



ROWING AGAINST THE CURRENT

THE DIVERSIFICATION CHALLENGE IN AFRICA'S RESOURCE-RICH ECONOMIES

John Page



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John Page is a Distinguished Visiting Fellow in the Global Economy and Development program at Brookings. He is also an advisor to the African Development Bank.

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INTRODUCTION

For a growing number of countries in Africa the current commodity boom is a huge opportunity. But if the economic history of resource-rich, poor countries—especially in Africa—is any guide, rather than bringing prosperity, the resource boom may drive them into what Paul Collier (2007) in his influential book *The Bottom Billion* terms the “Natural Resources Trap.” In Africa, countries dependent on oil, gas, and mining have tended to have weaker long-run growth, higher rates of poverty, and higher inequality than non mineral-dependent economies at similar levels of income.¹

Two recent studies suggest both the potential and the risks of resource extraction. Alekseev and Conrad (2008) show the potential—resource wealth has tended to make countries better off. They find that in the long run resource-rich countries have significantly higher levels of income than other countries. However, Collier and Goderis (2007, 2008) suggest that this may be due only to the income generated by resource rents rather than to the growth of output. In resource-rich economies—unlike those with more diversified economic structures—production and income may diverge substantially. Collier and Goderis ask whether a

commodity boom helps an economy to produce more output. They find that for the first few years following an increase in the price of commodity exports output increases relative to what it would otherwise have been, but usually the growth of output is not sustained. After two decades the typical resource extracting economy is producing less than it would have done in the absence of the boom. Collier and Goderis simulate the outcome of the current commodity boom and find that, if history repeats itself, after two decades output for the typical African commodity exporter will be around 25 percent lower than it would have been without the boom. This is the resource curse.

But geology is not destiny. Natural resource wealth can be an effective driver of growth. Chile, which has been the fastest growing Latin American country for the past 15 years, has relied almost entirely on exports of natural resource products. Botswana has been among the world's fastest growing economies for the last 30 years, and Indonesia and Malaysia have used their natural resource wealth to diversify and grow their economies. From the global evidence Collier and Goderis find that although a decline in production is the norm, it is by no means inevitable. Some societies have succeeded in harnessing commodity booms for

sustained increases in production, while others have not. The consequences of resource-riches, they argue, depend upon choices.

This paper is about one important set of choices faced by Africa's resource-rich economies, whether and how to diversify production beyond the natural resource sector. Following this introduction, Section 2 examines the role of natural resource exports in Africa's recent growth recovery. Using a new methodology developed by Arbache and Page (2007) it finds that Africa's growth acceleration after 1995 has been driven mainly by avoiding the policy mistakes that led to sharp economic contractions in the past and by a strong surge in growth in the resource-rich economies. This makes Africa's long-run growth prospects vulnerable to the natural resource curse.

Section 3 introduces the main theme of the paper: Africa's resource exporters are rowing against the current as they attempt to diversify their economies. The relative price changes that occur in a resource exporting economy—symptoms of the “Dutch disease”—place Africa's natural resource-rich countries at a disadvantage with respect to two drivers of industrial change and economic growth. Because Dutch disease discourages the development of new tradable goods producing activities, it inhibits the diversification of the manufacturing sector and limits the potential for increases in the sophistication of manufacturing production and exports. Both diversity and sophistication have been linked in recent literature to higher incomes and faster growth. In addition, research on the impact of agglomeration economies on produc-

tion costs and international competitiveness strongly suggests that late-comers to industrialization, such as Africa's natural resource exporters, suffer from a competitive disadvantage linked to the spatial distribution of global industry. It is far easier to expand an existing industrial agglomeration than to start a new one. Not surprisingly, then, the data show that Africa's mineral rich economies trail both the Africa regional average and the least developed countries in general in key indicators of industrial dynamism.

Section 4 draws on the experience of three successful natural resource exporters—Chile, Indonesia and Malaysia—to make the point that geology is not destiny. Each of these economies had rising income growth accompanied by increasing diversity of their manufacturing and export structure between 1980 and 2000. Successful diversification away from dependence on natural resources was the consequence of different public policies to mitigate the impact of the Dutch disease. In the cases of Indonesia and Malaysia, government policies successfully targeted moving into new more sophisticated manufacturing sectors. In Chile public policy favored the expansion into new, knowledge-intensive natural resource based exports.

Some options for policy choices are set out in section 5. The basic theme of the section is that governments—through improvements in the investment climate and public expenditures—can mitigate the worst consequences of the Dutch disease. Section 6 concludes and offers some ideas for further research.

RESOURCE-RICH COUNTRIES LED AFRICA'S GROWTH TURN AROUND

Economic performance in Sub-Saharan Africa (Africa) has markedly improved. Average GDP per capita growth (PPP) increased from -0.07 percent during 1975-1994, to 1.88 percent in 1995-2005. Per capita income in Africa has been growing in tandem with the rest of the world since the mid-1990s, and Africa's top performers are doing well compared with fast-growing countries in other regions (Arbache, Go and Page, 2008). What role if any have Africa's natural resource exporters played in this growth recovery?

In a pair of articles Arbache and Page (2007, 2008b) ask whether the region has finally turned the corner on the path to sustained growth. Africa's growth over the past three decades has not only been low; it has been highly volatile (see for example Ndulu et al., 2007; Arbache, Go and Page, 2008; Raddatz, 2008). In light of this volatility they seek to understand the origins of the growth turn around, using a variant of the methodology developed by Hausmann, Pritchett and Rodrik (2005) for analyzing growth accelerations. Arbache's and Page's approach differs from that of Hausmann, Pritchett and Rodrik in two ways. First, it identifies both growth accelerations *and* decelerations. Second, it does not use a common threshold growth rate to identify growth episodes. Instead, it defines acceleration and deceleration relative to each country's long-run economic performance.

Arbache and Page find that much of the improvement in economic performance in Africa after 1995 is attributable to a substantial increase in the frequency and country coverage of growth accelerations combined with reductions in the frequency and severity of growth decelinations (Table 1). Between 1975 and 1994 growth decelerations were twice as frequent as ac-

celerations. In contrast 42 percent of the 494 country-year observations for 1995-2005 were growth accelerations, and only 12 percent of the country-year observations were growth decelerations.

They also find that geology trumps geography in explaining the origins of Africa's growth turn around. Table 2 shows the frequency of growth acceleration and deceleration episodes by country type for 1995-2005. Resource-rich economies had a significantly higher frequency of growth accelerations than non resource-rich economies, and fewer growth collapses. Interestingly, the non-oil, resource-rich economies led the growth acceleration league table. This is largely due to the absence of growth accelerations in two important oil exporters—Congo Republic and Gabon. Turning to growth decelerations, resource-rich, non-oil countries were the only ones that had fewer growth collapses than the mean. There was not much difference in the probabilities of growth acceleration and deceleration episodes for different geographical locations. Landlocked countries without natural resources fared about the same as their non resource-rich coastal neighbors.

To assess the sustainability of growth Arbache and Page examine the behavior of three categories of "growth determinants"—investment, trade openness, and macroeconomic stability—drawn from the cross-country growth literature for growth episodes before and after 1995.² Their findings do not offer strong support to the idea that economic fundamentals have changed much since 1995 in either the resource-rich or the non resource-rich economies, but where significant changes have occurred they have favored the resource-rich.

In sum, Arbache's and Page's evidence suggests that rather than reflecting a fundamental shift in the underlying determinants of growth, Africa's growth

Table 1: Frequency of growth acceleration and deceleration, growth rates, and GDP per capita

Period	Observations (country- years)	GDP growth	GDP per capita	Frequency			Frequency		
				(country- years)	Growth rate	GDP per capita	(country- years)	Growth rate	GDP per capita
		GDP		Growth acceleration			Growth deceleration		
1975-2005	1,243	0.70	2,299	0.25	3.64	2,598	0.22	-2.74	1,794
1975-1984	316	0.13	2,180	0.04	4.61	2,796	0.18	-3.06	1,765
1985-1994	433	-0.23	2,183	0.21	3.21	2,907	0.36	-3.18	1,804
1995-2005	494	1.88	2,486	0.42	3.76	2,449	0.12	-1.29	1,797
1975-1994	749	-0.07	2,182	0.14	3.39	2,892	0.29	-3.14	1,794

Source: Arbach and Page (2008b)

Table 2: Frequency of growth acceleration and deceleration by country subset—1995-2005

Country category	Growth acceleration			Growth deceleration		
	Frequency (country- years)	Above/below country- years' mean	t-test	Frequency (country-years)	Above/below country-years' mean	t-test
All country-years' mean	0.42	-	-	0.12	-	-
Coastal	0.44	Above		0.12	Equal	
Landlocked	0.39	Below		0.13	Above	
Landlocked without resources	0.37	Below		0.14	Above	
Oil economies	0.49	Above		0.12	Equal	
Non-oil economies	0.40	Below		0.12	Equal	
Resource-rich	0.51	Above	*	0.08	Below	**
Resource-rich, non-oil	0.53	Above	*	0.05	Below	*
Non resource-rich	0.38	Below	*	0.14	Above	**

Notes: (*) t-test that frequency is equal to all country-years' mean rejected at the 5 percent significance level. (**) t-test that frequency is equal to all country-years' mean rejected at the 10 percent significance level.

Calculations based on country-years observations.

Source: Arbach and Page (2008b).

surge was propelled by the high frequency of growth accelerations in natural resources exporters and by better policies in all economies aimed at avoiding economic declines. This places much of future of Africa's

growth recovery in the hands of the mineral rich economies. As we shall see in the next section, that may be something of a worry for the sustainability of Africa's recent growth.

WHY WORRY ABOUT DIVERSIFICATION?

Because at some stage depleteable resources will run out, sustainable development through resource depletion depends upon the rents from resource extraction being converted into other sources of income. One way in which income can be diversified is by building up financial assets abroad, but this may have little impact on the domestic economy. If natural resources are sufficiently valuable or abundant, what happens to the rest of the economy may not be of great concern. National income will remain high due to rents to the resource and returns on foreign financial assets. For the typical resource-rich economy in Africa, however, natural resources are not sufficiently abundant to ignore what the country's economic structure will look like when the resource runs out. At some stage non-renewable resources will be fully depleted and the economy will need an alternative export sector.

Dutch disease and diversification

The income from resource extraction increases the demand for all goods in a resource-rich economy. In the case of traded goods the increased demand can be met by imports at fixed international prices, but the production of non-tradable goods is usually characterized by rising marginal costs, and their price rises relative to internationally traded goods. The foreign exchange market reflects this in a real exchange rate appreciation, reducing the potential profitability of new (and existing) tradable goods producing activities: this is the "Dutch disease." While it is appropriate for labor and capital to shift into non-tradable goods and services—otherwise people cannot consume more of them—Dutch disease tends to make the development of manufacturing more difficult.

Manufacturing is the quintessential exportable. The growth of manufactured exports has outstripped the growth of production by a wide margin in the last two decades (UNIDO, 2009). Exchange rate appreciation puts the economy at risk of having too few industrial activities outside of the minerals sector. It reduces the diversity of internationally competitive manufacturing activities and exports, and discourages entry into new, more sophisticated production and export lines.

To understand why this matters for long-run growth in resource-rich economies it is important to examine two "stylized facts" from the recent literature on industrial development. The first is that what an economy makes matters: diversity and increasing sophistication in manufacturing production and exports spur long-run growth. The second is that where you make industrial products matters: agglomerations or industrial clusters confer powerful competitive advantages on existing industrial locations and make it difficult for newcomers to break into global markets.

What you make matters

Two important empirical findings regarding industrial production, exports and economic development have emerged from recent work. The first is that as incomes rise countries become more diversified in terms of their production and export structures. New product lines are introduced and new activities are taken up within existing sectors, until countries reach quite high levels of income. The second is that countries that produce and export products that are primarily manufactured by countries with higher income levels tend to grow faster.

Imbs and Wacziarg (2003) find that poor countries—and to a lesser degree rich countries—tend to specialize in the production of a fairly narrow range of

activities. Across a wide range of incomes, however, the diversity of what a country produces increases with the level of per capita income. Importantly from the point of view of industrial development, Imbs and Wacziarg (2003) find that the same U-shaped pattern holds *within* the industrial sector. This suggests that the relationship between specialization in production and income is not solely a product of structural change between primary production and manufacturing. Diversification within the manufacturing sector also takes place as development proceeds.

Why should industrial and export diversity and sophistication matter for development? One reason may be that more diverse economies are better able to take advantage of export opportunities in global markets as they emerge

The same U-shaped relationship holds for export diversification (Klinger and Lederman, 2004; Carrere, Strauss-Kahn, and Cadot, 2007). The study by Carrere, Strauss-Kahn, and Cadot (2007) is of particular interest. Using data from 159 countries (including 121 developing countries) between 1988 and 2004, they find a strong U-shaped relationship between export concentration and per capita income. As per capita incomes rise, exports diversify within existing product lines and through the introduction of new products. Only at OECD levels of income do some export lines close down, and exports become more concentrated, largely due to increases in the market share of existing exports.

Other recent research (Hausman, Hwang, and Rodrik, 2007; UNIDO, 2009) has put forward compelling evidence that the sophistication of a developing country's manufacturing sector matters for its growth.³ UNIDO's (2009) *Industrial Development Report*,

2008/09 provides new evidence that there is a strong, positive relationship between the level of sophistication of a country's production and export structure and subsequent growth. Working with data from 1975 to 2003 UNIDO measures the sophistication of a country's manufacturing sector by the weighted average of the sophistication of the products produced by its industries. The sophistication of an industrial activity is measured by the weighted average of the per capita incomes of the countries that intensively produce it.⁴

The UNIDO results show a strong association between industrial diversification, sophistication and long-run growth. Developing countries are grouped into low and middle-income categories on the basis of their income in 1975 and are classified as fast growers if they have more than 50 percent of their annual growth rates above the median for the sample and slow growers if not. Fast-growing low-income countries both diversified their manufacturing base and raised their level of product sophistication. Fast-growing middle-income countries shifted strongly in the direction of more sophisticated products. Slow-growing low and middle-income countries in contrast moved in the opposite direction. Production intensities narrowed toward the mid range of product sophistication. In addition slowly growing middle-income countries experienced a decline in the intensity of high sophistication manufacturing.

Why should industrial and export diversity and sophistication matter for development? One reason may be that more diverse economies are better able to take advantage of export opportunities in global markets as they emerge. In the studies summarized above industrial diversification appears to lead export diversification. This is consistent with the idea that economies build industrial competence in new activities and then enter global markets. As the manufacturing base

in developing economies broadens from low sophistication to higher sophistication activities, new export opportunities arise. If those opportunities can be successfully exploited, “learning through exporting” may take place, raising the productivity of the manufacturing sector and providing further momentum for industrial diversification.⁵

Another reason may be that a wide range of industrial activities provides a broad basis for the entry and exit of firms. There is substantial evidence that productivity differs significantly across firms in developing economies even within the same sector. Higher productivity sectors are the result of the entry and/or expansion of higher productivity firms. A broad industrial base may facilitate the creation or expansion of more productive firms and ease the exit of less productive ones.⁶ The fact that industrial diversity and export diversity appear to be closely related to each other in fast growing economies may reflect the fact that diverse industrial structures facilitate the growth of globally competitive firms in an economy. A country with a rapidly growing number of such globally competitive firms will experience rapid productivity change within manufacturing and more rapid growth.

In resource-rich economies relative prices tend to restrict the ability of firms to enter new tradable goods sectors, whether to compete against imports or to export. This limits diversity in production and exports and may also constrain the ability to increase levels of sophistication. Resource-rich economies run the risk of finding themselves left with an industrial structure that limits their capacity for rapid growth as resource rents diminish. In short Dutch disease works against the drivers of long-run growth that are needed to sustain the economy once the minerals have been depleted.

Where you make it matters, too

Agglomeration economies arise from “economies of size” that are external to the firm but internal to a group of firms concentrated in a specific geographical location. The proximity of firms leads to a number of localized external economies.⁷ Information spillovers can arise from the sharing of technological or marketing knowledge or knowledge of improved management techniques. When firms are located near one another, it is easier to monitor what neighbors do and to learn from their successes and mistakes. Competitive pressures may lead to innovation and increase productivity (Porter, 1990). Close proximity between suppliers and purchasers may help to ensure timely delivery, lower inventory costs, and enhance quality.

Proximity of closely related industries can also generate pecuniary externalities. The most frequently identified of these is a “thick” labor market (Glaeser et al, 1992). Workers with skills specialized in a sector will be attracted to areas where employment in the sector is large relative to the total labor force. The density of employment reduces search costs and provides a measure of insurance against unemployment. Similarly, firms will be attracted to areas in which there are a large number of workers (or managers) with skills relevant to their industry. Location in a large labor market makes it easier to find specialized labor, such as designers, engineers, and consultants (Sonobe and Otsuka, 2006). Co-location may also facilitate sharing of indivisible goods and facilities, such as infrastructure, and joint actions by producers, including lobbying government officials.

In a world characterized by strong agglomeration effects late industrializers will find it is difficult to start a new manufacturing location. The first firms to locate there would lack the economies that are only generated by a cluster. Conversely, established manu-

facturing locations have a in-built advantage: costs are reduced simply because many firms are there. Breaking into global markets will be difficult for any late industrializer, but it will be especially difficult for resource-rich economies in which the exchange rate does not offset the cost disadvantage inherent in limited spatial concentration of industries.

Natural resources and industrial dynamism in Africa

The impact of natural resource dependence on the performance of Africa's manufacturing sector is clearly visible in Table 3. The table gives five measures of industrial dynamism, ranging from manufacturing value added (MVA) per capita to the share of high and medium technology exports in total manufactured exports. East Asia and the least developed countries—the two extreme bounds of the global distribution of these variables for developing countries—have been added as comparators.

Perhaps the most appropriate comparison is between the non resource-rich economies, excluding South Africa and the resource-rich economies excluding Botswana. South Africa is the region's dominant industrial economy, with an industrial structure very distinct from that of other diversified, non-mineral countries—even middle income countries—in the region.⁸ Similarly, Botswana represents the one case of successful development based on natural resources in

Africa. Part of that process was a deliberate strategy of economic diversification using the rents from diamond extraction.

Africa's resource-rich economies trail the non resource-rich on every one of the five indicators, sometimes by wide margins. The share of manufacturing in GDP in resource-rich African countries (excluding Botswana) is less than eight percent, lower than non resource-rich economies in Africa by about a third and trailing even the least developed countries. The share of manufactured exports in total exports—a key driver of learning by exporting—is 15 percentage points lower in resource-rich economies.

Resource-rich and non resource-rich economies are more similar in terms of the proportion of medium and high technology industries in total manufacturing value added, but they again differ quite strikingly in the share of medium and high technology exports in total manufactured exports. The combination of a low share of manufactured exports in total exports and a low share of high and medium technology exports in manufactured exports means that resource-rich economies in Africa are likely to miss out important opportunities for knowledge acquisition associated with more sophisticated manufactured exports.⁹ The low per capita level of manufacturing activity and the low share of manufacturing in GDP—especially in comparison to East Asia—also indicate a serious lack of diversification in Africa's resource-rich economies.

Table 3: Selected indicators of industrial dynamism in Africa, 2005

Country Type	Manufacturing Value Added (MVA) Per capita	Share of Manufacturing in GDP	Share of Manufacturing in Total Exports	Share of Medium and High Technology in Total MVA	Share of Medium and High Technology in Manufactured Exports
Resource-rich Economies	91.1	7.9	50.2	15.6	10.3
Excluding Botswana	83.2	7.4	43.5	14.7	10.9
Non Resource-rich Economies	121.8	12.1	59.1	15.1	16.8
Excluding South Africa	96.5	11.9	58.5	14.6	15.2
East Asia	582.3	29.5	91.9	97.5	64.1
Least Developed Countries	31.4	10.0	43.1	2.6	6.6

Source: UNIDO database; author's calculations

GEOLOGY IS NOT DESTINY

The present situation of resource-rich economies in Africa is not immutable. The paths of structural change in industry of three resource-rich industrializers—Chile, Indonesia, and Malaysia—are perhaps surprising and may offer some lessons for Africa’s natural resource exporters. Figure 1 plots the relationship between the sophistication of the manufacturing sector (on the vertical axis) and the level of development (represented by per capita GDP on the horizontal axis) for a cross section of countries in 1980 and 2000.¹⁰ Figure 2 gives the same relationship for manufactured exports between 1975 and 2000. Moving between each pair of figures traces the path of income growth and manufacturing and export sophistication for individual economies.

The regression line indicates the cross-section “average” level of manufacturing sophistication associated with a given level of development. Each index, by the nature of its construction shows a high positive correlation with aggregate per capita income levels. Richer countries produce and export more “sophisticated” goods by this measure and, therefore, tend to cluster in the upper right hand corner of each panel. Countries substantially above or below the regression line are of considerable interest. Positive outliers produce goods more typical of countries at higher income levels. Countries below the regression line produce goods that are less sophisticated than would be predicted by their levels of development.

Chile (CHL), Indonesia (IDN), and Malaysia (MYS) began in 1980 with levels of manufacturing sophistication that were close to that predicted by their level of per capita income. By 2000 Malaysia’s production structure had become highly sophisticated relative to its level of income; indeed, its associated income level was similar to that of an OECD country. Indonesia’s industrial structure had also increased in sophistication

relative to its level of income. Chile on the other hand, despite income growth that placed it at approximately the same level of per capita income as Malaysia had a level of industrial sophistication that was less than its predicted value and well below that of Indonesia and Malaysia.

Exports tell much the same story. In 1975 Indonesia had a level of export sophistication that was well above its predicted level and similar to that of Korea and Brazil. Malaysia and Chile in contrast had export sophistication levels that were below those predicted from their levels of income. By 2000 Malaysia had developed one of the most sophisticated export structures in the world, and Indonesia’s exports remained sophisticated relative to its income level. Chile remained a negative outlier, slightly below its predicted level of export sophistication, but its level of export sophistication relative to its level of income had increased substantially in 25 years.

These trajectories of structural change in manufacturing production and exports reflect differing strategies used by the three countries to support tradable goods production. As early as the mid-1980s, Malaysia—largely reflecting the experience of Japan, Korea and Singapore—introduced activist policies to diversify and upgrade manufacturing production and to attract foreign direct investment. A formal industrial clustering policy—designed to develop greater linkages and complementarities for local industries—was adopted with the introduction of the Second Industrial Master Plan in 1996.

The clustering approach combined excellent basic infrastructure—good transport services, power supply, water supply, and telecommunications—with superior provision of social services such as public health facilities and schools to make Export Processing Zones (EPZs)—such as the giant one in Penang—attractive

Figure 1: Evolution of manufacturing production sophistication

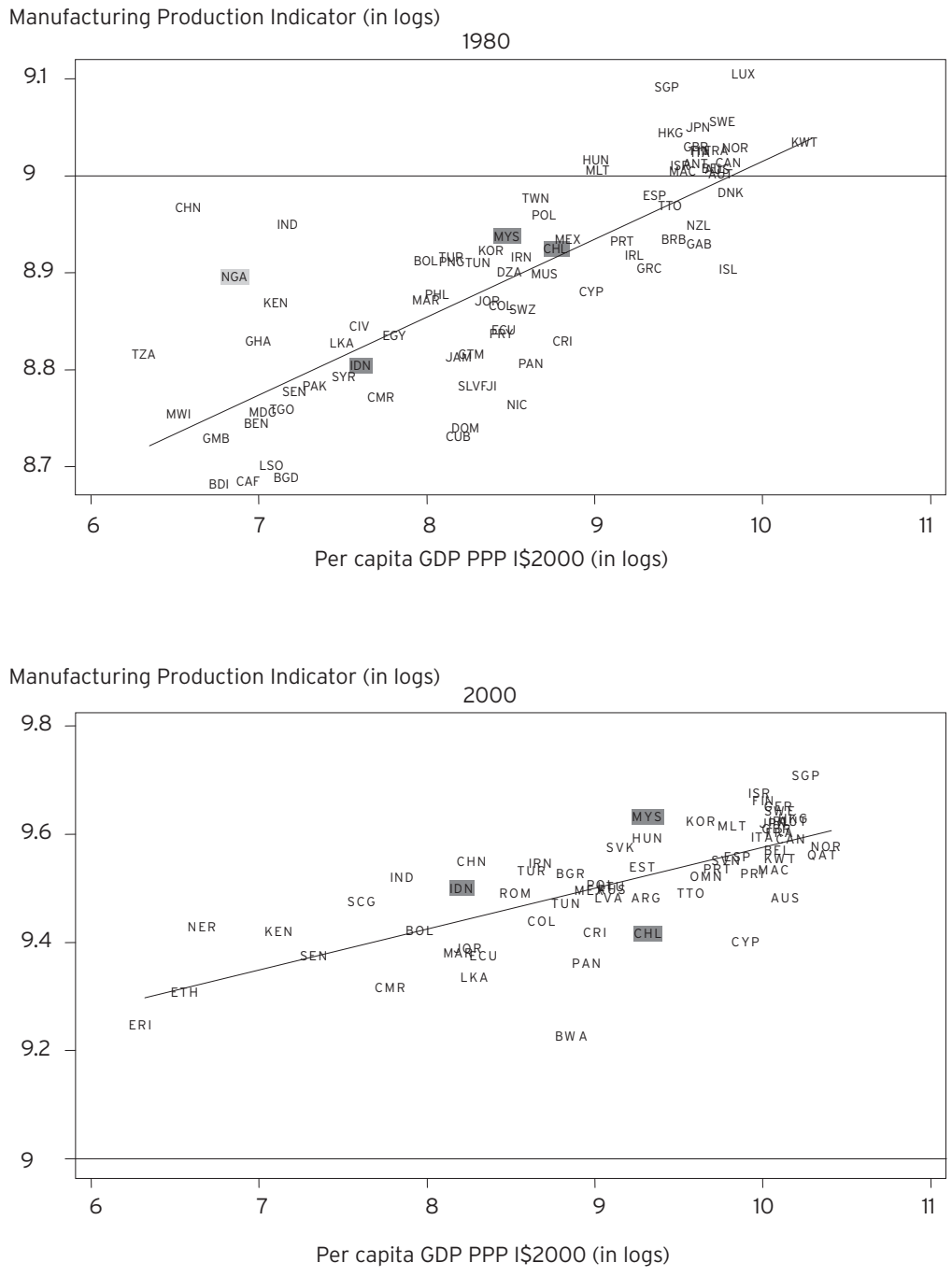
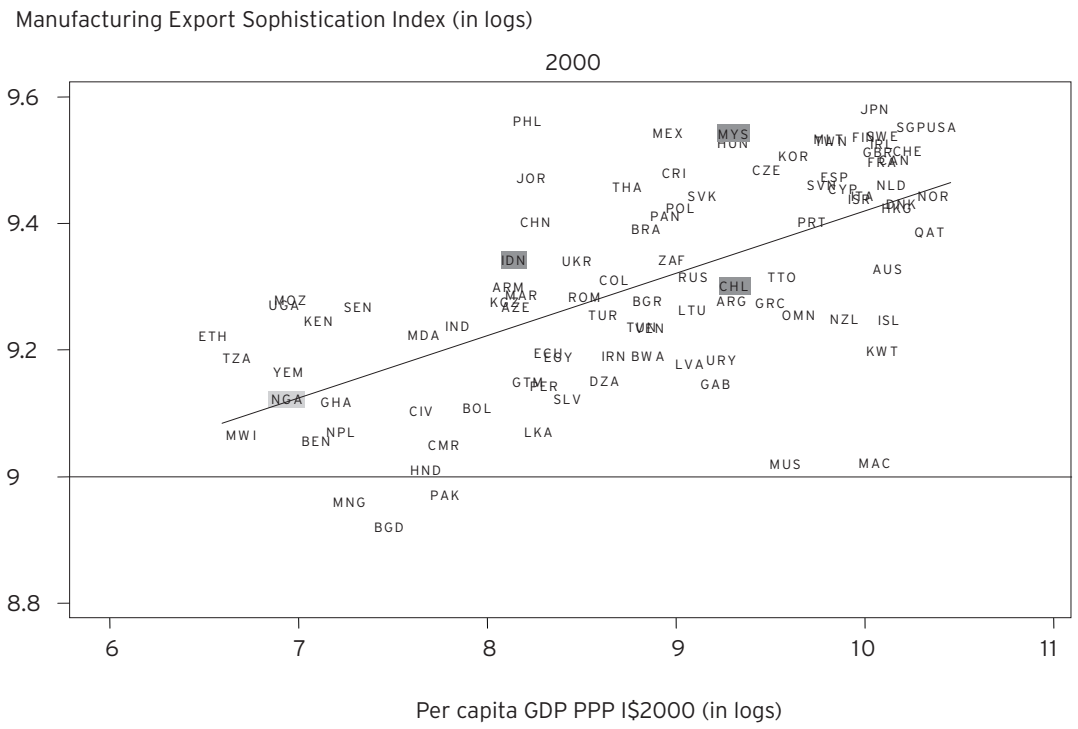
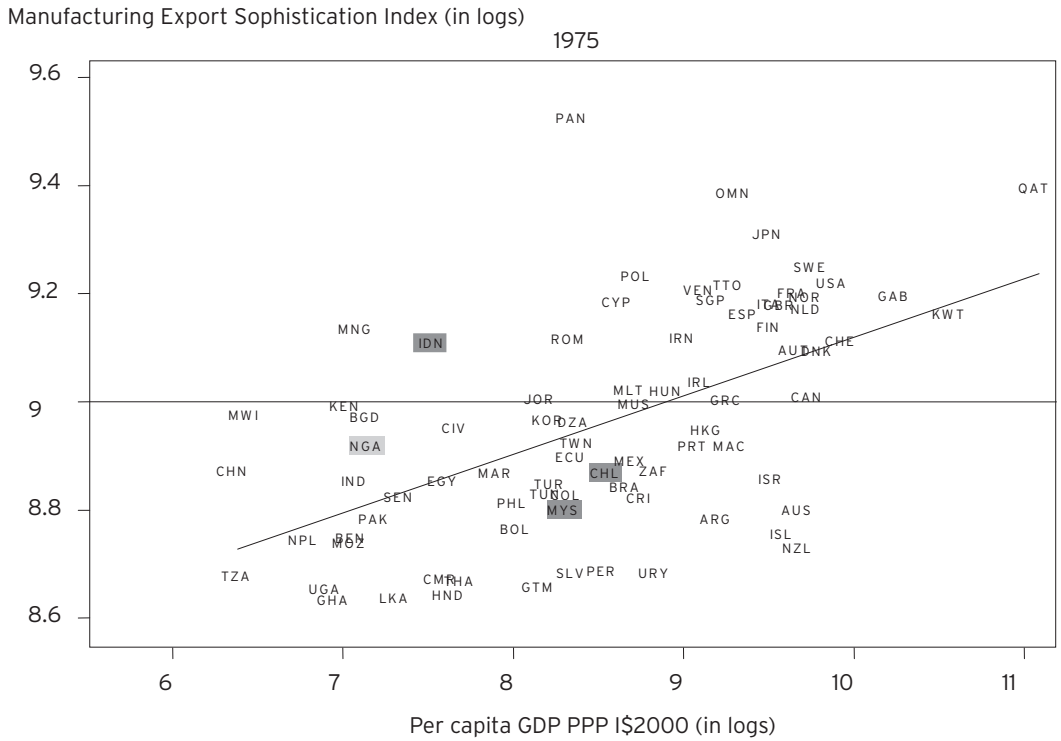


Figure 2: Evolution of manufacturing export sophistication



to foreign investors, skilled workers and managers. Institutional reforms were also introduced to improve the performance of the security and customs services within the EPZs. Drawn by these investments and financial incentives giant American, Japanese and European firms such as Intel, Advanced Micro Devices, National Semiconductor, Hewlett Packard, Seagate, Hitachi, Sony and Siemens moved to Malaysia. The agglomeration of these flagship firms helped stimulate the development of local supplier firms.

Indonesia implemented similar, although arguably less successful, attempts at industrial diversification in the late 1980s and the 1990s. This is reflected in the increase in its production and export sophistication levels in manufacturing. But Indonesia also used petroleum revenues for rural and agricultural development. At the same time that Nigeria had its first oil boom, so did Indonesia. The two economies were quite similar, large agricultural exporters. Yet in Indonesia agricultural exports expanded rather than contracted. Indeed, Indonesia broke into the global market in cocoa just as Nigeria was being squeezed out of it. Indonesia also successfully pursued a 25-year policy of using a share of its petroleum revenues to increase the productivity of small holder agriculture, through targeted fertilizer subsidies and massive investments in rural infrastructure (roads, irrigation, market infrastructure and water systems).

In contrast to Malaysia and Indonesia, Chile did not pursue an explicit industrial diversification strategy. Instead it attempted to diversify its economy into high end agriculture and agro-industrial products such as horticulture, wine, and salmon. The main driver of productivity improvements in these activities was acquisition and diffusion of production knowledge across firms, and the main policy instrument was public in-

vestment in knowledge. A public-private partnership, the Fundacion Chile, led the effort to identify, adopt, and adapt global best practices. Quality standards imposed by large, international buyers drove the acquisition of ISO certification and adoption of other good practices. Close horizontal links between firms, suppliers, and the Fundacion Chile enabled a strong flow of information and knowledge among firms.

At the same time that Nigeria had its first oil boom, so did Indonesia. The two economies were quite similar, large agricultural exporters. Yet in Indonesia agricultural exports expanded rather than contracted.

Nigeria makes an interesting contrast to the cases of Chile, Indonesia and Malaysia. In the 1980s Nigeria's production structure was substantially more sophisticated than Indonesia's and well above what would have been anticipated from its level of income. By 1990, although Nigeria ceased reporting production statistics and dropped from the sample, Indonesia had surpassed Nigeria's last recorded level of production sophistication. Nigeria also began the 1980s with a level of export sophistication that was well above its predicted level, exceeding the sophistication levels of Malaysia and Chile. In 1990 Nigeria continued to exceed its predicted level of export sophistication, but it had been overtaken by both Malaysia and Chile. By 2000 Nigeria's export sophistication had declined to its predicted value, well below that of Chile, Indonesia and Malaysia. While the three successful natural resource-rich economies were transitioning up and to the right, reflecting rising incomes and structural change, Nigeria remained essentially at the same level of per capita income and suffered from a significant decline in the sophistication of its exports.

POLICY OPTIONS FOR DIVERSIFICATION

Tradable goods production will expand or contract according to whether it is internationally competitive. This depends not just upon the exchange rate, which becomes less competitive as a result of resource exports, but also on the investments and institutional innovations that governments make to enhance competitiveness. Chile, Indonesia, and spectacularly Malaysia demonstrate that it is possible to use public policy to expand and diversify industrial production in a resource exporting economy. In Africa two instruments of public policy will largely determine the ability of resource exporters to diversify: institutional reforms and the public investment program.

Institutional reform and the investment climate

Improving the investment climate—including reducing the costs associated with bureaucracy, corruption, risk, and essential business services—is central to building international competitiveness in Africa's resource-rich economies. Surveys of manufacturing firms in African countries highlight a number of areas in which regulatory or administrative burdens impose penalties on exporters (Clarke, 2005; Yoshino, 2008). Enterprises involved in exporting identify trade and customs regulations as serious obstacles to doing business. Port transit times are long, and customs delays on both imported inputs and exports are significantly longer for African economies than for Asian competitors. Export procedures—including certificates of origin, quality and sanitary certification, and permits—can also be burdensome. Duty drawback and tariff exemption schemes are often complex and poorly administered, resulting in substantial delays.

Overall, the cost of doing business in Africa is 20-40 percent above that for other developing regions.

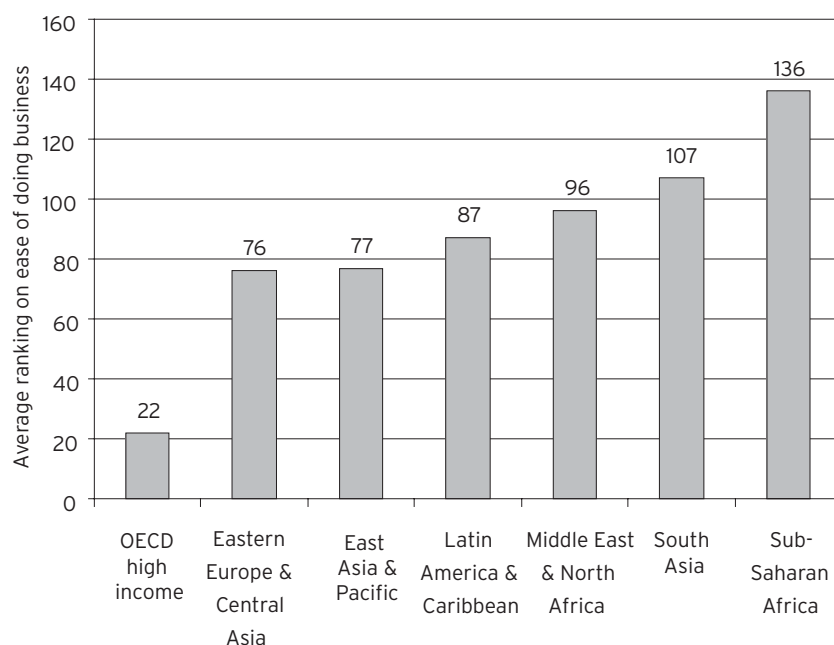
During 2006/07, the average rank of African countries (moving from 1 as the best environment) was 136 in the World Bank's Doing Business indicators (figure 3). Unfortunately, Africa's resource-rich economies lag even the regional average in terms of the investment climate and governance. The average rank of low income resource exporters in Africa is 161 on the doing business scale.

Resource-rich countries—and oil rich countries in particular—were also the main cause of the deterioration in average regional measures of governance between 1996 and 2005 (World Bank, 2007). These indicators were particularly low during growth accelerations in resource-rich economies (Table 3). While the average level of governance in non resource-rich economies exceeded the regional average during growth accelerations, it was markedly lower for the resource-rich and especially for oil exporters.

Why might the investment climate deteriorate in resource-rich economies, especially in good times? A possible explanation offered by Collier and Hoeffler (2008) is that in resource-exporting countries rent-seeking interests gradually dismantle the institutions that limit and strengthen those that expand opportunities for rent-seeking. The institutions that create and enforce regulation create rents. Incumbent workers and firms benefit from lack of competition and have little incentive to support improvements in the investment climate. Without external pressure the government is unlikely to reduce regulatory control.

Normally, pressures for regulatory reform would come from other interest groups in the society, but Collier and Hoeffler find that resource rents gradually weaken the checks and balances that provide scrutiny over the government. They argue that the intrinsic problem facing societies with large resource exports is that because the government receives income from

Figure 3: Average doing business score 2007



Source: World Bank Doing Business 2008

Table 3: Governance indicators during growth acceleration–1996-2005 (-2.5 to +2.5)

Indicator	All countries	Resource-rich	Non resource-rich	Oil exporters
Voice and accountability	-0.46	-0.79	-0.23	-1.25
Political stability	-0.47	-0.84	-0.21	-1.38
Government effectiveness	-0.59	-0.83	-0.42	-1.08
Regulatory quality	-0.49	-0.74	-0.32	-1.16
Rule of law	-0.66	-0.94	-0.46	-1.34
Control of corruption	-0.57	-0.79	-0.41	-1.18

Note: Authors calculations.

Rating scale ranges from -2.5 (weak performance) to 2.5 (very high performance).

Source: World Bank Institute Worldwide Governance Indicators

the resource rents, it does not need to tax its citizens. As a result, citizens are less inclined to scrutiny, and the society is not well-defended against the pressure from self-serving lobbies.

At the heart of the failure of checks and balances is the failure of accountability. How might Africa's commodity exporters strengthen accountability? One way might be to attempt to forge a national consensus—crossing ethnic, regional, and political boundaries—to use oil revenues to underpin a “shared growth” strategy, similar to those pursued by the first generation high performing Asian economies—including significantly Indonesia and Malaysia.¹¹ These strategies evolved through a process of dialogue between governing elites and their societies and had two common elements: fostering growth by encouraging high savings, long-term investments, and continuous improvements in organization, technology and management, and investing in highly visible wealth sharing mechanisms, such as universal primary education, rural development, and basic health care. Unlike populist redistribution schemes, such as food or fuel subsidies or public employment in non-productive activities, these strategies emphasized broad based investments with visible outcomes that could be monitored.

There are three reasons to think that such an approach might work today in Africa's resource-rich economies: external pressure, international standards, and internal voice. External pressure will come from the donor community. The Poverty Reduction Strategies (PRS)—involving extensive participation by civil society—required of African Governments for access to debt relief and concessional development finance have much in common with shared growth strategies. To the extent that Africa's resource exporters desire continued access to development assistance, reformers supported by the donor community

can use PRS exercises to open up territory for public debate on accountability. Nigeria for example successfully used preparation of its PRS to further the national debate of fiscal responsibility.

Adherence to international standards and codes can be made part of a shared growth strategy. Voluntary international standards and codes work to increase accountability in three ways (Collier, 2008). First, they focus the attention of both the government and civil society on decision points that are critical to whether resources are harnessed for development. Second, they avoid politicising some aspects of accountability because they are not associated with any particular politician. This may also give them continuity. Finally, although voluntary, they can bring pressure to bear. As some governments adopt codes and standards, others are revealed as reluctant to commit to them, and citizens may reasonably ask why. The *Extractive Industries Transparency Initiative* (EITI) is the first example of voluntary international standards and codes of conduct applied to resource extraction, but standards and codes can also be used for other areas of checks and balances, including regulatory reform.

Lastly, shared growth exercises—like poverty reduction strategies—tend to strengthen internal voice. They provide another means besides taxes to provoke scrutiny, because control over resources is attached to the strategy, and they provide an organized forum for public discussion of policy alternatives. Collier and Hoeffler suggest that one approach to strengthen the capacity of society to scrutinize government without relying on taxation is by publicizing evidence on the costs and benefits of the regulatory regimes that other governments have adopted. This can be accomplished in the course of developing a shared growth strategy.

Public expenditure and diversification

A central challenge for a low-income resource extracting economy is to allocate public investments and expenditures to offset the impact of Dutch disease. One strategy for countering the effect of real exchange rate appreciation is to make public investments that lower the costs of producing manufactured exports. The successful diversification of Chile, Indonesia and Malaysia, suggests that infrastructure, skills and knowledge should receive high priority in an investment strategy to boost productivity.

Focusing infrastructure on exports

Industry depends on infrastructure. Surveys of business in low-income countries consistently rank lack of access to and poor quality of infrastructure as one of the major constraints to private investment in manufacturing.¹² Power supply, water, transport, and communications infrastructure are of particular relevance for industrial development. With the exception of cellular telecommunications Africa lags other regions badly in terms of the quality and coverage of its basic infrastructure.

Resource-rich economies in Africa not only lack infrastructure in general; they lack the types of infrastructure that contribute to international competitiveness. The eight resource-rich African countries in the recently compiled World Bank (2007b) Trade Logistics Index have an average ranking of 106 out of 150 countries. The island economy of Sao Tome and Principe is, not surprisingly, the most highly ranked at 57. Seven of the remaining eight resource-rich economies rank in the bottom half of the distribution, and four of the eight are in the bottom quintile.

A key instrument in the effort to close this trade related infrastructure gap is the export processing

zone (EPZ). An export processing zone provides a clear geographic focus for government investments and institutional reforms. It also is subject to an efficiency test. Firms located in the zone must be able to export. This straightforward performance criterion is important: the export rule acts as a screening device to limit the entry of inefficient firms. Concentrating limited public investment resources in an EPZ may provide the threshold level of physical and social infrastructure needed to overcome investors more general concerns with the investment climate in the country. The opportunity to undertake institutional reforms in a limited geographic space and subject to a performance test may make the challenge of regulatory reform more tractable for African resource exporters than undertaking such reforms for the economy at large.

The debate on the merits of EPZs as tools for export promotion and trade policy reform has gone on for at least three decades. Most cost-benefit analyses of the performance of export processing zones (Jayanthakumaran, 2003; Warr, 1987, 1989, 1993) conclude that they are of marginal value as export promotion tools. But given the low level of industrial export dynamism and the lack of industrial agglomerations in Africa's resource-rich countries, linking export promotion and spatial policies through an EPZ may offer substantial potential benefits.

Johansson (1994) was an early proponent of the view that EPZs could offer externalities from knowledge transfers. He argued that location near successful multinational and local exporting firms offered other local firms:

- Opportunities to develop the "capacity to package" technical, marketing and managerial knowledge for exports.

- Access to international distribution channels which they could not develop on their own, and
- Reputational links to established multinational corporations with wide international business dealings that would facilitate entry into international markets.

Madani (1999) in her review of the EPZ literature argues that EPZs have contributed to the development of human capital, through skill acquisition by workers and through the development of local managerial and supervisory skills. She also notes that EPZs typically employ a large proportion of female workers. Thus, they play an important role in women's economic empowerment by bringing women into the formal labor market. At low levels of industrial development the thick labor market externalities and spillovers arising from improvements in general manufacturing competence can boost productivity and export competitiveness among firms in the zone. The evidence also seems to show that all firms in a cluster, whether they export directly or not, benefit from the presence of exporters (Bigsten, Gebreeyesus, and Soderbom, 2008).

However, many of the 3,500 EPZs around the world—and almost all of the EPZs in Africa—are dysfunctional. They fail to attract a sufficient number of firms to realize cluster economies, and in many cases they offer excessive subsidies to the few firms that they succeed in attracting. From case studies of the success and failure of EPZs three elements emerge as critical to their success—infrastructure, management and institutions. Physical and social infrastructure played a critical role in attracting major multinational firms to Malaysia. Mauritius has excellent port and airport facilities, and China has invested heavily in base infrastructure in its special economic zones.

Management of EPZs must respond to the needs of the enterprises that locate there. Often, especially in Africa, EPZs have been designed and run by bureaucrats who have no experience in business. In general, where the public sector has a poor track record of providing facilities and services, governments should turn to private management, either through concessions for the development and management of the EPZ or by contracting out management.

Whatever the form of management, government sets the legal and administrative framework for a zone, and governance matters. The case study literature on EPZs is unanimous that effective public institutions are critical to success. Efficient bureaucratic services, such as customs, are essential. Surveys also indicate that a clear and transparent legal and regulatory framework matters a great deal to decisions to locate in a zone.

Creating new skills

The international community has scored a major success in Africa by supporting the Millennium Development Goal (MDG) of universal primary education. Gross primary-school enrollment rates rose from 79 percent in 1999 to 92 percent in 2004. This success has, however, brought new concerns. Educational quality has not kept pace with quantity, even at the primary level, and there have been no comparable improvements in secondary and tertiary enrollments.

Africa faces a growing skills gap with its international competitors. While East Asian countries increased secondary enrollment rates by 21 percentage points and tertiary enrollment rates by 12 percentage points between 1990 and 2002, Africa raised its secondary rate by only 7 percentage points and its tertiary rate by just 1 percentage point. Real expenditure on

tertiary education in Africa fell by about 28 percent between 1990 and 2002 and expenditure per pupil declined from US\$6,800 in 1989 to US\$1,200 in 2002. Staff-student ratios in West African universities increased from 1:16 in 1990 to 1:32 in 2007 (World Bank, 2007a). Employer surveys report that tertiary graduates are weak in problem solving, business understanding, computer use, and communication skills (World Bank, 2007a).

The lack of expanded access to and improved quality in post primary education has serious implications for the ability of Africa's natural resource exporters to diversify. Recent cross country work—including a sample of African economies—indicates that there is a strong empirical link between export sophistication and the percentage of the labor force that has completed post primary schooling (World Bank, 2007a). There is also some evidence to suggest that enterprises managed by university graduates in Africa have a higher propensity to export (Wood and Jordan, 2002; Clarke, 2005). More evidence exists that among firms owned by indigenous entrepreneurs, those with university educated owners tend to show higher growth rates (Ramachandran and Shah, 2007).

Creating new skills is likely to be both politically and institutionally complex. The international development community remains focused on achieving the MDG goal of universal primary completion. As primary enrollment rates approach 100 percent the cost of providing an additional primary school place is likely to rise substantially. Even in economies facing soft fiscal constraints—such as the resource-rich—this is likely to result in further crowding out of post-primary expenditures from the education budget.¹³ To the extent that Africa's resource-rich economies still receive funding from the international community, they will need to reach agreement with their development

partners on a more nuanced measure of success in building human capital than the current MDG, and aid donors will need to show greater willingness to support secondary and tertiary education.

Improving quality means confronting head on the prevailing curricula and teaching practices of both secondary and university faculties. Quality assurance (QA) mechanisms—such as accreditation—are the primary means by which education systems achieve accountability for quality and relevance. Currently only 15 African countries have functioning education QA agencies. Most of these are less than 10 years old, and they differ substantially in their scope and rigor. International comparisons of learning achievement are also important benchmarks for assessing quality.

African governments have generally shown a reluctance to encourage private provision of educational services, especially in technical, vocational and tertiary education.¹⁴ These activities have high private returns and are very suitable for private provision. In countries such as Brazil, Chile and Korea research and teaching in social sciences and humanities disciplines have increasingly been left to private universities, while governments have concentrated their public investments on the development of science, engineering and technology.

Through public-private dialogue and tracer studies of graduates governments can identify both quantity and quality deficiencies in skills. In the cases of technical and vocational training private sector providers are more often attuned to the needs of the market place and more agile. The lack of financial depth in many African economies raises important equity issues with respect to private provision and financing of post primary education, but these can be dealt with through targeted grants.

Investing in knowledge

Unlike manufacturing, resource extraction is to an extent idiosyncratic, with particular problems associated with location-specific geology. This creates scope for specialist knowledge of these localized features giving local firms a comparative advantage (UNIDO, 2009). The classic example of this process is oil extraction in Norway. At the time of the oil discoveries Norway had no expertise whatsoever in the oil industry. However, the Norwegian government invested heavily over many years in building expertise. It established a national oil company which partnered with foreign companies in order to learn from them, and it invested in specialist departments within its universities which gradually built up both industry-wide knowledge and locally specific knowledge about deep-sea, cold-water oil exploration. Now, Norway's knowledge-based oil service industry is a major source of income in its own right.

Resource-rich economies in Africa can undertake similar efforts to exploit local knowledge. Government investment is likely to be through building up the geology and engineering departments of universities. It is clearly neither efficient nor feasible for each resource-rich country in Africa to develop such expertise. A more promising strategy is likely to be to develop a few region-wide centres of excellence

in mining engineering and geology. For example, Makerere University in Uganda has a long tradition of serving as a regional hub for Eastern Africa and is close to a wide range of mineral discoveries. Similarly, Southern Africa is an obvious candidate for a centre of expertise on mining technology and Nigeria for a centre on oil technology.

Chile shows a different way to use natural resource revenues to generate knowledge. In the Chilean case the knowledge was not directly linked to its main natural resource export, copper, but to a new line of business, agro-industry, in which geography and external markets played a significant role. The main driver of productivity improvements was generation and diffusion of production knowledge. Close interaction between regional and national governments and the private sector helped to ensure the relevance of the knowledge generated. A formal public-private partnership—the Fundacion Chile—led the effort to identify and adapt global best practices, and as the industry matured a strong focus on research by local and national universities evolved. Some African natural resource exporters may find similar opportunities to generate knowledge relevant to new export initiatives in agriculture or services, such as tourism, where geography or other endowments provide a comparative advantage.

CONCLUSIONS

The present rise in oil and minerals prices and the expansion of new discoveries represents an unparalleled opportunity for Africa's resource-rich economies to transform themselves. Yet while some societies have succeeded in harnessing natural resources for sustained increases in production, others have not. The stakes are high, both for Africa's resource exporters and for their non resource-rich neighbors. Africa's growth acceleration after 1995 has been driven mainly by avoiding the policy mistakes that led to sharp economic contractions in the past and by a strong surge in growth in the resource-rich economies. If history repeats itself, after two decades output for the typical African commodity exporter will be around 25 percent lower than it would have been without the current boom. This makes Africa's future growth prospects highly vulnerable to the natural resource curse.

But just how vulnerable are Africa's increasing number of natural resource exporters? For the typical resource-rich economy in Africa natural resources are not sufficiently abundant to ignore what its structure will look like when the resource runs out. The relative price changes that occur in a resource exporting economy—symptoms of the “Dutch disease”—place Africa's resource-rich countries at a disadvantage with respect to two major drivers of industrial change and economic growth. Because Dutch disease discourages the development of new tradable producing activities, it limits the scope for the diversification of the manufacturing sector and for increases in the sophistication of manufacturing production and exports. Both of diversification and increasing sophistication have recently been linked to higher incomes and faster growth.

In addition recent research on the impact of agglomeration economies on production costs and international competitiveness strongly suggests that late-comers to industrialization, such as Africa's natural resource exporters, suffer from a competitive disadvantage linked to the spatial distribution of global industry. It is far easier to expand an existing industrial agglomeration than to start a new one. These phenomena are clearly reflected in data that show Africa's mineral rich economies lagging in key indicators of industrial dynamism.

Chile, Indonesia and Malaysia—each a major natural resources exporter—had rising incomes and increasing sophistication of their manufacturing and export structure between 1980 and 2000. Successful diversification away from dependence on natural resources was the consequence of different, but effective, public policies to mitigate the impact of the Dutch disease. The contrast with Nigeria which experienced little income growth and declining production and export sophistication during the same period is telling.

Governments—through improvements in the investment climate and public expenditures—can mitigate the worst consequences of the Dutch disease. In the case of the investment climate and governance Africa's resource-rich economies will need mechanisms to reduce rent seeking and improve accountability, perhaps through the use of shared growth strategies to foster the creation of checks and balances. In the case of public expenditure combining infrastructure investments with an export test in the form of an Export Processing Zone (EPZ) may help late starters to encourage the formation of internationally competitive industrial clusters. Complementary investments in skills and knowledge also offer prospects for improved competitiveness and a more diversified economy.

The agenda for research to support evidence based policy making in Africa's resource-rich economies is largely an unfinished one. It ranges from the need for better understanding of the magnitude of Dutch disease in individual economies to comparative case studies on policy and institutional innovations to detailed micro economic analyses of the benefits of increasing diversity, sophistication and agglomeration at the country level. The potential productivity enhancing benefits of investments in infrastructure, skills, and knowledge need to be quantified to support the cost-benefit analysis of proposed public expendi-

tures, an absolutely essential element of good public expenditure management in resource-rich economies. The agenda for political economy research is similarly rich: why for example has Botswana succeeded in converting diamonds into sustained growth while other countries in the region have largely failed? Is it truly the absence of checks and balances that fosters rent seeking in resource exporters' regulatory regimes? Can national vision exercises bolster accountability? Successful diversification in resource-rich economies is all about making good choices, but without evidence, good choices are impossible.

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APPENDIX

Country	Oil Exporter	Coastal	Resource Rich
Angola	1	1	1
Benin	0	1	0
Botswana	0	0	1
Burkina Faso	0	0	0
Burundi	0	0	0
Cameroon	1	1	1
Cape Verde	0	1	0
Central African Republic	0	0	1
Chad	1	0	1
Comoros	0	1	0
Congo, Democratic Republic	0	0	1
Congo, Republic	1	1	1
Cote D'Ivoire	0	1	0
Equatorial Guinea	1	1	1
Eritrea	0	1	0
Ethiopia	0	0	0
Gabon	1	1	1
Gambia, The	0	1	0
Ghana	0	1	0
Guinea	0	1	1
Guinea-Bissau	0	1	0
Kenya	0	1	0
Lesotho	0	0	0
Madagascar	0	1	0
Malawi	0	0	0
Mali	0	0	0
Mauritania	0	1	0
Mauritius	0	1	0
Mozambique	0	1	0
Namibia	0	1	1
Niger	0	0	0
Nigeria	1	1	1
Rwanda	0	0	0
Sao Tome and Principe	0	1	1
Senegal	0	1	0
Seychelles	0	1	0
Sierra Leone	0	1	1
South Africa	0	1	0
Sudan	1	1	1
Swaziland	0	0	0
Tanzania	0	1	0
Togo	0	1	0
Uganda	0	0	0
Zambia	0	0	1
Zimbabwe	0	0	0

ENDNOTES

1. Eifert, Gelb and Tallroth (2003).
2. This literature identifies a long list of factors associated with sustained growth: political and economic institutions, inequality, fractionalization, social and physical indicators, export structure, macroeconomic stability, costs of doing business, trade liberalization, exchange rate overvaluation, education, health, terms of trade, financial liberalization, among others. See for example Arbache and Page (2008a); Hausmann, Pritchett and Rodrik, (2005); Ndulu et al., (2007); Johnson, Ostry and Subramanian (2007); Berg, Ostry and Zettelmeyer (2008).
3. Hausmann, Hwang and Rodrik construct an index of the degree of sophistication of exports based on the per capita incomes of the countries that produce them. The index (which they name PRODY) measures the per capita income level associated with an export by computing the weighted average of the incomes of the countries exporting the product. The weights are the revealed comparative advantage of each country in each commodity. If mostly high income countries have revealed comparative advantage in an export, the index level is high. It is low for products mainly exported by low income countries. UNIDO (2008) extends that concept to manufacturing production as a whole.
4. In this case the weights are the “production intensities”—an industry’s share of national manufacturing output relative to its global share of output—of the industries in each country, normalized to one.
5. The learning by exporting hypothesis is subject to criticism that more productive firms may self select to export. Bigsten et al. (2004) provide persuasive evidence that in Africa the relationship runs from exports to higher productivity rather than vice versa.
6. Hausmann and Rodrik (2005) refer to this process as “self-discovery”; firms learning what they are most competent at doing.
7. For a recent review of the literature on agglomeration economies as they affect developing countries see UNIDO (2008).
8. South Africa was of course for a long time a mineral dependent economy, and it still has a large extractive industries sector, but the combination of import substitution policies under sanctions and post independence industrial promotion policies have resulted in a share of primary production in total output and exports that is below the recognized threshold value for mineral dependent economies.
9. See for example Lal (2005).
10. The measures of product and export sophistication are taken from UNIDO (2009).
11. The term is due to World Bank (1993). A fuller exposition of the concept is provided in Campos and Root (1996).
12. See for example the World Bank’s *Doing Business* reports.
13. Africa (together with the Latin America which has a vastly different post primary education profile) is one of only two regions of the developing world in which the share of tertiary education in the overall education budget has fallen. (World Bank, 2007a)
14. Private universities account for 73, 71, and 75, percent of tertiary enrollments in Brazil, Chile, and Korea, respectively.



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