (US$ mn)	Population (mn)	GDP per capita (current US$)	% Share of GDP		
				Agriculture, etc	Manufacturing	Mining & utilities
	23,000	43.74	503	28	8	5

Trade Indicators (2010)	Total Exports(US$ mn)	Agriculture	Fuels	Manufactures	Ores & Metals
		% Share of Exports			
	2,075	37.0	5.6	8.8	20.6
	Total Imports (US$ mn)	% Share of Imports			
	4,406	14.4	8.8	61.6	1.2

Structural Change, Share of Sector in Total Manufacturing Output



Source: Calculated from UNDIO ISIC 2 database.

Manufacturing Pattern:

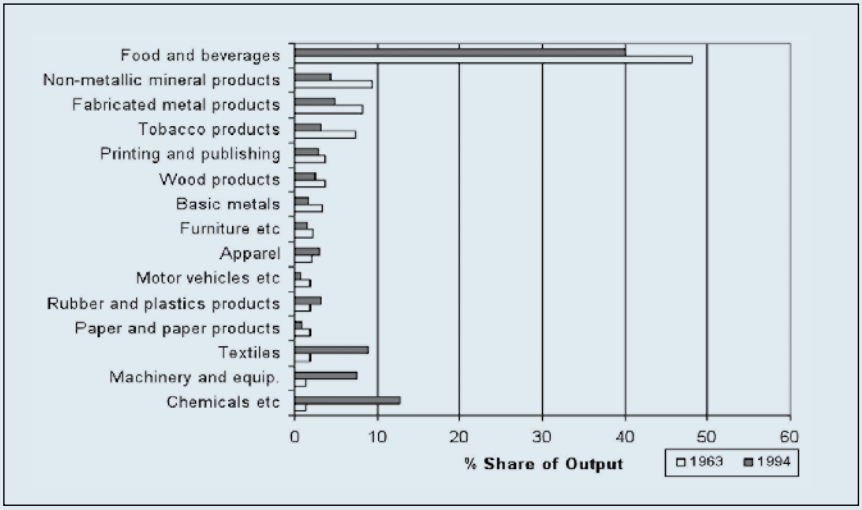
Below "Normal"	At "Normal"
Furniture and other manufactures Apparel and footwear Medical, precision and optical instruments Basic metals Textiles Fabricated metal products Wood products Coke and refined petroleum Chemical and chemical products Food and beverages	Tobacco products

Zambia

Economic Indicators (2009)	GDP (US$ mn)	Population (mn)	GDP per capita (current US$)	% Share of GDP		
				Agriculture, etc	Manufacturing	Mining & utilities
	12,700	12.94	990	21	9	4

Trade Indicators (2010)	Total Exports(US$ mn)	Agriculture	Fuels	Manufactures	Ores & Metals
		% Share of Exports			
	4,703	9.8	0.5	11.1	76.0
	Total Imports (US$ mn)	% Share of Imports			
	2,792	7.2	4.3	71.1	1.2

Structural Change, Share of Sector in Total Manufacturing Output



Source: Calculated from UNDIO ISIC 2 database.

Manufacturing Pattern:

Below "Normal"	At "Normal"
Medical, precision and optical instruments	Paper and paper products Printing and publishing Coke and refined petroleum Non metallic mineral products Basic metals Motor vehicles

APPENDIX B

This material is drawn from the case-studies of the Making the Most of Commodities Programme, a detailed empirical study of the depth and breadth of linkages to the commodities sectors in eight African countries. The details of these studies are shown in Table B.1 and they can be downloaded from commodities.open.ac.uk/discussionpapers; www.cssr.uct.ac.za/prism/projects/mmcp : Please note that the following is a presentation of research carried out by Open University and the Centre for Social Science Research and that information presented does not necessarily reflect the views of UNIDO.

Table B.1: Source of data on production linkages from the commodities sector in SSA: Countries and sectors

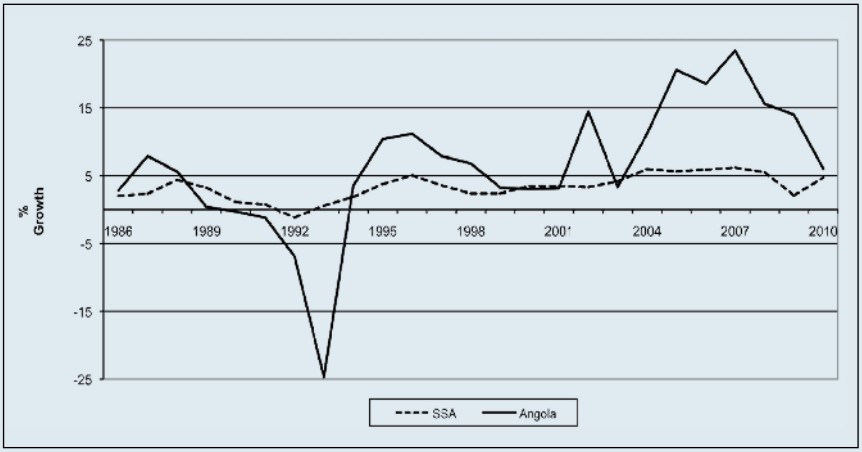
		Establishment period of the commodity sector	Linkage type	Commodity type	MMCP Discussion Paper*
Angola	Offshore-oil	Early 1990s	Backward	Energy	No. 11
Botswana	Diamonds	1960s	Forward	Hard	No. 6
Gabon	Timber	Early 1960s	Forward	Soft	No. 10
Ghana	Gold	late 19th century	Backward	Hard	No. 1
Nigeria	Oil	1950s	Backward	Energy	No. 8
South Africa	Mining capital equipment	1880s	Backward	Hard	No. 5
Tanzania	Gold	1998	Backward	Hard	No. 7
Zambia	Copper	Early 20th century	Backward	Hard	No. 3

B.1 Backward linkages into offshore oil production in Angola

Angola achieved independence from Portugal in 1975, but rapidly descended into civil war. This war continued until 2002 and was a source of major social, political and economic disruption. What had been a relatively diversified economy during the colonial period, with a spread of economic activity in a variety of agricultural and mining sectors, collapsed into a bifurcated economy, with the cash economy being centred around the capital city Luanda, and the interior of the country retreating into semi-subsistence production.

Economic decline was particularly marked during the height of the war between 1988 and 1994, and despite growth reviving in the mid-1990s, it was only after the end of the civil war in 2002 that the current rapid trajectory of economic growth was established (Figure B.1). Until recently, Angola's growth rate was below the average for SSA, but after the commodities boom in 2003-2004, Angola's growth rate decisively exceeded that across the continent.

Figure B.1: Annual GDP growth rate (%) (1986-2010)

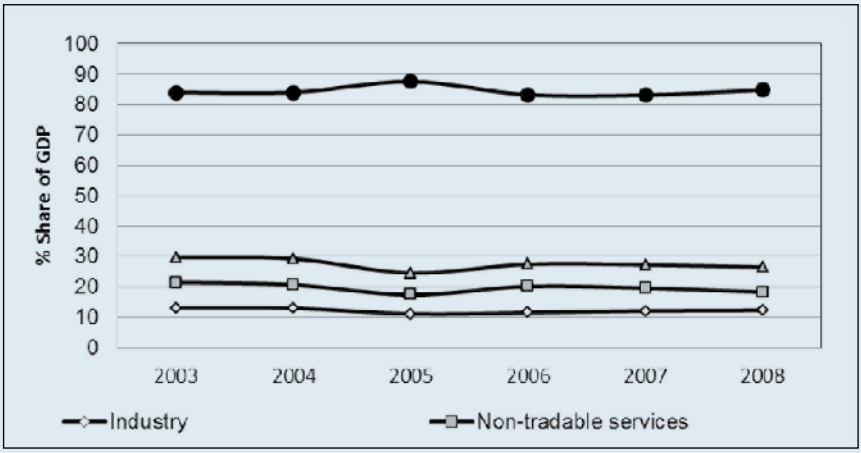


Source: World Development Indicators data online. **http://data.worldbank.org/data-catalog/world-development-indicators** (accessed July 2011)

The key to the revival of Angola's growth over the past two decades has been the discovery of offshore oil. Exploration of these deposits took off in earnest in the mid-1990s, and the first major offshore well started production in 1999. Angola possesses the 15th largest oil reserve in the world and the second largest reserve in Africa after Nigeria.

By 2010, it had become the 15th largest oil producer in the world. As a consequence of the growth of the oil sector and the collapse in economic activity in other sectors, the Angolan economy has become increasingly dominated by oil. The oil sector not only accounts for more than half of GDP (Figure B.2), but also is the primary contributor to government revenues, accounting for more than 60 percent of total government revenue (Table B.3).

Figure B.2: Sectoral composition of GDP, 2003-2008 (%)



Source: Teka (2011); MIND (2009)

Table B.2: The share of oil and mineral rents in GDP and public expenditure, 2000-2011 (US$ and %)*

Year	Gov. oil rents (USD Billion)	Oil rents (% of GDP)	Oil revenue (% of gov. expenditure)
2000	---	63.3	64
2001	0.5	50.8	66
2002	1	48.8	68
2003	1.06	48.3	66
2004	2.2	53.7	58.3
2005	2.7	65.1	45
2006	3.7	60.8	52
2007	21.2	61.3	61
2008	37.1	67	58.2
2009	17.2	38.6	60
2010	25.3	--	61
2011	--	--	62

* The data includes (i) royalties (oil production and oil transaction taxes) (ii) share of profit in production sharing agreements (iii) revenue from consumption tax on petroleum derivatives and (iv) (iii) limited revenues from the awarding mining rights

Source: MINFIN (2011); World Development Indicators (2011)

The Petroleum Activity Law (Law 13/76 of 1976) assigned sole ownership of Angola's hydrocarbon resources and mining rights to the Angolan state. The state manages the sector through Sonangol, which is the concessionaire of the country's oil industry and the sole owner of concession rights. Other investors can only participate in the oil extraction sector in partnership with Sonangol. But Sonangol's ambitions go beyond merely holding property rights over oil deposits. It also sees itself as an active investor both in oil extraction and in the forward processing of oil, and models itself on other national oil companies such as Petrobas in Brazil. In addition, as will be shown below, Sonangol is also involved in and responsible for driving backward linkages, and in particular those involving locally-owned firms.

National ownership of resources and concession rights gives the state (through Sonangol) significant bargaining power across the oil and gas value chain. Amongst other things, the government has used this leverage to advance what it sees as national interests (in this case, not just the localization of value added, but also the localization of ownership) in the oil sector through local content policy.

The decrees of 1982 and 2003 and the Petroleum Activity Law of 2004 instituted two main drivers of local content. The first was a series of requirements to ensure the employment of Angolan nationals in the oil industry and in the linkages which feed into and out of the oil extracting sector. Inter alia, this policy mandates (i) preferential employment of Angolans unless a lack of competent Angolan labour can be provided (ii) at the renewal of every contract and on an annual basis, companies must submit a plan to recruit and train Angolan workers to meet the employment targets set by the government, and (iii) companies are required to pay a levy towards the development of Angolan human resources. Oilfield producers must contribute US 15 cents of a dollar per barrel produced per year, associate operators (oil companies without operator status) must contribute US$ 200,000 per year, and oil service companies must contribute amounts agreed bilaterally with the Ministry of Petroleum. Table B.3 below shows the targets set out by the government for the angolanisation of the oil sector's labour force.

Table B.3: angolanisation Targets

Levels (Grades)	1985	1987	1990
Up to Grade VI (Unskilled/Semi-Skilled)	100%	100%	100%
Grades VII-XI (Mid-Level Technicians)	50%	60%	70%
Grades XII-XIII (Higher Level Personnel)	--	50%	80%

Source: Teka (2011)

The second factor driving Angola's local content programme is the preferential treatment of national firms in the supply of goods and services. National firms are defined as firms with more than 51 percent of share capital owned by Angolan citizens. The key rule is that of exclusivity, which stipulates that all goods and services not requiring high capital value (the decree does not specify this in detail) and lacking in-depth and specialized know-how (again, this is left unspecified) must be sourced from national firms, unless the price of these local inputs is more than 10 percent higher than the price of imports.

Between 2004 and 2010, total investment in the Angolan oil industry was US$ 69 bn, with a further US$1 5 bn invested in supportive infrastructure and US$ 1.2 bn in the marketing link in the value chain. US$ 52 bn of this investment was directed to the construction and support of the offshore oil industry, all of which in principle could have resulted in local linkages. In reality, the only linkages of significance (that is, where there was some semblance of domestic value added) was in two components of the SURF (sub-sea umbilicals, risers and flow-lines) sub-sector.

Sub-sea umbilicals are cables that enable communication between sub-sea production systems (exploiting subs sea wells) and rigs (production systems) on the surface and control centres on the shore. Flow-lines (whose main components are risers and manifolds) enable a two-way flow of crude from sub-sea to surface and lubricants from surface to sub-sea production systems. This sub-sector (SURF) accounted for one fifth of total investment over the period (Table B.4). Interviews were conducted about the nature and extent of value added in these two sub-sectors with eight oil producing companies, four control line suppliers and nine flow-line suppliers. One of these firms produces control-lines in Angola in a joint venture with Sonangol, and two firms assemble flow-lines. Table B.5 shows the composition of cost structures in the domestic manufacture of flow-lines and control-lines. The bulk of costs--almost two-thirds of the total--was made up of intermediate products and raw materials. Next in importance was expenditure on labour. Together, these two inputs accounted for 84 percent of total costs. Only 6.2 percent of expenditure was on machinery. This breakdown of expenditure reflects the fact that in both of these sub-sectors, the primary activity is assembly (although control-lines production does also involve a degree of design and transformation of raw materials through the use of carousels).

Table B.4: Investment in the offshore oil production sector, 2004-2010 (US$ bn, %)[1]

Oilfield segments	Capital expenditure (US$ bn)	Share (%)	Local links
Engineering	4	8	Services
Procurement, construction & installation	4	8	Systems construction
Systems, equipment, piping & valves	2	4	Systems sale & construction
Sub-sea umbilicals, risers and flow-lines (SURF)	11	21	Manufacture, sale & services
Sub-sea production systems	6	11	Systems sale & installation
Sub-sea services	1	2	Construction & services
Rigs & drilling	12	23	Drilling services
Drilling systems	3	6	Contracting & services
Downhole & well	8	16	Equipment sale & services
Decommissioning	1	2	Services
Total	52	100	

Source: Teka (2011)

Turning to the last column of Table B.5, it is evident that the only items procured locally were consumer goods i.e. basic goods, and services (accommodation, catering, cleaning, human relations management, stationery, etc) and labour. But even here much of the value of these products which were procured locally was in fact largely made up of imports. For example, basic goods and services include computers, paper and furniture, none of which are produced domestically.

1 The study focuses on the SURF segment

Table B.5: Local content in domestic manufacture of flow lines, control lines (%)

Types of inputs	Share of operating expenditure	Description	Source	
			Import	Local
Production machinery (amortisation cost)	6.2%	Carousels, reelers, pipe pincers, loaders, rollers, stalk racks, cranes, etc.	✓	--
Intermediate materials	64.2%	Carbon & stainless steel, brass, inconel, monel, polyethylene, services, etc	✓	--
Raw materials		Metal, steel, copper	✓	--
Labour (skilled/ unskilled)	20%	Engineers, managers, welders, etc.	✓	✓
Basic general gervices	5.4%	Lease (rental cost of buildings/facilities)	--	✓
Basic general gervices	2.5%	HSE, catering, cleaning, security, civil construction, labour recruitment, lease	--	✓
Basic general goods	1.4%	PPE, IT & electronic equipment, office furniture, stationary, etc	✓	--

Source: Teka (2011)

Focusing on the labour component of domestic value added--which accounts for one-fifth of the total expenditure in domestic manufacturing--it is evident that between 2003 and 2009, there was a significant increase in the angolisation of the labour force (Table B.6). Although most of the local labour employed is unskilled and semi-skilled, there has been a marked increase in the percentage of Angolan citizens in skilled operations. There are ambitious targets for the angolisation of this skilled cadre of labour by 2014.

Table B.6: Local labour content in manufacture, 2003/4-2014

Period	Control lines (%)		Flow-lines (%)	
	Basic/mid-skilled	Higher-skilled (Engineers)	Basic/mid-skilled	Higher-skilled (Engineers)
2003/4	80	0	70	5
2009	90	17	72	20
2014	90	52	85	35

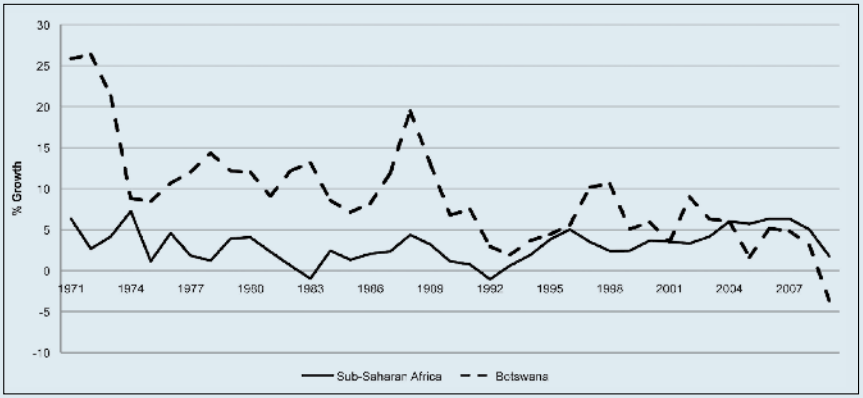
Source: Teka (2011)

B.2 Forward linkages in the diamond sector in Botswana

Botswana is a geographically large country roughly the size of France or Texas with a small population of 1.9 million. Over two-thirds of the drought-prone country is desert, semi-desert or scrub and does not lend itself to settled agriculture. It does, however, have a large pastoral sector and exports beef to the EU. But unlike the more verdant New Zealand, if Botswana were predominantly a pastoral economy it would not be able to provide its population with a high standard of living. Yet in 2010, Botswana's per capita income (US$ 8,180) ranked it as a middle income country. This relatively high per capita income was a result of four decades of sustained economic growth (Figure B.3), and for much of this period Botswana ranked, with China, Korea and Singapore, as one of the world's most rapidly growing economies.[2]

The driver of this rapid economic growth and the resulting high level of per capita income in Botswana has been the production of diamonds, a precious stone yielding large resource rents, particularly for countries such as Botswana with easily accessible surface deposits of high quality stones. Diamonds were first discovered in Botswana shortly after independence in 1966, and large-scale production began in 1971. Currently, Botswana accounts for more than one-quarter (by value) of global diamond production. In the context of a virtually non-existent manufacturing sector and a poorly endowed agricultural sector, the contribution of diamonds to Botswana's GDP (Figure B.4) and to government revenues (Figure B.5) has been very significant. At present, the sector contributes more than 40 percent of GDP and more than half of all government revenue.

Figure B.3: GDP growth rate, 1971-2009 (% p.a.)

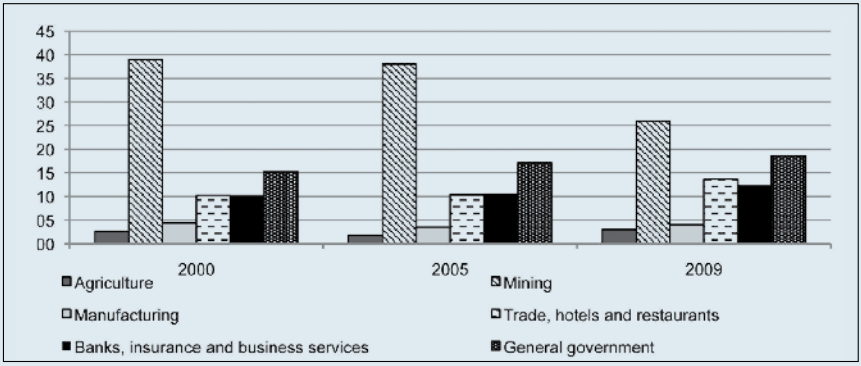


Source: World Development Indicators data online. **http://data.worldbank.org/data-catalog/world-development-indicators** (accessed July 2011)

2 Botswana was one of 13 countries identified in the World Bank Growth Commission (Spence Report) as having sustained growth of over 7 percent for more than 25 years.

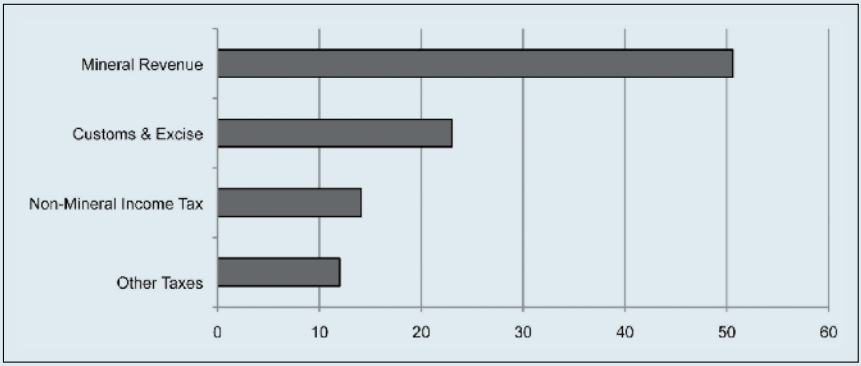
However, the contribution of this bounty of nature to the economy is not without problems. For one thing, the sector employs only a small proportion of the labour force, and the capacity of the population to the share in resource rents depends largely on the continuation of a relatively uncorrupt and efficient government. But more problematically, the low cost surface diamonds which have hitherto sustained the industry will be exhausted. Unless new deposits can be found within two decades, Botswana faces a major squeeze in income. For these reasons the government has committed itself to a programme of diversification based on the extension of production linkages from the diamond sector.

Figure B.4: Percentage contribution to gross domestic product by selected economic activities



Source: Mbayi (2011)

Figure B.5: Composition of government revenue (2000-2009)



* Diamonds account for more than 90 percent of mineral revenues

Source: Mbayi (2011)

The long-recognized need to diversify out of the heavy dependence on mining had previously led the government to promote the development of a cutting and polishing industry in the early 1980s, mainly as a way of increasing employment. At the time, De Beers, the global mining company which dominated production in Botswana and the sale and marketing of diamonds in the global economy, did not support the government's ambitions. De Beers argued that cutting and polishing activities were not economically viable in Botswana. Mild pressure from the government on DeBeers led to the establishment of three cutting and polishing factories between 1980 and 1990. However, none of these factories ever reported a profit. Some observers believe that these losses were artificially achieved through transfer pricing by De Beers in order to avoid pressures for further processing, but this is an untested assertion. Whatever the reasons, limiting this truncated programme of forward linkages during the 1980s, Botswana's opportunity to ratchet up the pressure for forward linkages came in 2005, when De Beers' 25 year mining license was due for renewal. The government had a great deal of bargaining power due to De Beers's reliance on production from its 50-50 joint venture with Debswana. Debswana supplied around 60 percent of De Beers's global supply of rough diamonds. The government insisted that in order for De Beers to renew its mining license for another 25 years, it should help Botswana create a viable and globally competitive cutting and polishing industry. De Beers gave in to the government's demands, realizing that it could no longer hold back beneficiation in Botswana and signed the new mining contract.

After the new contract was signed, the government invited the world's leading cutting and polishing companies to establish factories in Botswana and, in the process to transfer cutting and polishing skills to local citizens. 16 of these companies were selected and licensed to operate in Botswana. DeBeers and the government then established the Diamond Trading Company (DTC) in 2008 which, like Debswana, is a 50-50 joint venture. DTC Botswana is responsible for the sorting and valuing of Debswana's production (replacing the Botswana Diamond Valuing Company). It also controls the supply of diamonds to the 16 cutting and polishing companies and is responsible for supporting the development of the cutting and polishing industry. The new agreement required DTC Botswana to release diamonds to the local manufacturing industry at a value of at least US$ 500 mn a year and to develop targets for this to increase over time. It was also tasked with the creation of at least 3,000 jobs in the development of the cutting and polishing industry. The agreement includes a penalty clause for non-performance, so in marked contrast to the previous attempt to promote beneficiation, De Beers has a vested (and financial) interest in making the programme a success. The 16 cutting and polishing companies, known as Sightholders, are only assured rough diamond allocations on the condition that they hire and train locals with cutting and polishing skills.

- The government has established a Diamond Office to support izs primary objective of beneficiation in Botswana's diamond industry. This office focuses on building strategic alliances, developing infrastructure and providing a favourable fiscal regime. The government's vision for diamond beneficiation is supported by multi-faced strategies

aiming to create downstream competencies in the value chain in the cutting and polishing industry, jewellery manufacturing industry, diamond trading industry and ancillary businesses (Figure B.6). The first part of the beneficiation strategy, and the only one to have been systematically addressed by 2010, was the creation of a viable cutting and polishing industry. Policies designed to enhance competences further down the chain (for example, in jewellery manufacture[3] and trading) are still under development.

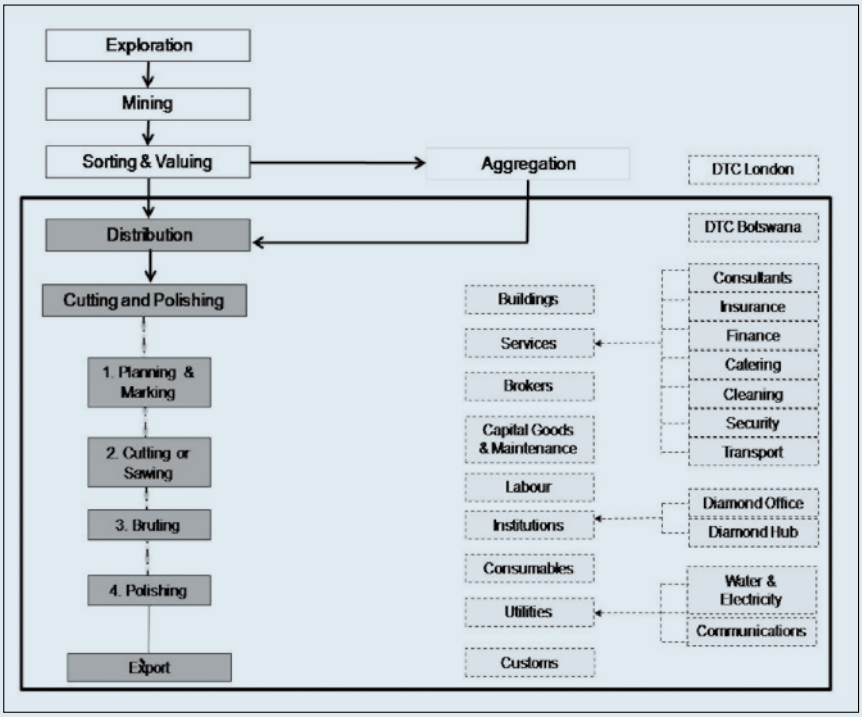
- The 2005 agreement between the government and DeBeers included agreements on sales and distribution, in which the 5-year sales agreement stated that all Debswana production would be sold to DTC London (a wholly owned DeBeers entity), whilst the distribution agreement stated that aggregation, which had taken place in London for over a century, would be moved to Botswana. Aggregation involves the mixing of all DeBeers' supply of diamonds, regardless of origin, into parcels that meet the demands of each of DeBeers' customers or Sightholders. Although DeBeers agreed to have this process moved to Botswana; by the end of 2010, when the sales agreement ended it had not done so. DeBeers offered many reasons for this, including the financial crisis and inadequate infrastructure in Botswana. When the sales contract ended at the end of 2010, it was extended for another three months because DeBeers and the government had not reached an agreement on the new sales contract.

In September 2011, DeBeers and the government finally signed a new sales agreement after long negotiations. Its bargaining power over the control of diamond supplies meant that the Botswana government was able to over-rise the concerns of De Beers and to ratchet up the promotion of linkage development exert and, in particular, to allow government to also enter the marketing links in the value chain. Thus, the ten-year sales agreement (signed in mid-2011 was backdated to January 2011) requires that by the end of 2013, DeBeers will finally implement the previously agreed on relocation of aggregation.

This relocation of aggregation will have considerable spill-overs on many industries like transport, finance and hospitality, because the world's diamond industry will now go to Gaborone instead of London to buy diamonds from DeBeers. In addition, the agreement provides for an independent sales channel for 10 percent of Debswana's production, which will increase to 15 percent over five years, whilst the rest of Debswana's production will be sold to DeBeers/DTC London. Further, the 2011 agreement states that more diamonds will be made available in the local cutting and polishing industry, but no figures have been mentioned to date. The government will also license two or three additional Sightholders in Botswana to establish new cutting and polishing factories. Thus, as a consequence of this new agreement, linkage development in Botswana's diamond value chain is likely to increase, both in terms of depth and breadth from the levels recorded in a survey conducted in 2010.

3 To date, two of the Sightholders have opened jewelry manufacturing factories in Botswana in 2011

Figure B.6: Botswana's downstream value chain



Source: Mbayi (2011)

Hence, there is clear evidence of substantial forward linkages in Botswana's diamond industry, driven by government policy rather than by market forces. The issues at stake are therefore whether this will be a globally competitive industry in the future, and how much of these forward linkages reflect real domestic value added. In exploring these issues these issues, 12 of the 16 cutting and polishing firms and six of their suppliers were interviewed for the relevant study.

It is as yet too early to determine whether Botswana's cutting and polishing industry will be globally competitive. At first glance, the answer seems negative, since labour costs per carat of cut-diamond in Botswana are much higher than in either India or China (Table B.7). However, there are three reasons to suspend judgement on this count. First, whilst Botswana's labour costs are indeed higher than in China and India, they are much lower than in Belgium and Israel, both of which have long-established cutting and polishing industries. These high cost centres manage to maintain their presence by focusing on larger and more valuable stones, and leaving low wage economies (India and China) to produce cheaper

stones. Botswana is targeting a mid-level quality of cutting and polishing, above the small stones produced in China and India, and below the highly specialized stones produced in Europe. Second, it is dangerous to make static cost judgements, particularly in a skill-intensive sector. The question is not so much whether Botswana's current production costs are high, but whether they will remain high in the future. Heavy investments in training by the government and the need for firms to invest in skills (since, to some extent, they have no alternative but to cut and polish in Botswana), suggests that wage costs in Botswana may be a moving frontier as domestic skills improve. And, third, new technologies are being introduced which substitute for the long-accumulated tacit skills which have historically dominated this industry. As in the introduction of computer-numerical-controlled machine tools in global metal industries in the 1990s, these technological innovations offer the possibility of newcomers circumventing skills barriers which had historically excluded them from competitive production.

Table B.7: Industry and Botswana government estimates on the range of cost per carat in Botswana relative to other centres (US$)

	Industry	Government
Botswana	45 – 120	35 - 90
India	35	10
China	20 –25	17
Namibia	45 –100	-

Source: Mbayi (2011)

A further issue is the extent to which the forward linkages in the diamond sector involve domestic value added. If the complete diamond value chain is considered, most of the product's final value accrues after mining and particularly in jewelery manufacturing and retail (Table B.8). Nevertheless, the sorting and valuing, and cutting and polishing stages, which Botswana aims to command in the short- to medium-run, are substantial, accounting for an additional 33 percent of the value generated in mining.

A significant (but unmeasured) component of these additional processing costs is the cost of labour. If the projected development of marketing capabilities--as proposed in the 2011 legislation and included in the "marketing and retail" category in Table B.8--bears fruit, the degree of domestic value added may increase significantly within the next decade.

Table B.8: Value addition in the diamond pipeline

Stage of Global Value Chain	% of original value
Producer Selling Value	100
Sorting and Valuing	115
Cutting and Polishing	127
Polished Dealing	133
Jewellery Manufacturing	166
Marketing and Retail	320

Source: Even-Zohar (2007)

Since the cutting and polishing industry was launched in 1982, 16 cutting and polishing firms ("Sightholders") have established operations in Botswana. 14 of these firms were set up after the new agreement with Debswana in 2005. (An additional two firms will locate to Botswana following the 2011 Agreement with De Beers). They employ more than 3,000 people, most of whom are locals (Table B.10) an important outcome given the high rate of unemployment in the country (estimated at 30 percent of the labour force).

The monthly salaries are in the range of US$ 150 to US$ 600 (US$ 2 = Pula 12), which is above the minimum wage for the manufacturing industry. Most of these firms own their premises, suggesting a long-term commitment to Botswana and continuous investment in local procurement.

Table B.9: Ownership and employment patterns in 12 cutting and polishing firms

Origin of Parent Company	Est.	% Local Employ.	Salary Range*	Own or Rent Premises
Belgium	1982	90%	-	Own
	1990s	97%	P1300 – P3000	-
	2007	95%	P1000	Rent
	2004	95%	P1000	Own
Israel	1990	95%	P1500	Own
	2007	80%	-	Rent
	2007	95%	P900 – P3000	Own
	2007	n/a	n/a	Own
India	2007	80%	-	Rent
	2007	85%	P1000 - P4000	-
South Africa	2007	83%	-	Own

Source: Mbayi (2011)

The direct employment of around 3,000 people in the cutting and polishing firms results in an annual wage bill of over US$ 135 mn (Table B.10). The portion of the wage bill accruing to the 210 expatriates employed in the industry is almost double the proportion of the wage bill going to the 2,730 locals who are employed. In addition to these 3,000 employees in cutting and polishing, employment has also been created in second-tier supplier industries.

Table B.10: Direct employment and wages and salaries, 2010

	Employees/ Total employment	Employees	Average Monthly Wage (US$)	Annual Wage Bill (US$)
Total employment	**100%**	**3000**	...	**$22,628,064**
Factory	91%	2730	...	$7,268,160
Middle Management	7%	210	...	$7,799,904
Top Management	2%	60	...	$7,560,000
Total Locals Employed	**93%**	**2790**	...	**$7,928,064**
Factory	96%	2678	$200	$6,428,160
Middle Management	4%	107	$1,167	$1,499,904
Top Management	0%	0	...	$0
Total Expatriates Employed	**7%**	**210**	...	**$14,700,000**
Factory	20%	42	$1,667	$840,000
Middle Management	50%	105	$5,000	$6,300,000
Top Management	30%	63	$10,000	$7,560,000
Gross salaries and wages as % of total costs (excluding rough diamonds)	...	...	...	15% - 45%

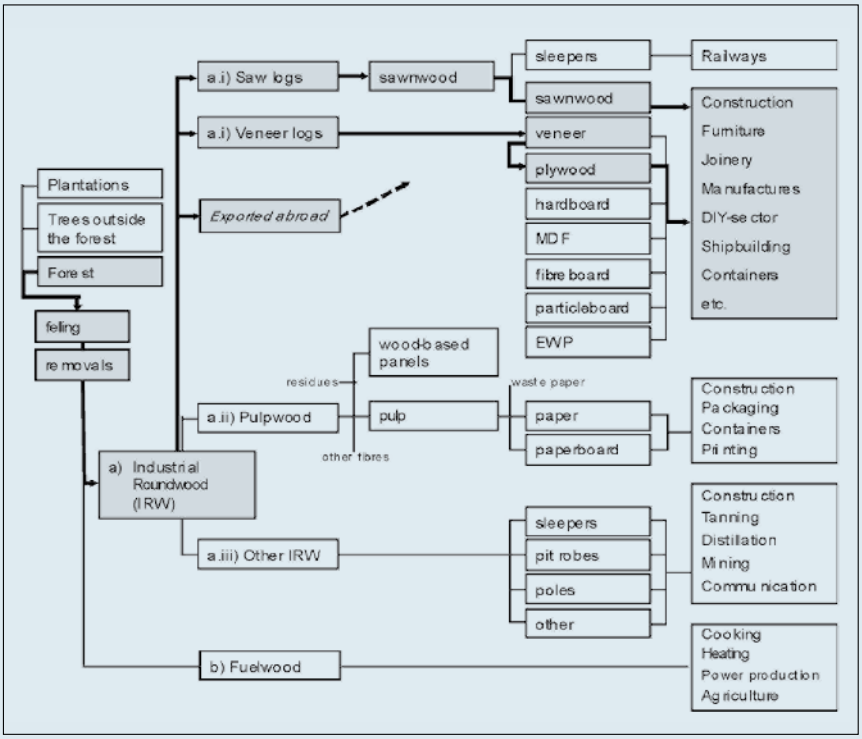
Source: Mbayi (2011)

B.3 Forward linkages into the timber sector in Gabon

Based on an ubiquitously-grown soft commodity (wood) and feeding into a range of both basic and income elastic goods (furniture and construction), the timber value chain is well developed in a wide range of countries. Figure B.7 shows the range of links in this value chain, from the plantations of timber through intermediate products. In recent decades, the industry has become more integrated into the global economy. A key development was the introduction of flat-pack furniture during the 1990s, an innovation which reduced the cost penalties involved in shipping bulky and relatively low value products. The result was that,

increasingly, furniture production was gravitating to the site of log production, and away from the site of final markets. This transition in timber processing was intensified since many Wood products are labour intensive in production and often also involve noxious environmental emissions. Further, government policies in many low income countries specifically fostered the timber processing industry as an entry point into industrialisation, since this is a sector with relatively few technological or scale barriers to entry.

Figure B.7: The global timber value chain



Notes: Grey text boxes highlight the three dominant products produced in Gabon; EWP = engineered Wood products, MDF = medium-density fibreboard, DIY = do-it-yourself;
Source: Terheggen (2011)

Tropical timber fills a specialized niche in this global industry. Its timber takes a long time to grow, has a distinctive appearance, is "hard" and is in short supply. It therefore tends to sell at a premium, particularly for species such as mahogany and ebony where there are growing pressures to halt the depletion of global stocks and to limit supplies to renewable plantations. The share of tropical timber in global timber production is around 15 percent,

with the largest five producers accounting for 70 percent of the total. Of this, Brazil accounts for 20 percent, Indonesia for 16 percent, Malaysia for 16 percent, India for 15 percent and Nigeria for five percent. Although Gabon only accounts for three percent of global tropical timber production, it consumes very little of this output domestically and is the seventh largest tropical log exporter.

Situated on the African West Coast between the Congo and Cameroon, Gabon is sparsely populated, with a total population of 1.9 million. Although it has a relatively high per capita income for the region (US$ 7,240 in 2008) much of the population lives in poverty. GDP of US$ 14.4 bn in 2008 was dominated by highly concentrated income streams from oil production. In 2008, around 80 percent of total export earnings and 65 percent of government revenue were derived from the oil industry. But these resource rents are poorly distributed. In addition to oil, Gabon possesses valuable deposits of manganese, copper and precious stones. Logs, the third largest export after oil and manganese, accounted for 6.2 percent of total exports in 2008 (OECD, 2009).

Gabon has around 23 million hectares of forests, which cover nearly 85 percent of its total land mass, making it the second most heavily forested African country. Although historically timber was the major sector in Gabon's cash economy, it has become overshadowed by the oil sector, and now accounts for less than three percent of GDP. It is, however, the second largest employer after the state, absorbing an estimated 28-30 of the active labour force (much of this is part-time employment).

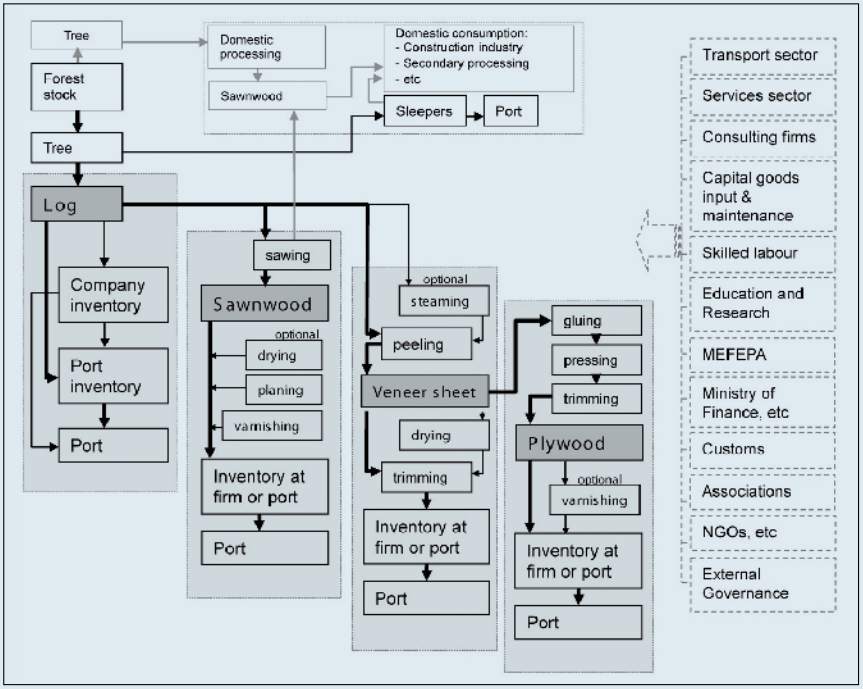
Extraction and exportation of tropical timber on an industrial scale began around 1900, and until the late 1990s, timber was predominantly destined for France and other EU markets. Since then, exports to China have grown and (in round-wood equivalent volume) exceed those to the EU. In 2001, the government introduced legislation designed to provide both for a sustainable timber industry and to encourage forward linkages. The Forestry Code (*Loi N° 016/01 Portant Code Forestier*) of 2001 included four major features. The first was the termination of the state-owned company's (SNBG, *Société Nationale des Bois du Gabon*) monopoly over the commercialization of the dominant species Okoumé and Ozigo. The second was the introduction of a sustainable forest management system, and the third saw the introduction of a higher degree of transparency to combat corruption and illegal logging. The final component of the Forestry Code was designed to promote the domestic processing of logs. It established a target of domestic processing, specifying a target of 75 percent by January 2012. Since progress in meeting the 75 percent processing target for January 2012 was slow, at the beginning of 2010 the government announced a log export ban.

Two key factors led to the introduction of the Forestry Code. First, Gabon's oil reserves are finite and oil production peaked in 1996/7. This led the government to target economic diversification in general, and the adding of value to raw materials in particular. The second

factor was pressure from a series of external agencies, including the IMF and the World Bank (Gabon's largest creditors), European governments and European buyers of tropical timber and Wood products. The fact that the historically dominant buyers from Europe were content to see primary processing occurring at the site of logging removed a potential obstacle to this policy-induced promotion of forward linkages. Even though progress in meeting the January 2012 target was slow, the timber value chain in Gabon has seen a deepening of forward linkages (Figure B.8).

In the early years, market-led exports were relatively small and stable (hovering between 50,000 and 100,00 cubic metres p.a.), but after the late 1990s, and particularly after the introduction of the Forestry Code in 2001, exports of processed timber products grew rapidly, exceeding 450,000 cubic metres in 2005. However, despite this growth, in terms of round-wood equivalents, this export of processed timber was only 33 percent of total timber exports in 2007 (Figure B.9). Whilst European buyers have imported a growing proportion of processed timber products, Chinese buyers almost exclusively buy unprocessed logs.

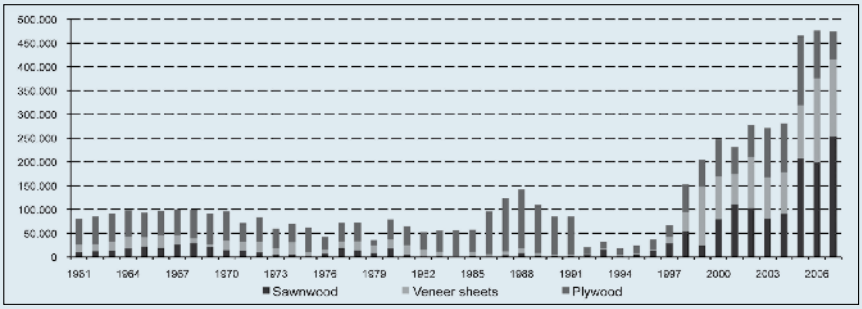
Figure B.8: Gabon's tropical timber value chain



Note: Dash-lined text boxes give examples of actors external to the value chain

Source: Terheggen (2011)

Figure B.9: Export volumes of Wood products, 1961-2007 (cubic metres)



Source: ForesSTAT data online ‹···http://faostat.fao.org···›(accessed January 2011)

Aside from the timber, local content in the Gabonese timber industry and in the processing sector is largely confined to labour. It is estimated that wage costs account for up to a quarter of total production costs in a vertically integrated logging processing company. Other major cost items are capital goods (20 percent), transportation (14 percent), customs (22 percent) and taxes (10 taxes). Most of the machinery and transport is made up of imports. But even this overstates the domestic value added component of costs (excluding the resource rents derived from ownership of timber), since Gabon has an acute shortage of both skilled and unskilled labour.

Table B.11: Distribution, origin and cost of labour (percent, euro)

	Distribution	Origin		Cost
	(percent)	*(percent)*		*(euro)*
		Gabon	Foreign	
Management	7	24	75	5,700
Technicians	4	59	41	1,600
Administration	6	87	13	700
Labourers	74	84	16	300
Transport	6	70	31	800
Environment & Social	2	74	26	600

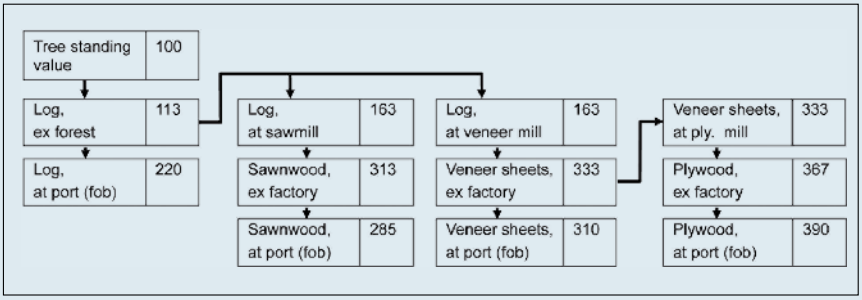
Source: Terheggen (2011)

As one company observed: "We would like to fill our senior positions with Gabonese, but ...we cannot find skilled labour in Gabon". Consequently, a high proportion of the skilled labour force and 16 percent of unskilled labour was made up of migrants, many of whom repatriate their salaries abroad (Table B.11). Senior management is most often sourced from Europe and/or Asia (depending on the ownership of production), whereas foreign labour

in administrative positions, in transportation and in production/processing (labourers) is mostly made up of migrant labour from other Central African countries.

An index of the value of logs and processed Wood products after their respective points of production (ex-forest or ex-factory) as well as the point of exportation (at port, fob), provides an overview of the accretion of value added throughout Gabon's tropical timber industry (Figure B.10). The value chain starts at the forest level where the standing value of a tree is assigned an index value of 100 points. Once the tree is felled, cleared of its branches and transported to the landing site (log collection point in the concession area) there is an increase in its value to 113 index points. The transportation from the landing site (ex-forest) to the port results in an index point value of the same log of 220 points. Similarly, the sawn logs (with an index of 163) result in a fob price of sawn-wood with an index of 285, of veneer sheets of 310 and of plywood of 390.

Figure B.10: Intra-chain value added distributions



Source: Terheggen (2011)

To some extent, the slow progress in meeting the Forestry Code objectives is attributable to processing inefficiency. Exported as logs, Gabonese producers are able to command the highest share of resource rents, since Gabon is a privileged supplier of many tropical species, particularly Okoumé[4], which is prized because of the ease with which the bark can be peeled. However, to the extent that processing is inefficient by global standards, some of these resource rents are dissipated. Processing may increase domestic value added, but will lead to lower levels of profits. And insofar as these profits are invested productively and the returns to this investment stay in Gabon, it may be that the social interest is best met without the beneficiation of Gabon's timber wealth.

4 Okoumé grows in 70-80% of Gabon's forest and in much smaller volumes in neighbouring countries. There are no perfect substitutes although Meranti (an Asian species) is a second-best option.

B.4 Backward linkages into the gold sector in Ghana

Gold has been produced for over 1,000 years in the territory of the Ancient Kingdom of Ghana, the Gold Coast Colony and post-independence Ghana. After South Africa, Ghana is the second-ranked African gold producer. Large-scale industrial gold mining in Ghana dates back to the last quarter of the 19th century. After a period of decline under government control in the nationalist era in the 20 years from the early 1960s, the industry was restructured and modernized under the post-1983 Economic Recovery Programme (ERP), which prominently featured a revised mining code, the Minerals and Mining Law (PNDCL 153) of 1986.

Since the mid-1980s, gold mining has seen sustained increases in foreign investment, output and export volumes. Between 1980 and 2000, production increased by 700 percent. In 1999, gold comprised 97 percent of mineral exports and became the country's leading contributor to overall exports. After a brief interruption during a period of gold price weakness at the turn of the century, production expansion resumed. Facilitated by a further revised mining code that was consolidated in the Minerals and Mining Act 703, 2006, US$ 3 bn was invested in the industry in 2006 and 2009. In 2009, gold exports exceeded US$ 1 bn and accounted for 43 percent of Ghana's exports (Table B.14). Mining's contribution to Gross Domestic Product, of which gold still represents some 95 percent, was 5.8 percent in 2009, up only a percentage point from 1990, but still higher than Ghana's other main export commodities, cocoa (3.9 percent) and forestry (3.2 percent). Total employment in the large-scale mining sector fluctuated, falling from a peak of nearly 20,000 in 1995 to 17,332 in 2009. This fall reflected a period of sustained productivity enhancing investment. Given the rapidly escalating price of gold in the context of the post-2002 commodity boom and global economic uncertainties, investment in the mining sector has grown significantly in recent years, and looks likely to continue growing in the future.

Table B.14: Ghana gold mining - 1990, 1995, 2000, 2005, 2009

Year	1990	1995	2000	2005	2009
Production oz	541,147	1,715,867	2,457,152	2,138,944	3,119,823
Contribution to GDP (%)	4.8	5.6	5.6	5.0	5.8
Export Value	US$ 304m	US$ 647m	US$ 702m	US$ 946m	
Share total exports (%)	19	44	36	34	43
Employment total	N.A.	19,557	15,120	13,766	17,332
Mining licenses granted	3	4	2	2	6
Prospecting licenses granted	37	23	4	22	72
Reconnaissance Licenses Granted	1	42	1	31	21
Small-scale gold licences granted	0	0	9	21	66

Source: Ghana Minerals Commission

By 2009, Ghana had become the world's ninth largest producer of gold, accounting for 3.8 percent of global production, up from 2.6 percent five years earlier. The Birimian and Tarkwaian gold belts (known as greenstone belts), which characterize the western half of Ghana and which host gold mineralization that contains both hard rock and placer (alluvial) gold deposits, continue northwards and westwards into the broader region. Ghana is thus simultaneously at the forefront of an expanding West African industry, as production increased significantly in the neighbouring countries of Mali, Burkina Faso, Guinea, Mauritania and Côte d'Ivoire.

Ghana has eight large mines, all of which are owned and managed by five international producers. It also possesses a small number of far smaller producers, and a significant contribution of registered semi-formal, small-scale producers which generate around 10 percent of national output (triple the level of 20 years ago). In addition, there is substantial, albeit unmeasured production from the unregistered, informal and technically illegal small-scale artisanal miners known as *galamsey*, whose activities spread through gold mining areas and which employ an estimated range of 50,000 to 200,000 people.

The Minerals and Mining Law of 1986 is the core legislation which frames the operations of the industry. A key component of the ERP, it constituted the first ever Ghanaian legislation that was specific to mining. This law was amended with the Minerals and Mining Amendment Act of 1994 (Act 475) after the re-establishment of civilian democratic rule in 1992. Act 475 has subsequently been amended with the Minerals and Mining Act of 2006 (Act 703). Act 703 is a comprehensive law that covers virtually all aspects of mining, namely, ownership of minerals and the cadastral system; mineral rights; royalties, rentals and fees; dispute resolution; reconnaissance licenses; prospecting licenses and mining leases. Other areas include surrender, suspension and cancellation of mineral rights; surface rights and compensation; industrial minerals; small-scale mining and administration and miscellaneous provisions.

Act 703 seeks to promote a localization policy and facilitate the local content of the industry to maximize the benefits of mining for the Ghanaian economy. In this regard, it provides for the following measures:

- A 10 percent government stake in all large-scale gold mining companies without any financial contribution;
- The reservation of small-scale mining for Ghanaian citizens;
- Gold mining companies are to give preference to "made in Ghana" products, to public corporations and service agencies located in the country, and to employment of Ghanaians;

- Gold mining companies are required to submit detailed programmes for the recruitment and training of Ghanaian personnel;

- Clause 50(3) of Act 703 specifically calls for eventual "localisation" of mining staff. It defines "localisation" to mean a training programme designed towards the eventual replacement of expatriate personnel by Ghanaian personnel.

Besides restructuring the law governing the operations of the mining sector, the Minerals and Mine Law of 1986 sought to strengthen mining support institutions under the Mining Support Programme. The main aims of this programme were to develop the capacity of mining support institutions to enable them to promote investment in the sector and to develop mechanisms to enhance productivity and financial viability.

As a consequence of the very long history of gold mining in Ghana, and particularly the demand arising from the rapid expansion of the industry after the mid-1980s, there has been a gradual development of a supplier industry. Ghana's leading Business Directory, the Surf Yellow Pages Ghana (2010 edition), indicates a large population of companies involved in supporting the mining sector, the vast majority of which are concerned with gold mining. Some 300 companies are listed under the three categories of mining companies, mining equipment and mining services. The first-tier suppliers include global mine construction companies such as Lycopodium, and a strong showing by a number of well-known, international OEM companies (Atlas Copco, Boart Longyear, Sandvik, Liebherr, Mantrac/ Caterpillar), input suppliers (Carmeuse Lime Products, Castrol, Maxam, African Explosives) and agents and distributors (Barbex Technical Services, Riepco).

Local firms feature more prominently amongst the smaller first tier- and second-tier suppliers. These are primarily in the metals and metalworking (Tema Steel), chemicals and plastics (Riepco, Interplast), civil engineering (Engineers and Planners), business services (KEK Insurance Brokers) and logistics (Allship Logistics) fields. While not presently members of the Ghana Chamber of Mines, a number of other locally-owned companies (such as Western Forgings, Tropical Cable and Conductor, and Wire Weaving Industries) also provide inputs to the mines.

The major gold mines claim a large number of local suppliers. For example, Golden Star Resources lists several hundred suppliers, of which 60 are "active suppliers" (defined as 12 or more orders a year). Gold Fields, Anglo Gold Ashanti, Chirano, and Newmont list a total of 521 suppliers. These claims are supported by Chamber of Mines data on the distribution of mining revenues. This demonstrates a large aggregate spend by producing companies making up some 20 percent of revenues (US$ 467m) on local purchases, to which a further 18 percent (US$ 428m) on fuel and power must be added. Imported consumables comprise 16 percent of the total, and capital expenditure (largely in capacity expansion, the majority of which is imported plant and equipment), 29 percent (Table B.15).

Table B.15: Local linkages in Ghanaian gold mining: Ghana Chamber of Mines producing members 2008: Distribution of funds

Classification	Amount (million $)	%
Employees	175	8
Capital expenditure	669	29
Direct payments to govt.	146	6
Mining host communities	12	1
Local purchases (excluding fuel/power)	467	20
Local purchases (fuel/power)	428	18
Loans	52	2
Imported consumables	376	16
TOTAL	2,325	100

Source: Ghana Chamber of Mines

A striking feature of this supplier development, which supports the conclusions that this has been a largely market-driven process of outsourcing and specialization, is the geographical concentration of suppliers in mining supply industrial districts. Of the firms listed in the directory of suppliers, at least 80 percent are located in Greater Accra, in Accra itself or in the adjacent port/industrial city of Tema. The only other metropolitan area with a substantial number of suppliers is Takoradi in the Western Region (Kumasi, the large metropolitan commercial and political capital of Ashanti Region, is seemingly under-represented as a locale for mining supply).

The Chamber of Mines Supply Manager's Sub-Committee has identified 27 product categories (Table B.16), presented in the box below, which are either already being manufactured in Ghana or should be assessed for "import substitution potential." Annual spend on these Ghanaian-owned suppliers is estimated at US$ 120 mn, and the aim is to increase this to US$ 200 mn in the longer term. The Chamber is seeking to move from a sourcing policy based on a percentage value of procurement spend to one based on targeting products (services are not included) which are being, or likely, can be made in Ghana.

Table B.16: Feasible products for future near-term backward linkages

1	Activated Carbon	15	Conveyor Rollers, Idlers & Pulleys
2	Yelomine pipe	16	Steel products, including fabrication
3	Rock-bolts and split-sets	17	Tyre-retreading
4	Caustic soda	18	Heavy duty electric cables
5	Explosives manufacturing, including ammonium nitrate	19	Metal or PVC core trays
6	Ventilation ducting	20	Chain link fencing, wire netting, barbed wire, welded mesh, expanded mesh, concrete mesh, razor wire and panel mesh
7	Ammonium sulphate	21	Motor re-winding
8	Mill liners	22	Plastic sample bags
9	Grinding media	23	Calico bags
10	General/specialty lubricants	24	Bullion boxes
11	HDPE & PVC pipes	25	Reversed engineered specialty products
12	Overalls & work clothes	26	Cupels & crucibles
13	Cement and cement products	27	Wood products
14	Quicklime and hydrated lime		

A number of mines have introduced programmes designed to increase local content, particularly from communities based close to the mines. This includes the purchase of goods and services such as construction, maintenance, catering, landscaping, haulage, transportation and security. In 2002, the Ghana Minerals Commission mandated all mining companies to assist their host communities to develop local linkages.

All large mining companies in Ghana have set up departments and units to deal with this. In some cases to demonstrate their commitment, foundations have been set up which tie mining production and revenue to funds for local community development. A case in point is the Gold Field Ghana Limited's (GFG), Foundation which was established in 2004 to promote and fund community development projects within the Tarkwa and Damang catchment area of the company's operations under an initiative titled the Sustainable Community Empowerment and Economic Development (SEED) programme. The main objective of the GFG Foundation is to promote the development of the company's primary stakeholder communities.

The Foundation's work is funded by a contribution of one US dollar for every ounce of gold sold by the company, as well as a deduction of 0.5 percent of pre-tax profits. Based on this funding contribution, increases in the price of gold and in company profitability imply that there will be growing funds for community development projects. In addition, other companies providing mining support services to Gold Fields Ghana are also encouraged to contribute, either in cash or kind, to the Foundation's activities. Table B.17 shows the

contributions made by the GFG Foundation to various sectors in its primary catchment area.

Newmont has a Foundation for local development, funded by a contribution of one US dollar for every ounce of gold sold by the company, as well as a deduction of one percent of pre-tax profits. Golden Star Mining Company has established the Golden Star Development Foundation (GSDF) to promote and fund development projects in its operational areas. Projects funded by GSDF in 2008 included the establishment of an educational scholarship scheme; provision of educational infrastructure (school building); health infrastructure (including medical supplies) and a community electrification project.

Table B.17: GFG Foundation: Percentage expenditure on sectors and total contribution (in US Dollars) on community development projects, 2002-2009

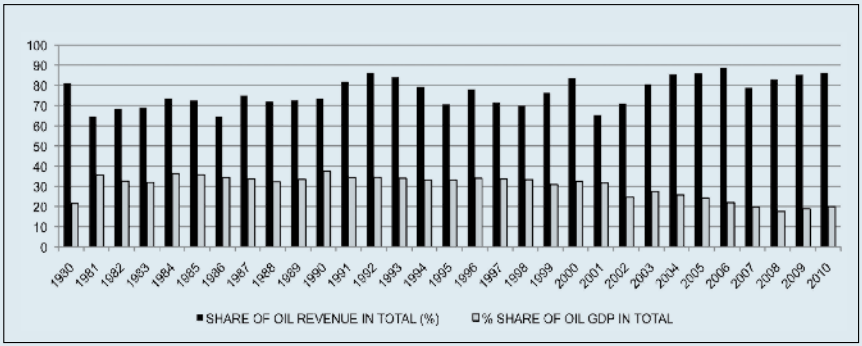
Sector	Financial Year								Total (%)	Total ($'000)
	2002	2003	2004	2005	2006	2007	2008	2009		
Education	57	8	57	35	31	25	36	25	31	2808
Health	21	64	8	27	3	3	5	2	12	1060
Water & Sanitation	9	17	11	19	13	17	16	11	14	1315
Agriculture	-	-	6	1	23	45	31	33	24	2213
Others	13	11	18	18	30	10	12	29	19	1710
Total ($'000)	474	721	362	915	1380	1391	1932	1931	100	9107
Projects not funded by GFG Foundation										1382
Grand Total										10,489

Source: Gold Fields

B.5 Backward linkages into the oil sector in Nigeria

Nigeria has a well-established oil and gas extraction industry which was established following the discovery of commercial quantities of oil in 1956. But it was not until the end of the Nigeria civil war (1970) that the oil industry began to play a prominent role in the economy. By 1982, the oil sector was providing more than 60 percent of total government revenue, and although this share has fluctuated with volatile oil prices, it has consistently remained above 60 percent. The contribution of the oil industry to Nigerian GDP has been significant over the years, exceeding 20 percent since the early 1980s, and in some years accounting for more than one-third of GDP (Figure B.11). The downturn in this share of GDP between 2004 and 2007 was interrupted by the increase in oil prices in 2009 and 2010 (although up-to-date GDP figures are not available). The likelihood that oil prices will remain high in the future ensures that the oil and gas sector will continue to play a dominant role in the economy.

Figure B.11: Shares of Oil in Total Revenue, GDP of Nigeria (1980-2008)



Source: Central Bank of Nigeria Statistical Bulletin (2009)

In 2010, Nigeria was the 10th largest global oil producer, and until recently (when Algeria became the largest producer), the major oil-exporting economy in Africa. Reserves at the end of 2007 were 36.2 billion barrels, 2.9 percent of the global total. Nigeria's downstream oil industry is made up of four refineries with a capacity of 438,750 bbl/d. But a series of problems--fire, sabotage, poor management, poor maintenance and corruption--have meant that the refineries often operate at less than 40 percent of full capacity. This has also meant that despite being a major exporter of crude oil, Nigeria is also a significant importer of petroleum. Policy attention is focused on increasing this downstream processing capacity.

Despite this focus on forward linkages, there has been a long history of local content policy designed to deepen backward linkages. This started with the Petroleum Act of 1969 which contained a section on the protection for indigenous Nigerian firms and a section on human capacity development. The joint operating agreements (JOA) and the production sharing contract (PSC) between the Nigerian government and the foreign oil companies in 1991 and 1993, included measures to promote local content by explicitly recognizing that this might require the industry to pay more for local inputs than for imports. Policies introduced in 2005 moved beyond price-premia and involved the issuance of 23 directives by the Nigerian government, mandating the use of selected local services and mandating the sourcing of low-tech on-shore supply of goods and services to indigenous firms.

Partly as a natural working-out of market forces, and partly as a consequence of these local content policies, estimates of local content in the oil and gas industry has risen sharply, particularly over the past decade. Local content rose from 3-5 percent in the 1970s to 20 percent in 2004 (UNCTAD/CALAG, 2006). In 2005, the Nigerian government set a local content target of 49 percent for 2009 and 70 percent for 2010, but these targets were not met. In 2009, local content had only reached a level of 39 percent. Despite this failure to

meet the 2010 target, Nigeria has made significant progress. Nevertheless, Nigeria's level of local sourcing is much lower than in countries such as Brazil, Malaysia, Venezuela and Norway, all of which achieve local content levels of between 45 and 75 percent (UNCTAD/CALAG, 2006). Local content levels are, however, much higher than in other SSA oil exporting economies such as Angola – see Section 4.1 above.

Nigerian policy has long recognized that local content, i.e. the percentage of spend procured domestically, is not the same as local value added (i.e. it is not just the breadth of local content which is important, but also its depth):

> "the quantum of composite value added to, or created in the Nigerian economy through the utilization of Nigerian human and material resources and services in the exploration, development, exploitation, transportation, sale and processing of Nigerian crude oil and gas resources resulting in the development of indigenous capabilities, while encouraging foreign investment and participation, without compromising quality, health, safety and environmental standards" *(NNPC, 2009)*

Most recently, the Nigerian Content Act (2010) seeks to speed up the indigenization of the industry, privileging not just domestic supply, but domestic supply by Nigerian firms:

> "Nigerian independent operators shall be given first consideration in the award of oil blocks; oil field licenses, oil lifting licenses and in all projects for which contract is to be awarded in the Nigerian oil and gas industry. In the bidding for any license, permit or interest and before carrying out any project in the Nigerian oil and gas industry, an operator shall submit a Nigerian content [plan] to the board demonstrating compliance with the Nigerians Content Act. Finally, the award of contract shall not solely be based on the principle of the lower bidder; where a Nigerian indigenous company has capacity to execute such job, the company shall not be disqualified exclusively on the basis that it is not the lowest financial bidder, provided the value does not exceed the lowest bid price by 10 percent".

The capacity to increase local content clearly follows from the quality of domestic capabilities. In 2003, a detailed study of the industry suggested that the gap between the needs of the oil and gas sector and local capabilities was smallest in seven sectors, namely in fabrication and construction; well construction and completion; modification, maintenance and operations; transportation; control systems and ICTs; design and engineering and consultancy (Heum *et al*., 2003).

In the light of this assessment, the relevant sutdy of backward linkages into the oil and gas industry focused on three of these sub-sectors--fabrication and construction; well construction and completion and control systems and ICT. These three sectors were chosen

since they covered a range of competences and represented a discrete and researchable set of companies. 15 of the 45 large foreign- and locally-owned producing firms were interviewed, most of which had head offices in Lagos, and 115 oil and gas industry suppliers clustered around the two oil cities of Port Harcourt and Warri (accounting for half of all known supplying firms in these regions). These cities were chosen since they were the major centres where oil prospecting, exploration, production and refining occur and local serving firms have concentrated. A multi-stage sampling technique was used in the case of oil firms' suppliers. In the first instance, the population was stratified into the two regions (Port Harcourt and Warri) and each of the cities was further stratified into wards. Using the raffle variant of simple random sampling, 50 percent of suppliers firms were selected in each ward.

What is the evidence on local sourcing which emerges from this focus on the three sub-sectors feeding into the oil industry? Beginning with data derived from the oil sector companies, nine of the 12 interviewed firms estimated that they purchased more than half of all their goods and services from local suppliers (Table B.18). This considerable commitment to local purchasing exists despite the fact that procurement decisions (including of consumables) are largely taken by the head offices (which is generally outside of Nigeria),

Table B.18: Share of inputs from local suppliers/outputs sold to local processors

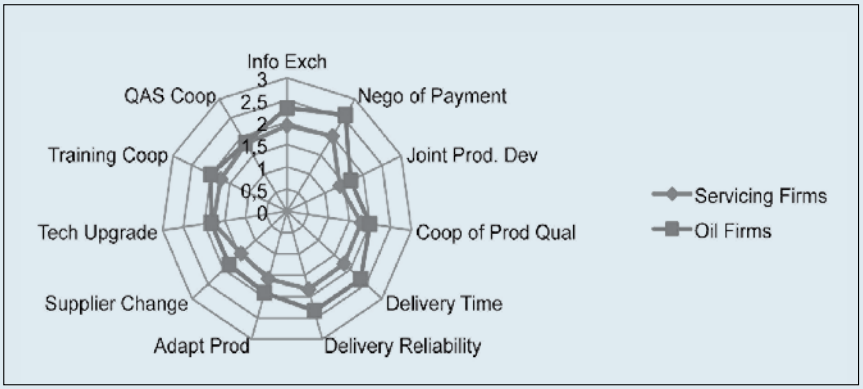
	Frequency	Percentage
Backward linkages:		
Goods: Up to 50%	3	25
51%-75%	5	41.7
Above 75%	4	33.3
Services: Up to 50%	3	25
51%-75%	9	75
Forward linkages:		
Up to 50%	5	41.7
51%-75%	4	33.3
Above 75%	3	25
Locus of decision making		
Who is in charge of supply management?		
Local office	0	0
Head office	12	100
Does this include consumables?		
Yes	10	83.3
No	2	16.7

Source: Oyejide and Adewuyi (2011)

Despite this high level of local sourcing, much of this occurs on an arms' length basis, suggesting that there is considerable leeway for the promotion of better linkages between

the oil firms and their suppliers. Figure B.12 shows the result of asking the same question of both the oil firms and their suppliers about the nature of their interchanges on a range of factors which are important in achieving systemic value chain efficiency. On a scale of 1 ("not at all") to 3 ("constantly"), each of the parties was asked to score the quality and frequency of their contacts. It is clear that as a general rule, the oil firms tend to rate their linkage with their servicing firms higher than the suppliers for all of these modes of interaction. The gap in perceptions was greater with regard to payment negotiations and delivery reliability and delivery frequency. But it is interesting that with regard to quality--a critical success factor in the oil industry--there was a close alignment in the perceptions of the oil firms and their suppliers.

Figure B.12 Alignment of perceptions on the frequency and quality of interchanges between lead oil firms and first-tier suppliers



1=No contact, 2=Occasional contact 3=continuous contact

Source: Oyejide and Adewuyi (2011)

This misalignment in perceptions between the oil firms and their suppliers exists despite the fact that most of the large oil firms have active supplier development programmes (Table B.19). It is clear, however, that the International Finance Corporation Supplier Development programme does not appear to be seen as useful by the oil companies. Further, although the oil companies believe that they have reasonably close relationships with their first-tier own suppliers, this does not extend down the supply chain. Only one of the 12 lead commodity producers said that it provided support to second-tier suppliers.

Table B.19: Supply chain development programmes

	%
1. Provide assistance to suppliers in meeting up with standards	
Yes	75
No	25
2. Have a strategy for supply development for local business	
Yes	75
No	25
3. Participate in IFC suppliers development programme	
Yes	8.3
No	91.7
4. Keep relationship with firms that provide input to suppliers	
Yes	8.3
No	91.7

Source: Oyejide and Adewuyi (2011)

The lack of contact between lead commodity producers and second- and third-tier suppliers raises the associated question on the depth of local content provision. In other words, are local sources merely a front for the importation of goods and services? Table B.20 provides data on the local purchasing by 80 first-tier suppliers to the oil industry in the three sub-sectors. They reported substantial levels of local content in their own purchases. Taken as a whole, 55.1 percent of 80 first-tier supplying firms purchased more than half of their services from local second-tier suppliers. This level of local sourcing was highest in the fabrication and construction sub-sector and in the well construction and completion sub-sector. In these two sub-sectors, 45.5 percent and 41.1 percent, respectively, source more than 75 percent of their inputs locally. The significance of this data is that it suggests a considerable depth to backward linkages in the Nigerian oil and gas industry. That is, unlike the experience of "local supply" in many of SSA's commodity sectors, where "local" represents merely the localization of the importation function, in the Nigerian oil and gas industry a large measure of "local supply" does indeed reflect local value added.

Table B.20: Share of local content in purchases by first-tier suppliers to the oil and gas industry (%)

Sector	0-25%	26-50%	51 -75%	76 -100%
Control system & ICT	31.6	21.1	21.1	26.3
Fabrication & construction	13.6	22.7	18.2	45.5
Well construction & completion	20.6	20.6	17.6	41.1
Others	40	40	20	-
Total	22.5	22.5	18.8	36.3

Source: Oyejide and Adewuyi (2011)

B.6 Backward linkages into mining equipment and services in South Africa

The large-scale exploitation of minerals in South Africa dates back more than 150 years to the discovery of diamonds, and subsequently during the 1870s, to the discovery and exploitation of deep deposits of gold ore. South Africa not only possesses the most developed mining and mining supply industry in SSA, but in some important respects also stands out as a world leading producer of individual minerals and in the contribution of mining to the economy as a whole. It also possesses extensive forward linkages from the commodities sectors, not just in the processing of many ores, but especially in the processing of soft industrial commodities. South Africa possesses a well-developed industrial sector, the origin of which rests in mineral extraction and the development of extensive linkages to this sector. South Africa thus provides a cogent challenge to one of the central tenets of the Resource Curse theory, that is, that resource exploitation undermines industrial activity.

In recent years, mining has seen a decline in its share of GDP (from 8.8 percent in 2000 to 6.3 percent in 2010). Its share of exports (41 percent in 2010) remained roughly stable over the decade, but fell and then rose in tandem with global commodity prices (Table B.21).

Table B.21: Percentage share of mining and quarrying in South Africa GDP and exports (2000-2010)

Year	Value Added In GDP	Exports
2000	8.8	39
2001	8.5	39
2002	8.3	37
2003	8.4	33
2004	8.1	32
2005	7.8	32
2006	7.3	33
2007	6.9	32
2008	6.3	33
2009	6.1	39
2010	6.3	41

Source: Value Added GDP values from South Africa Statistical Yearbook (2011).
Exports values from http://apps.thedti.gov.za/econdb/rapportt/rapstruc.html

In the early years, economic policies on mining had two main thrusts. The first was to provide a favourable environment for mining investors. This, in turn, entailed keeping costs down, notably the wage costs of African miners. At the same time, there was a second thrust that entailed a number of policies which sought to advance backward

linkages. Prominent in the past were policies of tariff protection that provided support for domestic industry.

Currently, a major thrust of government policy with respect to mineral products is to promote downstream beneficiation. Beneficiation features strongly in the National Industrial Policy Framework and in the Industrial Policy Action Plan (IPAP). The IPAP envisages minimum beneficiation levels for ten "selected commodities." These commodities are not specified, but presumably involve all of the major mineral products. Thus, the IPAP Key Action Programme 12.5.1, specifies

> Setting minimum beneficiation levels for key commodity chains. Nature of the intervention: The Department of Mineral Resources (DMR) to establish and define minimum levels of beneficiation for each of the 10 selected commodities. This will lay the foundations to create specific value chains, including in 5 instances up to the fourth level of minerals value addition.
>
> Our natural comparative advantage in the underlying resource-based industries along with additional factor endowments (especially relatively inexpensive electricity costs) provides us with an opportunity to be competitive in downstream value addition. The end-game is to acquire a competitive position as far down the value chain towards finished product production as is possible.

However, this is not the only approach driving the development of industrial policy. The International Panel on Accelerated and Shared Growth Initiative for South Africa (ASGISA) argued that

> ..both theory and practice provide reasons to question the presumption that downstream processing is an appropriate development path. The skills and other inputs required to process raw material and market finished products could be very different from those required to mine or grow them....Moreover...as transportation costs have declined, and global markets have become more integrated, the advantage of proximity to raw material production has diminished. (Hausmann, Klinger and Lawrence, 2008:1)

Leaving aside the current policy debate on whether to promote forward or backward linkages from the commodities sector in the future, past developments have meant that insofar as South Africa has a globally competitive industrial structure in the hard commodities sector, this is to be found in regard to backward linkages, particularly mining equipment and specialist services. This comparative advantage can be evidenced in a number of ways.

The first is with regard to innovative capabilities in general, and patents in particular. The

quantity and quality of South African mining and related technologies were assessed utilizing 1976-2006 USPTO patent data from the United States Patent and Technology Office (USPTO).[5] South Africa has a considerable number of patents. Mining-related technology patents make up a much larger share of South Africa's total patenting activity than for other comparator countries which have significant mining industries and are considered to be at the technology frontier (Table B.22).

Table B.22. All patents and mining technology patents at the USPTO 1976-2006; South Africa and comparator countries

	All Patents	Mining Tech. Patents	Share (%)
South Africa	3151	142	4.51
United States	1,587,915	7,882	0.5
Australia	16,283	311	1.9
Canada	65,580	853	1.3
Global total/average	3,189,941	17,098	0.54

Note: A patent belongs to the "Mining Related Technologiesî" cluster if it belongs to one of the following 3-digit USPC classes: 299 - Mining or In Situ Disintegration of Hard Material, 051 - Abrasive Tool Making Process, Material, and Composition, 023 - Chemistry: Physical Processes, 037 ñ Excavating, 075 - Specialized Metallurgical Processes, 172 - Earth Working

Source: United States Patent Office database. 1976-2006.

Patent quality can be assessed by examining the number of citations received. In aggregate, South African patents receive fewer citations than patents in the comparator countries. By contrast, South African mining and related patents receive more citations than patents of comparator countries. By this measure, the value of South African patents is higher than for comparator countries. Randomly matching each South African patent to a similar American, Canadian, or Australian patent gives somewhat weaker results. The average number of citations for a South African mining technology patent is likely to be less than that of a similar Canadian or US patent. However, a South African mining patent is more cited than that of a comparable Australian patent.

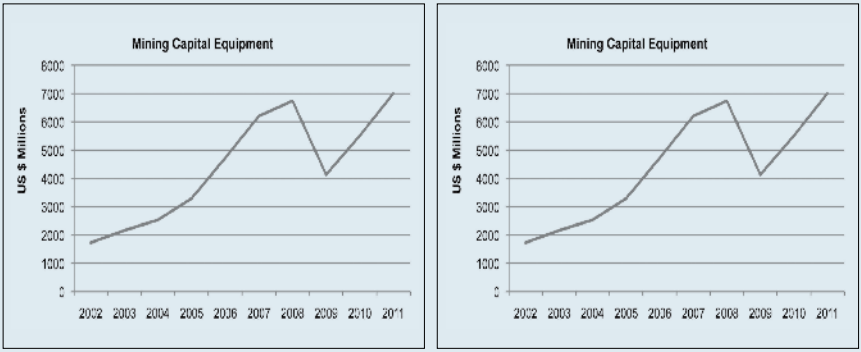
A second indicator of the development of world class backward linkages from South Africa's hard commodities sector is the share of this sector in external trade. The level and particularly the growth of exports of mining equipment and specialist services is one clear manifestation of global competitiveness. This is particularly so in the light of the fact that these exports have not benefited from any specially designated state support. Exports can be divided into two broad categories. The first category is exports-related to new projects--new mines or mineral processing activities. The second category is the after-

5 The data and analysis on South African patents were provided by Professor Lee Bransetter to a World Bank Study entitled "Closing the Skills and Technology Gaps in South Africa."

market--to existing mines or mineral processing activities. The latter is much more critical, but the competitive edge to supply to the after-market is often secured through firms being engaged in projects from the outset.

The determination of specifically mining exports is a complex issue. Since trade data is categorized by product rather than by customer, it is very difficult to determine precisely what is destined for mining as opposed to other markets. The South African Capital Equipment Council (SACEC) has assessed, (for South Africa) at an eight-digit HS level, which capital equipment products are destined for the mining sector. SACEC categorization has been used in the data below. Currently, exports of mining capital equipment are running at approximately US$ 4 bn. Exports have been growing rapidly--in nominal terms quadrupling since 2000.[6] Figure B.13 shows both the absolute level of mining capital equipment exports and the share of these exports in total exports. This shows a rapid rise in exports between 2000 and 2007 and a largely stable share of total exports.

Figure B.13: Mining capital equipment exports ($m)



Source: Calculated from COMTRADE database accessed through WITS online ‹···https://wits.worldbank.org/WITS/WITS/Restricted/Login.aspx···› (accessed February 2011)

For all capital equipment, South African imports exceed exports by a large margin--in 2008 and 2009, imports were three times larger than exports. With respect to mining equipment, however, South Africa is a net exporter. But this overall positive trade balance reflects a negative trade balance with the rest of the world, but a strong positive trade balance with sub-Saharan Africa (Table B.23). The dense network of mining production and services companies results in a high local value added for this sector--estimated at approximately 90 percent (Kaplan, 2011).

6 Prior to 2000, there were a number of changes in the definition of products which make it difficult to construct a clear time series.

Table B.23: South Africa mining equipment exports, imports ($'000), 2005-2009

	2005	2006	2007	2008	2009
Trade with World					
Exports	3,292,256	4,721,750	6,200,709	6,742,700	4,130,184
Imports	3,173,526	4,285,689	5,987,691	6,174,743	3,668,875
Trade Balance	118,730	436,061	213,081	567,957	461,309
Trade with SSA					
Exports	786,793	1,025,801	1,494, 146	1,935, 971	1,542,666
Imports	10,972	13,423	15,317	24,485	32,232
Share of Total Exports	24%	22%	24%	29%	37%

Source: Calculated from COMTRADE database accessed through WITS online ‹---https://wits.worldbank.org/WITS/WITS/Restricted/Login.aspx---› (accessed February 2011)

Much of these exports result from the global expansion of South African mining houses which then utilize their existing supplier base in South Africa. African countries--notably in the Southern Africa region--are the major markets for South African exports of capital goods. Eight of the top ten destination countries are African and all except Nigeria are located in the sub-region. Unfortunately, the services export data do not allow for mining services to be isolated. But net export earnings are likely to be substantial and significantly positive.

Beyond this aggregate data, a more specific enquiry supports the conclusions that the South African supplier industry has developed globally competitive capabilities on the basis of its experience in serving the domestic mining industry. South Africa is a world leader in a host of mining equipment products. These include spirals for washing coal; pumping up water; hydropower; tracked mining; underground locomotives; ventilation; shaft sinking; turnkey new mine design and operation, and many others. The area where South African expertise is particularly advanced and is at the global frontier is in deep level mining and associated competencies. South Africa is much weaker in so-called "yellow metal" areas--such as mining vehicles--where scale economies are critical and where large TNCs dominate. There are also examples of horizontal linkages, where competences were built in other sectors and then applied to mining, for example, transport and haulage equipment where South Africa has leading global products (Kaplinsky, 2011a). Similarly, as in the case of hydraulic equipment, there are also cases where the mining sector provided the initial source of demand and successful domestic firms then branched out to serve the needs of other sectors.

Focusing on the depth and breadth of backward linkages in South Africa, it is possible to draw six conclusions. First, South African mining activities have, from a very early stage, required the utilization of advanced technologies and systems. This has in large part been

a consequence of the geological specificity of mining deposits in South Africa, particularly the need to mine at great depths. Second, the local deployment of such technologies and systems combined with a particular structure of the South African mining industry and state directed policies, allowed for the early development of considerable local technological expertise. State policies have been critical in the past. Government provided not only tariff support but also financial and technological support to local industry. Linkages with the National System of Innovation have been important for the mining sector and also for local industry. Third, the technological content of mining and mining-related activities everywhere has increased significantly over the last two decades as a result of a number of factors--including increased globalization, market segmentation and the changing role of TNCs and the engagement of generic technologies, particularly IT. Fourth, the significantly enhanced technological content of mining-related activities coincided with two critical changes in South Africa: the decline of mining output for some minerals, notably gold, and the end of apartheid in 1994. As a result, South African mining firms have engaged in substantial expansion abroad. This, in turn, has created significant opportunities for exports of mining-related equipment and services. Fifth, South Africa has a significant cluster of firms in mining equipment and related services which are at the global technological frontier. This is evident in respect of exports, intellectual property and leading products and companies. Indeed, this cluster is the only significant area of industrial activity where South Africa is located at the global technological frontier. Sixth, South Africa's competitive position is being undermined--both at the "lower" manufacturing end and the "higher" end of R&D and new product development.

B.7 Backward linkages into the gold sector in Tanzania

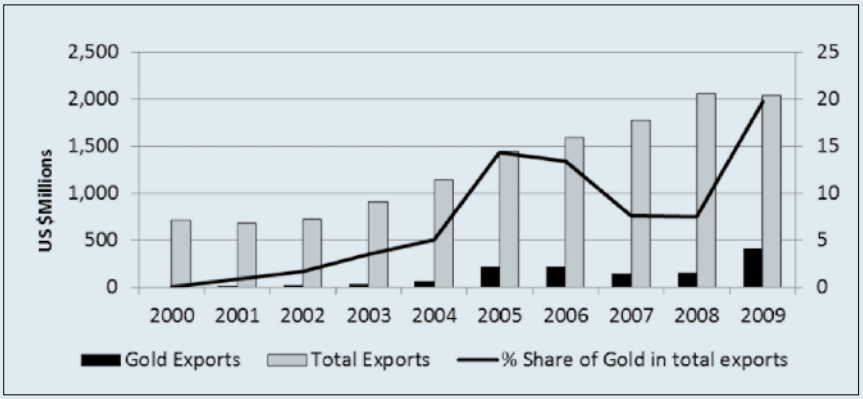
Historically, gold production has been dominated by a few large producers. For many years, South Africa accounted for more than 60 percent of total global production. Recent decline in its production and the rise in production in other countries have meant that in 2010, the world's largest gold producer was China, followed by the USA and then South Africa. Beyond a group of eight large gold producers (together accounting for almost one-half of the global total in 2010), are a clutch of around 90 smaller producers. Tanzania, with a production capacity of 50 tonnes in 2009, fits into the second tier of producing countries, along with Argentina, Bolivia, Brazil, Chile, Colombia, Ghana, Kazakhstan, Zimbabwe, Mali, Morocco, Mexico, Papua and the Philippines

Since independence in 1961, Tanzania has had a stuttering growth experience. For much of the 1980s and 1990s, economic growth was slow. The average annual growth between 1988 and 1993 was 1.1 percent (less than the rate of population growth), which compared poorly with that for SSA as a whole (2.7 percent). However, since the late 1990s, economic growth has revived. Between 2000 and 2010, the economy grew at an annual rate of 6.8 percent,

above the average for SSA as a whole (4.6 percent).

One major factor underlying this revival in growth was the development and expansion of Tanzania's gold mining industry. Following the onset of production in 1998, there are now six active gold mines in Tanzania, and gold has emerged as the country's leading foreign exchange earner. Gold exports more than trebled between 2000 and 2010, exceeding US$ 2 bn in 2010 and accounting for more than 20 percent of total exports (Figure B.14). However, the low-tax regime introduced to foster the gold industry meant that the contribution of the gold sector to total government revenue was only US$ 46.5 mn in 2004-5 (the most recent year for which data is available), contributing only 1.4 percent of total government revenue.

Figure B.14: Exports of gold and gold as share of total exports (US$ mn and %)



Source: World Economic Indicators and COMTRADE (2010)

Access to the country's mineral resources, which is governed by the Mining Act of 1998, was in a process of revision in 2010[7]. This 1998 legislation represented a radical departure from the 1979 Act which had previously restricted access to mineral deposits to the state. The new policy opened the mining sector to local and foreign private sector investors. It reserved two sets of activities for firms wholly-owned by Tanzanian citizens--Primary Prospecting Licences (PPL) and Primary Mining Licences (PML). However, these local firms can sell these rights on to foreign firms at a later stage if they enter into joint ventures with local partners. Whilst licences for other activities which are issued to foreign firms require proof of both technical and financial capacity and capabilities, these requirements are not specified for wholly-locally owned firms. Section 10 of the 1998 Mining Act has provisions that allow the Minister of Minerals and Energy to negotiate and grant tax exemptions and environmental impact assessment exemptions with individual investors, without being restricted by other

7 This research was carried out before the Tanzanian Parliament legislated a new Mineral Act in April 2010.

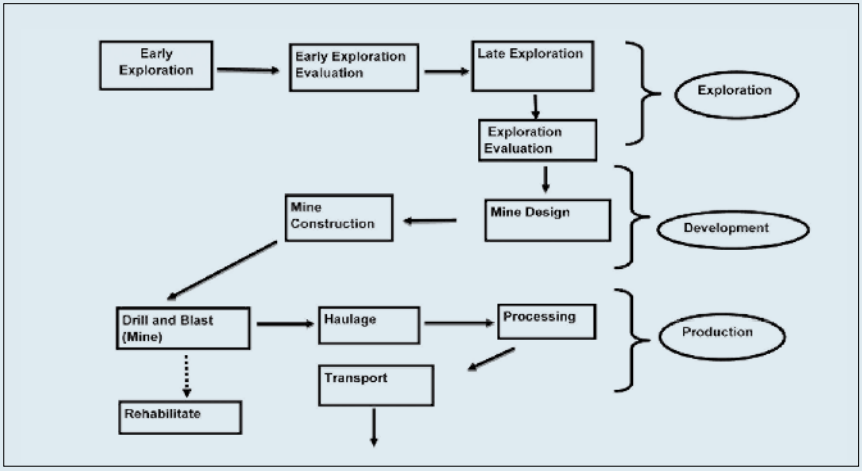
legal requirements. The Mining Development Agreements (MDA) are designed to provide large investors with the assurance of stability in long-term mining projects. A MDA is negotiated and granted in addition to other incentives provided to all investors, such as depreciation allowances of 100 percent, repatriation of capital and profit directly related to mining, exemption of import duty and Value Added Tax (VAT) on equipment and essential materials.

Government policy recognizes the need to develop linkages into and out of the gold mining sector. However, other than the exclusive primary prospecting and mining rights granted to local citizens, there are no other elements of the legislation which target local content or which restrict the capacity of the mining firms to import their inputs.

In examining the breadth and depth of backward linkages into the Tanzanian mining sector, a range of firms across the value chain were interviewed, including seven representatives from the three large-scale mining firms, four exploration firms and 12 representatives from eight suppliers to the mines. As noted earlier, however, research access in general, and the ability to collect numerical data in particular is especially difficult in Tanzania, given the heated political debate accompanying the revision of the Mining Act in 2010 when the research was conducted.

The structure of the gold mining value chain in Tanzania is shown in Figure B.15. It consists of three primary sets of activities--exploration, the development and construction of the mine and the operation of the mine. Our analysis of backward linkages focuses on linkages into the production and exploration of sub-chains.

Figure B.15: The Tanzanian gold mining value chain



Source: Mjimba (2011)

Linkages to the local provision of inputs into both these sub-chains are weak. In the exploration link of the chain, the three large-scale mining firms active in Tanzania have their own in-house greenfield exploration department. AngloGold Ashanti (AGA) has an exploration branch with head offices in Johannesburg, South Africa and its exploration team in Tanzania comprises both Tanzanian citizens and expatriate staff. A similar pattern exists for Resolute and Africa Barrick. Nevertheless, each of the large mining houses also outsources part of their exploration activities (Table B.24). Consequently, there are a range of exploration firms operating locally. But with two exceptions, all of these are foreign-owned and draw their inputs from abroad (Table B.25).

Table B.24: Outsourced and in-house activities in exploration sub-chain

Service/Process	In-house	Outsourced
Target generation	Y	N
Area selection	Y	N
Geophysical work	N	Y
Laboratory work	N	Y
Quality assurance and quality control	Y	N
Drawing up contracts	Y	N
Reserve estimation	Y	N
Logistics	N	Y
Data capture and processing	Y	N
Drilling	N	Y

Source: Mjimba (2011)

Table B.25: Gold exploration firms active in Tanzania

Head quarters	Ownership structure (shares)		Service scope	Works location in Tanzania
Canada	0	100	Junior explorer	Magambazi
Tanzania	Majority	Minority	Junior explorer	Imweru and Lupa
Canada	0	100	Junior gold explorer	SusiRiver and Mabele Hills
Guernsey	0	100	Gold exploration and development	Lupa gold field, Mgusu and Singida
Republic of Ireland	0	100	Gold and nickel deposit exploration and development	Itetemia, Luhala and Morogoro
Canada	0	100	Junior gold explorer	Saza and Makongolisi
Australia	0	100	Mineral exploration and development	Nyanzaga
Australia	0	100	Mineral exploration	Miyabi and Igurubi
United Kingdom	0	100	Mineral exploration and development	Miyabi
Australia	0	100	Mineral exploration and development	Imweru
Canada	0	100	Gold and base metal Exploration and development	Ikungu, Isambara, Mnekezi, Vinyoza and Msasa projects
Tanzania	Majority	Minority	Junior explorer	Not indicated
Tanzania	100	0	Junior explorer	Not indicated
Tanzania	100	0	Junior explorer	Kinyambwiga

Source: Mjimba (2011)

There are a limited number of local linkages from these first-tier exploration firms to second-tier suppliers. The linkages are limited to relatively simple geophysical and geochemical exploration works such as ground based magnetic surveys and exploration, drilling and general services such as exploration logistic services.

The structure of suppliers providing geochemical services--that is, the collection and

analysis of rock samples--is somewhat different in that three sets of activities are also provided by state-owned Tanzanian firms (Table B.26). These firms engage in geological mapping, surveys and analysis and provide drilling services. These three locally-owned providers have been operating for many years and reflect the pre-1997 environment in which the state had exclusive control over the gold mining industry.

Table B.26: Exploration geochemical works goods/services providers in Tanzania

Head office	Service scope	Ownership structure (shares)		
		Local	Foreign	Public
Tanzania	Geological mapping, geophysical and geophysical surveys and analysis	100	0	100
Tanzania	Drilling (scope and range not ascertained), mineral exploration and property consultancy and joint venturing	100	0	100
Tanzania	Geological mapping, geochemical and geophysical surveys and analysis	100	0	100
Tanzania	Drilling (scope not ascertained)	Majority	Minority	0
Tanzania	Stream sediment, soil and rock chip sampling	100	0	0
Singapore	Surface diamond core, high air capacity, reverse circular, grade control, heli-portable diamond, deep directional core orientation, air core, geotechnical, coal and coal-bed methane drilling services	0	100	0
Australia	Rotary air blast (RBA), kit bit, reverse circulation, diamond, directional and grade control drilling services	0	100	0
Australia	Reverse circulation, surface diamond, directional, RBA and air core drilling services	0	100	0
Canada	Surface and underground coring, directional, reverse circulation, geotechnical coal and coal-bed methane drilling services	0	100	0
Australia	Sample preparation and analysis	0	100	0
Italy	Sample preparation, analysis and turnkey surveys	0	100	0

Source: Mjimba (2011)

Local content in the geochemical services linkages in the exploration sub-chain is very low and is largely limited to local labour inputs. For example, all drilling equipment and components used in Tanzania are imported without any local value addition. The maintenance of the machinery is effectively a closed system with the drilling firms dealing directly with machinery and spare manufactures who service their global operations. There are two such firms with worldwide operations supplying drilling machinery and spares. Both have established subsidiaries in Tanzania to service equipment used in the large mines. Typically, they source specialized skills from their global labour force rather than from Tanzania. Local sourcing of manufactured inputs is only at an embryonic stage. For example, containers for rock samples (which have to be made of inert and durable materials) are imported from South Africa and Australia. In 2010, local suppliers began producing these containers in small volumes.

The exploration sub-chain also draws on geophysical services (Table B.27). Here, too, foreign-owned firms dominate and almost exclusively draw their skills form their global labour pool rather than from Tanzania. There is, however, one locally-owned firm which participates in this sub-sector, providing ground-based magnetometer surveys.

Table B.27: Geophysical work service providers active in Tanzania

Head Office	Service scope	Ownership structure share	
		Local	Foreign
South Africa	Airborne geophysical surveys	0	100
Zimbabwe	Ground based geophysical surveys	0	100
Australia	Satellite imagery and geo-spatial solution provider (Quick bird images)	0	100
Australia	Geological mapping	0	100
Australia	Airborne magnetic surveys	0	100
Tanzania	Ground magnetometer surveys	100	0

Source: Mjimba (2011)

A similar story of very limited local purchases emerges in the case of the production link in the gold value chain. The major local purchase is of liquid fuel required for the heavy drilling and earth-moving equipment used in gold mining. Liquid fuel is imported and reaches the mines at great cost due to the poor quality of infrastructure. A group procurement manager illustrating the point observed that:

> 'If you think about your Caterpillar truck,… … your average fuel consumption [during typical mining operations] is about between 95 litres to 100 litres per hour and you can work it out if you have 30 trucks, 24 hours a day , 360 days a year.. …… that excludes the loaders.' (Interview, November 2009).

The maintenance and repair of the heavy equipment which is utilized in the mine is generally outsourced, but to the global firms which supply this equipment for the global operations of the mining companies. Caterpillar operates as Mantrac with local branches in Dar es Salaam, Mwanza, Tanga and Moshi. The firm offers a range of comprehensive repair and maintenance contracts to the mining (and other) sectors. The Mwanza workshop services the country's gold mining sectors. Komatsu operates as Pan African Mining Services Tanzania Limited, with maintenance and repair contracts with individual mines. There were almost no changes in this sourcing structure between 2005 and 2009 for a range of goods, reflecting varying degrees of technological content (Mjimba, 2011). These data are also interesting since they show the heavy presence of South African and Australian suppliers. Both countries have developed mining industries and have, over the years, seen the emergence of significant backward linkages.

B.8 Linkages into the copper sector in Zambia

Zambia has a long history of copper mining, dating back to the early twentieth century. Soon after independence in 1964, the copper mines were nationalized, and later consolidated into the Zambia Consolidated Copper Mines (ZCCM), majority-owned by the government (60 percent of equity), with a minority share owned by Anglo American Corporation (27.3 percent). Copper mining generated the bulk of government revenues in the early post-independence period. From the mid-1970s, Zambia's copper mining sector came under mounting pressures from plummeting world prices and low levels of re-investment. Consequently, production levels fell sharply.

The Structural Adjustment Programmes (SAP) introduced in Zambia during the 1990s resulted in the gradual privatization of the mines, a process all but completed by 2001. Policies towards the mines were subsumed under the general provision of the SAPs, and no specific mining vision was adopted, either during the SAPs or subsequently. Inter alia, as a consequence of the absence of a vision towards the mining sector, there are currently no provisions in any of the legislation which explicitly targets backward linkages and local content. Only the bilateral Development Agreements with each mining company envisaged an effort from the mine to use local suppliers, but these were not legally binding commitments.

In 2009, Zambia was the largest African and the 7th largest global copper producer, accounting for 3.3 percent of global output. Reserves are such that even without new discoveries, copper mining can continue at current rates for 60 years. In 2000, Zambia's copper exports were valued at US$ 474 mn, but a combination of increasing production and rising prices resulted in export receipts rising rapidly to almost US$ 4 bn in 2009.

Figure B.16: Copper value chain

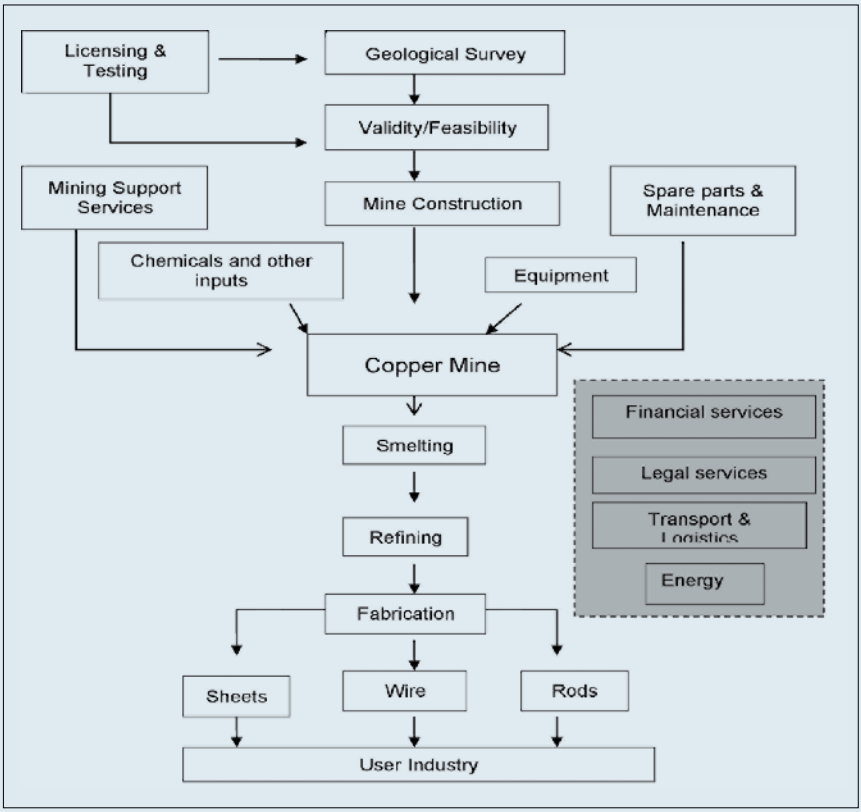
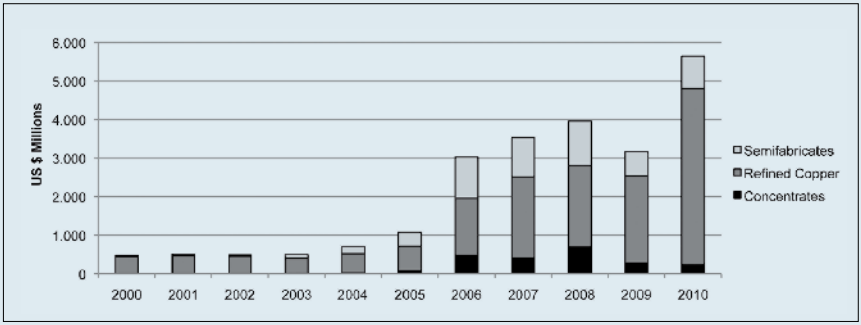


Figure B.17: Composition of Zambia's copper exports, 2000-2009 (US$, '000)



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

In recent years, copper has accounted for between 74 and 83 percent of Zambia's total exports, and for 9.1 percent of GDP in 2009. However, as a consequence of the liberal fiscal regime accompanying privatization, virtually none of the resource rents accruing from copper mining in Zambia have gone to the government. That is, whereas copper mining had contributed an average of 45 percent of government revenues between 1965 and 1975, it made virtually no direct contribution to government revenues during the post-2002 price boom (Bova, 2009). The low revenue stream was due to the very generous fiscal regime included in the bilateral development agreements. Moreover, alleged transfer pricing, whereby copper was sold by the mining companies to their subsidiaries at prices well below market prices, further lowered the corporate taxable basis (Al Jazeera, 18 June 2011).

There is considerable breadth to both forward and backward linkages in Zambia's copper value chain (Figure B.16). Focusing on forward linkages, copper is mostly exported in refined form, representing a number of value added stages after mining (cathodes) (Figure B.17). In recent years, there has been substantial investment to increase productive capacity in downstream processing, including the construction of two new smelters (one of US$ 310 mn by a Chinese firm, and a smaller investment by an Indian firm). In addition, a Swiss-Canadian firm invested US$ 190 mn to expand an existing smelter to 850,000 tons per annum, making this the largest copper smelter in Africa and the fifth-largest in the world. Further downstream processing into semi-fabricates takes place, but this linkage is thin. Semi-fabricates represents the first stage of processing for refined copper and feed into the construction and manufacturing sectors. Zambian exports of semi-fabricates include copper plates, sheets and strips and copper wire, and export values increased substantially over the years, though official figures are inconsistent.[8]

This downstream processing of copper ore is currently almost exclusively undertaken by one company, which is a subsidiary of a large American metal processing conglomerate. It is important to note that as a sectoral characteristic, competitiveness in semi-fabricates manufacturing is not typically determined by proximity to the mines, but by labour cost and access to infrastructure. Semi-fabricates manufacturing, therefore, faces the same substantial challenges that the manufacturing sector suffers in Zambia in general. However, an ongoing US$ 800 mn investment by a Chinese firm in the Chambishi Multi-Facility Economic Zone will deepen forward linkages by building a large-scale semi-fabricates manufacturing capacity.

There have also been substantial backward linkages to the mining sector. From data supplied by the Kitwe Chamber of Commerce and Industry and the mining companies, it is possible to estimate the total population of suppliers to be around 200 firms. (Of these, 50

8 COMTRADE, which sources data from the revenue and customs authority, records exports of engineering products totalling more than US$ 1 bn in 2008. For the same year, the Zambia Development Agency data record exports of only US$ 210.5 mn. This latter (and lower) Figure B. is almost certainly more reliable, as it is directly sourced from the company.

were interviewed, in addition to eight of the 14 large and small-scale mines). This estimate comprises established formal sector industrial suppliers. Before the late 2000s, there were also a number of informal traders, but many of these exited the industry (see below).

Table B.28: Local sourcing as % of total spending among selected mining companies

	Share of local sourcing
Large-scale mine A	82%
Large-scale mine B	86%
Medium-scale mine C	60%
Small-scale mine D	Equipment and spares: 10% purchased from local suppliers 90% directly imported Consumables: 60% purchased from local suppliers 40% directly imported
Small-scale mine E	Production costs are disaggregated as follows: 80% on equipment and consumables – purchased from local suppliers 10% food 10% labour
Small-scale mine F	Supply chain: 25% is directly imported (mainly spares) 75% purchased from local suppliers (but 70% are purchased from importers)
Small-scale mine G	Supply chain: 80% purchased from local suppliers 20% directly imported

Source: Fessehaie (2011)

The breadth of linkages from the mines, particularly the larger mines, is significant. Large mines procure between 60 percent and 86 percent of inputs from the local supply chain, whereas small mines procure between 35 percent and 80 percent (Table B.28). This procurement reflects the purchase of goods and services required for the operation of the mines rather than for their construction. The smaller mines are less mechanized and mainly consist of small, open-pit operations. Therefore, their demand for specialized capital equipment, such as hydraulic equipment, pumps and valves, is low but the degree of local sourcing figures is high because, rather than importing equipment and spares, small-scale mines often hire equipment from local firms.

The first-tier suppliers, which are mostly based in the Copperbelt, fall into three categories. The first are manufacturing firms producing a wide range of inputs, such as metallurgical, plastic and rubber products, engineering products, paints and foundries. In 2010, there were less than 40 of such firms operating. With the exception of one large steel foundry, they are relatively small-sized. The local value added content of these suppliers tend to

be substantial, but most of the firms in this category are finding it increasingly difficult to compete with imports from South Africa and China. In 2010, for example, two engineering companies and two foundries were exiting or had just exited the mining supply chain.

The second group are medium- and large-scale services providers, predominantly subsidiaries of TNC OEMs, large distributors and representatives of specialized, capital intensive firms (such as drilling companies and providers of specialised transport). Value added amongst this set of suppliers is significantly lower than among the manufacturing firms, but some of them operated in skills intensive sectors, such as specialized engineering services. Approximately 150 firms operate in this category, and most are competitive and profitable enterprises, with their services being highly valued by the buyers.

In addition to these formal sector suppliers (approximately 40 local manufacturing firms and 150 TNC OEM subsidiaries), there is a third and more numerous category of very small-scale suppliers, with very low levels of local content. Most of the few hundred firms in this category--characterized by low entry and exit barriers--are widely referred to as "briefcase businessmen" because they operate 'out of a briefcase'. They engage in small -scale importation of supplies, often securing contracts in an illicit manner and with no value added in after-sale services. After the 2008 copper price crisis, most of the copper mines restructured their supply chains and eliminated these largely inefficient suppliers, drastically reducing their number. However, not all of these suppliers are informal and transient. Some agents and distributors provide stockholding and back-up services, often developing agreements with sole manufacturers abroad and slowly graduating into sole distributors. But as in the case of the "suitcase businessmen", other than importation and stockholding, no value is added to the chain.

Although the local acquisition of inputs represents a substantial spend by the mines. this needs some qualification. First, in some cases the level of outsourcing is illusory, since as in the case of the "briefcase businessmen", the suppliers merely import intermediaries. Second, the level of outsourcing has fallen in recent years, as mining firms have internalized activities which were previously bought-in. For example, one mine had outsourced the maintenance and operation of loaders, but weak local capabilities and the criticality of these operations led to the vertical re-integration of this activity. Third, Chinese and Indian firms, which are the latest investors, have a shorter history of supply chain management and therefore tend to outsource a smaller proportion of their input needs. For example, the Chinese mining houses developed in-house engineering, electrical and mechanical services and built a foundry. Moreover, when one of the largest OEMs downsized its workforce due to the economic crisis, the Indian mine employed the skilled workforce and built in-house capabilities in its own mine.

A key factor leading to the thinning out of the Zambian supply chain was the privatization of the mines. This dramatically changed the rules of the game. The new mines previously

owned by TNCs with long experience in mining required efficient supply chains, operating at the technological frontier and within acceptable costs and lead times. They were not legally bound to maximize local outsourcing, and they operated in a period in which they had to undertake large expenditures to recapitalize the mines, despite the fact that copper prices were low during this period. In these circumstances, buyers shifted from local suppliers to cheaper imports, especially from South Africa, but also from Europe, Canada and Australia. Within the supply chain, major changes took place. Local manufacturers had to compete with foreign investors locating production, or often only distribution facilities in Zambia, as well as with imports. Lacking, amongst other things, the technological capabilities and economies of scale of competitors, and no longer protected by high import tariffs, they found it increasingly difficult to compete with the quality and prices of foreign suppliers. Consequently, in the early 2000s, manufacturers were exiting the mining supply chain, replaced by services providers, both Zambian and foreign-owned. Only a fraction of the latter engaged in value added services. Moreover, and as part of a global trend, many first-tier OEM suppliers established a direct presence in the Copperbelt in order to tighten control over the quality of the goods and services provided to the mines, and to increase revenues streams from highly profitable after-sale services (Table B.29).

Table B.29: Key participants in the copper mining supply chain

During nationalization	Post-privatization
Large number of state-owned and privately-owned manufacturers (providing specialized mining components, spares and consumables	Importers. A large number of briefcase businessmen (now disappearing), and agents and distributors of components, spares and consumables)
Independent agents and distributors of capital equipment (some locally-owned)	OEMs subsidiaries (only distribution and after-sale services)
Specialized services providers	Specialized services providers
Some OEMs with manufacturing capabilities, for capital equipment	Privately-owned manufacturers, mostly Zambian-owned (providing consumables and protective equipment)

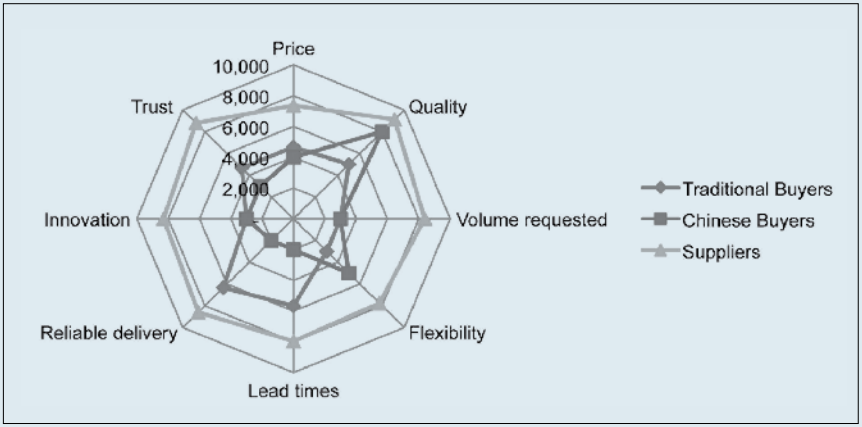
Note: In terms of the category of firms dominating the supply chain (in numbers)

Source: Fessehaie (2011)

The diminishing capability of local suppliers in the context of the rising technological complexity of mining is reflected in the judgements of two sets of buyers--the "Northern/ traditional" investors (including South African buyers) and the new emerging country investors from China and India. These different groups of buyers rate the capabilities of local suppliers differentially (Figure B.18). The "Northern" buyers have, over the years, established relationships with their supply chains which have led them to identify, and work with a relatively stable set of suppliers. By contrast, the newer entrants tended to have more arms' length relationships with their suppliers and to have less confidence in their capabilities. The Chinese, and particularly the Indian, mines tended to place more

emphasis on price in their negotiations with suppliers. It is notable, and this reflects international experience in environments of immature supply chains, that the suppliers had a much higher confidence in their capabilities than did the buyers.

Figure B.18: Comparative rating of supplier capabilities by traditional buyers, Chinese and Indian buyers and by the supply chain itself



1=poor performance, 10=highest level performance

Source: Fessehaie (2011)

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