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Should Africa Industrialize?

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Abstract

Africa should industrialize. Without structural change it cannot sustain recent growth. Economies with more diverse and sophisticated industrial sectors tend to grow faster. But since 1980 Africa has deindustrialized. The paper shows that between 1975 and 2005 the size, diversity and sophistication of industry in Africa have all declined. An industrialization strategy containing two elements is needed. The first is straightforward: refocusing current investment climate reforms on infrastructure, skills, and regional integration. These actions alone will not be sufficient, however. Africa must also learn to compete through strategies to create an export push, develop industrial clusters, and attract task-based production.

Keywords: Africa, industry, industrial policy, growth, sophistication, exports

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Tables and figures appear at the end of the paper.

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1 Introduction

Industry ... is the means by which rapid improvement in Africa's living standards is possible …

Kwame Nkrumah (1965)

Africa's post-independence leaders—like many developing country policy makers in the 1960s and 1970s—looked to industrialization as the key to rapid economic growth. However, the state-led, import-substituting industries they created were frequently uncompetitive and unsustainable. Efforts to spur industrial development in Africa largely vanished with the economic collapses and adjustment programmes of the 1980s and 1990s.[1]

While the last two decades of the twentieth century were boom times for industrial development in low- and middle-income countries, industry was moving *out* of Africa. Between 1995 and 2008, manufacturing growth in developing economies was more than 6 per cent per year, in Africa it was about 3 per cent. Since 1980 industry in Africa has declined as a share of both global production and trade (UNIDO 2009), and today, Africa's industrial sector is in many ways less advanced than in the first decade following independence. In contrast to much of the rest of the developing world Africa has 'deindustrialized'.[2]

This paper addresses the questions: should Africa industrialize and how? Section 2 takes up the question of why Africa should industrialize. The post-1995 growth turnaround notwithstanding, lack of structural change—the shift of resources from low-productivity to higher productivity sectors—limits Africa's long-term growth prospects. Industry is most often the leading high productivity sector, and recent research indicates that economies with more diverse and sophisticated industrial sectors tend to grow faster. Africa, however, is moving in the opposite direction. Manufacturing value added has declined as a share of GDP since the mid-1980s. New evidence on changes in industrial production and export sophistication for 18 African economies shows that between 1975 and 2005 the diversity and sophistication of industrial production and exports have declined in most African economies.

Section 3 begins the discussion of how to industrialize. Agriculture remains the largest employer in many of Africa's economies, and it therefore must play a role in the region's industrialization. One view of that role argues that an agricultural transformation is a necessary precursor to an industrial transformation. Two factors suggest that this type of agriculture-led industrialization strategy is of limited relevance to contemporary Africa—lack of technological innovations in African agriculture and globalization. An alternative way in which agriculture can support industrialization is via agro-industry specific value chains. This approach appears to hold more promise as an industrialization strategy, but the strategic and policy interventions needed to boost

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1 The international community—a key partner in Africa's economic story—also virtually abandoned interest in growth in pursuit of the Millennium Development Goals.

2 For further discussion of deindustrialization see Fionna Tregenna's contribution to this volume.

value chain-based agro-industrial production are similar to those needed for an industrialization strategy in general.

Section 4 presents an industrialization strategy for Africa. It outlines two broad areas of public action. The first is the less controversial: continuing the investment climate reforms urged by the international financial institutions, but with greater emphasis on public action in infrastructure, skills, and regional integration. The second is more likely to provoke debate: Africa must learn to compete through strategic actions to create an export push, to develop industrial clusters, and to attract task-based production. Section 5 concludes.

2 Why industrialize?

After stagnating for much of its post-colonial history, economic performance in Africa markedly improved after 1995. Between 1994 and 2008, average economic growth was close to 5 per cent per year. And, while Africa did not escape the global crisis of 2008–09, its impact was relatively mild. The region managed to avoid a contraction in 2009, growing by 2 per cent, and grew by about 5 per cent in 2010. Growth is projected to accelerate to 6 per cent in 2011 (IMF 2010). However, Africa's growth, both before and after the crisis, is fragile. In a series of papers Arbache and Page (2007; 2008; 2009) use a new approach to the analysis of 'growth episodes' to assess Africa's growth turnaround.[3] They find that the improvement in economic performance in Africa after 1995 was due largely to avoiding the catastrophic economic policy mistakes of the 1980s. This resulted in a substantial reduction in the frequency and severity of growth collapses. Growth accelerations were confined mainly to mineral rich economies.

What is missing from Africa's growth story is structural change. There is little evidence that significant changes in structural variables underpinned more rapid growth between 1995 and 2005 (Go and Page 2008; Arbache and Page 2009). Like the 1995–2005 growth turnaround, the region's post-crisis recovery has been driven primarily by fewer mistakes, commodity prices and the recovery of domestic demand. Without major changes in economic structure Africa remains vulnerable to shocks and to a long-run decline in commodity prices.

2.1 What Africa makes matters: structural change, diversity, and sophistication

The 1980s and 1990s were marked by a shift of manufacturing production out of Africa. Excluding South Africa, the region's share of global manufacturing production fell from 0.4 per cent in 1980 to 0.3 per cent in 2005, and its share of world manufactured exports from 0.3 to 0.2 per cent (UNIDO 2009). Table 1 compares selected indicators of industrial development for Africa and all developing countries in 2005. The share of manufacturing in GDP is about one third of the average for developing countries, and in contrast with developing countries as a whole, it is declining. Per capita manufactured output and exports are less than 20 and 10 per cent of the developing country average, respectively. The region has low levels of manufactured exports in total exports and of

[3] Important contributions to this literature on growth episodes – focused on growth accelerations only—include Hausmann, Pritchett, and Rodrik (2005) and Jones and Olken (2005).

medium- and high-tech goods in manufactured exports. Particularly worrying is the fact that these measures have changed little since the 1990s (UNIDO 2009).

That Africa has experienced so little structural change through industrialization is worrying in itself, but recent research on structural change within industry points to two further threats to the region's long-run growth, lack of diversity, and sophistication. Globally, countries with more diversified production and export structures have higher incomes per capita, and countries that produce and export more sophisticated products—those that are primarily produced by countries at higher income levels—tend to grow faster. Both of these stylized facts suggest that what Africa makes, matters.

Poor countries tend to specialize in 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 (Imbs and Wacziarg 2003). The relationship between diversity in production and income per capita is not solely a product of structural change between primary production and manufacturing. Within the manufacturing sector new product lines are introduced and new activities are taken up in existing sectors until countries reach quite high levels of income. At that point specialization in production again increases, resulting in a U-shaped relationship between specialization and per capita income. Other research indicates that the same U-shaped relationship holds for export diversification (Cadot, Carrère, and Strauss-Kahn 2011). As per capita incomes rise, exports diversify within existing product lines and through the introduction of new products.

Two empirical studies also find a strong, positive relationship between the level of 'sophistication' of a country's industrial production and export structure and its subsequent growth (Hausmann, Hwang, and Rodrik 2007; UNIDO 2009). In this work the degree of sophistication of a product or export is measured by the per capita incomes of the countries that 'intensively' produce (export) it. If mostly high-income countries produce (export) a product, the income level associated with the product is high and the product is classified as sophisticated. Products mainly produced (exported) by low-income countries are classified as unsophisticated. Developing countries that produce and export a high proportion of products that are mainly produced by richer economies grow faster.[4]

Figure 1 plots the relationship between the production sophistication of the manufacturing sector of each country in the UNIDO database (on the vertical axis) and per capita GDP (on the horizontal axis). The index of production sophistication is constructed in two steps. First, the sophistication of each International Standard Industrial Classification (ISIC) 3-digit manufacturing sector is measured by the weighted average of the per capita GDP of all countries producing goods in the sector. The weights are the production intensities of the sector—the ratio of the value added share of the sector in a country's total manufacturing value added relative to the sector's value added share in world manufacturing value added—in each producing country

4 Hausmann, Hwang, and Rodrik (2007) argue that their econometric evidence points to the relationship running from greater sophistication to growth. The relationship is robust to a number of specifications and treatments for two-way causality. UNIDO (2009) uses a different approach to address the endogeneity problem and arrives at similar results.

(normalized to 1).[5] Next, country level manufacturing production sophistication is calculated as the weighted average of each country's individual sectoral sophistication indices, where the weights are the share of manufacturing value added of each sector. Figure 2 repeats the exercise for export sophistication, where the weights now refer to export intensities and export shares.

The regression line indicates the cross-section 'average' level of manufacturing production sophistication associated with a given level of development. By the nature of its construction, the country measure of sophistication shows a high positive correlation with aggregate per capita income levels. OECD countries cluster around the regression line in the upper right of each graph. The African economies in the sample are concentrated in the lower left corner of each figure.

Because the indices of production sophistication are measured in current US$ it is not possible to compare sophistication levels from year to year directly, since they are affected by price changes. The relevant comparison in the figures is the distance from the predicted relationship. Countries substantially above or below the regression line are of considerable interest. Positive outliers produce goods more typical of countries at higher levels of income. Countries below the regression line produce goods that are less sophisticated than would be predicted by their levels of income.

Moving between the figures from earliest to latest traces the path of economic development and manufacturing sophistication for individual economies. The paths taken by such successful industrializing economies as Hong Kong, Malaysia, Singapore, and South Korea move up and to the right in these figures, reflecting the positive association between product and export sophistication and per capita income growth. China and India stand out among the low-income countries. Early on both economies had structures of manufacturing production that were significantly more sophisticated than those associated with their level of per capita income. In India's case, however, its manufactured export sophistication was more in line with predicted values.

The concept of sophistication combines the more traditional idea of technological sophistication based on process technology with 'firm capabilities', the tacit knowledge and working practices embodied in the firm's work force, into a single measure of productivity.[6] Sophisticated products embody advanced country productivity levels along both dimensions. The ability of firms in lower-income economies to produce, and especially, export sophisticated goods indicates that they have mastered both the 'hardware' (process technology) and the 'software' (management practice, quality control and value chain management) required to produce such goods at an earlier level of development than might be expected. Low-income economies with a high

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5 Production intensity indicates whether a country's production in a sector is more or less concentrated than the world average. Hence, changes in production intensity indicate whether an economy is entering or leaving a sector relative to the evolving structure of global production. This approach is analogous to the use of revealed comparative advantage for exports by Hausmann, Hwang, and Rodrik (2007).

6 UNIDO (2009) discusses the ranking of products by sophistication of process technology. For an introduction to the concept of firm capabilities see Sutton (2005).

concentration of such firms are likely to exhibit more rapid productivity growth in manufacturing.[7]

The UNIDO (2009) study represents a first attempt to look simultaneously at the impact of both diversity and sophistication on growth. Tracing the evolution of industrial structure over time for economies classified by initial level of income and growth performance UNIDO finds that fast growing low- and middle-income countries both diversified and increased the sophistication of their production and export structures between 1975 and 2005. Slowly growing low- and middle-income countries in contrast were less successful at diversifying, and performed especially poorly in terms of increasing product and export sophistication.

2.2 Diversity and sophistication have declined in Africa

Since the middle of the 1970s Africa has been making fewer of the kinds of industrial products that matter for its growth. Between 1975 and 2005, the sophistication of the manufacturing sector in 16 of the 18 African economies in the UNIDO database declined, relative to predicted values. The results are more mixed for exports. About half of the African countries in the sample increased the sophistication of their export bundle relative to their level of income while the other half moved in the opposite direction. None of the African countries in the sample had the movement up and to the right characteristic of successful industrializers. In contrast with more rapidly growing countries, the diversity and sophistication of the region's manufacturing sectors and its per capita incomes stagnated.

Figure 3 shows how two classes of industrial activity—low-sophistication products and high-sophistication products—have evolved in Africa between 1975 and 2003 relative to several comparators.[8] The average production intensity for the country product group is plotted along the vertical axis. The beginning point of each arrow in the figure marks the average production intensity for the country-product group in 1975–80. The tip of the arrow marks the average production intensity for the period after 1995.[9] A value of 0, marked by the horizontal line, indicates that the average production intensity for the country-product group is equal to the global average.

In the period since 1975 fast growing low-income countries—Africa's most relevant comparator—captured an increasing share of global production in both high sophistication and—driven mainly by the explosive growth of apparel manufacturing—low sophistication sectors. Thus, the fast growing low-income countries have become increasingly diversified and sophisticated. Africa in contrast failed to keep pace with the fast growing low-income countries in low sophistication sectors and was exiting high sophistication production. Production intensities increased marginally in low sophistication sectors and declined in high sophistication sectors. The region's

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7 For further discussion see UNIDO (2009).

8 Manufacturing activities are classified as 'sophisticated' if they have an index value of US$13,500 or above for the period after 1995 (regardless of their values in the earlier periods). Unsophisticated activities are classified as those with values below US$10,000 in 1995. The omitted category of products lies between those two bounds. See the notes to Figures 4 and 5 for the sectoral breakdown.

9 The final year of the series is 2003 in the case of production and 2005 in the case of exports.

manufacturing base was becoming less diverse and at the same time less sophisticated. The decline in manufacturing sophistication was especially sharp in the region's early industrializers—Kenya, Ghana, Tanzania, and Zambia.

Figure 4 repeats the analysis for exports. Here again there is little structural change and the contrast between the fast growing low-income countries and the sample of African countries is equally stark. Fast growing low-income countries increased export intensities in both low sophistication and high sophistication sectors, indicating increasing revealed comparative advantage in both categories of exports. The Africa economies increased export intensities in low sophistication goods, but much more slowly and had virtually unchanged export intensities in high sophistication sectors. Relative to the fast growers, African manufactured exports were also becoming more concentrated and less sophisticated.

Putting the production and export stories together, what appears to have taken place in Africa during the 1980s and 1990s was a narrowing of the production and export structure in manufacturing and a shift toward less sophisticated activities. This is consistent with the closure of non-competitive, import substitution industries—many of them state owned—following the trade liberalizations and privatizations of the adjustment period. At the high sophistication end African manufacturers were not able to compete with OECD and middle-income developing country suppliers. Africa lost ground in high sophistication sectors. Those manufacturing activities that remained following trade liberalization were more competitive internationally. As a consequence, revealed comparative advantage in low sophistication goods increased somewhat. That was the good news. The bad news was that competitive pressure from Asia—as a global supplier of such products as clothing and footwear—meant that low sophistication production and exports from Africa grew very little relative to the evolving global structure of production and exports.

3 Agriculture and industrialization

A majority of Africans continue to work in agriculture, and any new approach to industrialization must consider its relevance to industrial development. There is a large literature that argues that successful cases of industrialization are rare in the absence of a prior agricultural transformation.[10] This section examines two perspectives on the relationship between industry and agriculture in Africa. The first argues that an agricultural transformation is needed before industrial growth can take off. For the majority of Africa's economies there are two reasons to be skeptical of such an agricultural-led industrialization strategy, the limited range of technological innovations available to transform African agriculture and the globalization of both agriculture and manufacturing. A second, and more promising, view is that productivity change in agriculture can boost industrial development by supporting global value chains in agro-industrial products.

[10] For a survey see World Bank (2008).

3.1 Agriculture-led industrialization

Since the early 1970s John Mellor and others have championed the concept of agriculture-led industrialization, based mainly on their interpretations of the industrial revolution in Britain and the East Asian Miracle.[11] The intellectual architecture of agriculture-led industrialization is grounded in the closed, dual economy model. In its simplest form the story follows these lines. Agricultural growth is driven by productivity improvements in smallholder agriculture, either in the form of new technologies for the production of existing crops, as in the Green Revolution, or the introduction of new higher value added crops, such as fruits and vegetables. The increases in agricultural productivity raise farm household incomes and in turn lead to higher expenditures on non-agricultural goods, stimulating the growth of the industrial and services sectors. In the absence of international trade productivity growth is also needed to restrain increases in the price of food, the urban wage good, as the urban economy expands. The evidence in support of agriculture-led industrialization comes largely from research showing that the consumption multipliers from growth in agriculture are higher than from other sectors (Mellor 1995; World Bank 2008).

This view of the role of agriculture in industrial development leads to seemingly paradoxical policy advice. For industrialization to succeed it is necessary first to focus on an agricultural transformation, raising land productivity and creating more efficient market links between urban and rural areas. Only after these public actions have taken place should governments turn to industrial development. In Africa this approach to industrialization has found concrete expression in Ethiopia, where since 1993 the growth and development strategy has been built on 'agricultural development-led industrialization'.[12]

For an agriculture-led industrialization strategy to succeed, Africa would need a 'double green revolution', combining new agricultural technologies with adaptation to its huge diversity of ecosystems (Otsuka 2010). The need for new innovations is made even more urgent by climate change which is likely to pose a significant threat to African agriculture. The Stern Review (Stern 2007) points to some potentially dramatic shifts in agricultural productivity due to global warming. Agriculture in higher latitude developed countries is likely to benefit from moderate warming (2–3^{o}C), while even small amounts of warming in tropical regions will lead to yield declines. Stern estimates that impacts of global warming will be highest in Africa. This is because crops are already close to critical temperature thresholds and most of the countries have limited adaptation potential in agriculture.

However, the innovations on which an agriculture-led industrialization strategy could be based are not likely to be available. Although modern agricultural biotechnology has the

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11 The cases of Hong Kong and Singapore are dismissed by these authors as city states and therefore unique.

12 For a large, landlocked agrarian economy such as Ethiopia the logic of the agriculture first strategy cannot be dismissed out of hand, although as Dercon and Zeitlin (2009) point out the evidence supporting such an approach is not wholly persuasive. Even in Ethiopia rapid increases in agricultural yields over more than ten years have failed to generate corresponding increases in industrial production. Recently, the government in Ethiopia has modified the strategy to include more activist industrial development policies.

potential to transform African agriculture, Africa has banned the use of genetically modified (GM) crops. Therefore, very little research will be conducted on the biotechnology innovations most relevant to the region. Even if the GM ban were lifted within the next few years, because the lead time between research and application is around 15 years, new technologies would not become available until around 2030 (Collier 2010). The lack of appropriate technologies for African agriculture is exacerbated by the collapse of agricultural innovation and extension systems across the continent (Oyelaran-Oyeyinka and Gehl Sampath 2010).

Openness to trade fundamentally changes a key assumption underpinning the agriculture-led industrialization strategy. Over the past 25 years multilateral and bilateral trade agreements have opened all of Africa's economies and those of its major markets to international trade in both manufactured and agricultural products. These global changes mean that industry no longer needs a growing domestic market for its continued growth. Exports provide a far larger market. Rural-urban migration and rising urban demand no longer need result in sustained increases in the relative price of food; imports can substitute for domestic production.

The fact that an agriculture-led industrialization strategy may be inappropriate for contemporary Africa does not mean, however, that it is possible to ignore agricultural development. Given the large relative size of Africa's rural economy, productivity growth in agriculture is needed to raise rural incomes and reduce poverty. In a world of increasing food price volatility it also represents a means to dampen food price inflation. And, improvements in the productivity and quality of high value agricultural crops can make it possible to enter global agro-industrial value chains. Rather than leading industrial development, it is essential that productivity growth and greater market integration in agriculture proceed together with industrialization.

3.2 Entering global value chains

The idea of 'adding value' to agricultural commodities prior to export has a long history in Africa. It continues to have relevance today. Modern agro-industry covers a broad range of activities. At one extreme agricultural processing can involve the transformation of agricultural raw materials into a variety of processed products. This traditional linkage between agriculture and industry remains underexploited in Africa in part due to deficiencies in the supply of agricultural inputs and in part due to cascading tariffs in importing countries—particularly in Asia—that discriminate against the export of higher stage processed goods. At the other extreme there is the expanding global trade in horticultural products and flowers. Keeping products fresh (maintaining the cool chain) and transferring them quickly from farm to shelf adds value. Value is also added through packaging, preparation, and innovation.

Global markets for agro-industrial products have become more challenging in recent years for two reasons:

- *Standards*: both the range of items covered by mandatory standards and the stringency of standards have increased, and compliance with standards has become more complicated because of a shift from product standards, largely enforced through testing at borders, towards controls over the way that products are grown, harvested, processed and transported.

- *Product requirements*: global buyers' requirements include volume, speed, and reliability of delivery, customization of products through processing and packaging, and product safety.

Because of these challenges, global agro-industry is increasingly dominated by value chain relationships in which lead firms coordinate the vertical supply chain (World Bank 2003). These lead firms have taken on many of the characteristics associated with modern manufacturing, including driving product differentiation and innovation, quality assurance based on risk management, and process control (Humphrey and Memedovic 2006).

In agro-processing, cut flowers, and horticultural exports the coordination, management and control challenges posed by entering global value chains are closer to those of manufacturing than traditional agriculture, and the policy actions needed to spur their growth are the same as those needed to meet the industrialization challenge more generally. Successful agro-industrial exporting calls for developing logistics capability. Physical infrastructure is critical at points of export (airports and seaports) and in connecting production centres to ports (roads and rail). Value chain coordination puts a premium on effective communication. This requires investment in information and communication technology. The standards infrastructure is particularly important for success in global markets. Finally, given the importance of business service requirements in agro-industrial value chains, the support services needed by agricultural producers are closer to business development services than to agricultural extension (Humphrey and Memedovic 2006).

4 Toward an industrial development strategy

The state-led, import substitution strategies of the 1960s and 1970s produced industry without efficiency. The distortions to the price system and the subsidies from the public purse were simply too great for the region's industrial enterprises to be sustainable in the long-run. The adjustment policies of the 1980s and 1990s, however, produced efficiency without industry. Liberalized international trade benefited the consumers of industrial products, weeded out obviously non-competitive firms, and improved the allocation of investment, but industry failed to grow, even in the product lines that remained competitive following the economic reforms. Restoring industrial growth in Africa will require a new set of policies and public actions. This section sets out two elements of an industrialization strategy.

4.1 Improving the investment climate

Reacting to the unsuccessful and sometimes disastrous results of Africa's early experiment with industrialization, policy attention since the mid-1990s—especially from the international donor community—has tended to focus on the costs of doing business. These have been well-documented in a decade of comparative research sponsored by the World Bank and the World Economic Forum and are summarized in the report of the Commission on Growth and Development (2008). Much of the difference in industrial performance between Africa and other developing countries can be traced to differences in the 'investment climate'—the physical, institutional, and regulatory environment within which private investors make their decisions. Overall,

the cost of doing business in Africa is 20–40 per cent above that for other developing regions.[13]

The reform agenda for the investment climate has centred on economy-wide reforms in trade, regulatory, and labour market policies, designed to reduce the role of government in economic management. While these policy and institutional reforms are perhaps necessary, they have not proved to be sufficient to increase investment and growth, especially in Africa.[14] At a minimum the government and donor view of the investment climate needs to be broadened to encompass three critical business environment factors that constrain industrialization in Africa: infrastructure, skills, and regional integration.[15]

4.1.1 Infrastructure

Firm level studies of productivity in Africa highlight infrastructure deficiencies as a significant barrier to greater competitiveness (Eifert, Gelb, and Ramachandran 2005; Yoshino 2008). Although indicators of infrastructure access rose between the 1990s and 2000s this was mainly in communications technology, water supply, and sanitation. Sub-Saharan Africa (SSA) continues to lag at least 20 percentage points behind the average for low-income countries on almost all major infrastructure measures.[16] In addition the quality of service is low, supplies are unreliable, and disruptions are frequent and unpredictable (Table 2).

There has been little strategic orientation of Africa's infrastructure investments to support industrial growth and little willingness on the part of Africa's development partners to finance infrastructure investments (World Bank 2007a; Page 2011). Road infrastructure has received scant attention, and although concessions have been awarded to operate and rehabilitate many African ports and railways and some power distribution enterprises, financial commitments by the concessionaire companies are often small. Access to communications services has increased dramatically, thanks to the cellular revolution, but high-speed data transmission critical to exporting lags badly.

4.1.2 Skills

Africa's skills gap with the rest of the world is large and growing. While East Asian countries increased secondary enrolment rates by 21 percentage points and tertiary enrolment rates by 12 percentage points between 1990 and 2002, Africa raised its secondary rates by seven percentage points and its tertiary rates by only one percentage

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[13] See for example the Doing Business surveys by the World Bank or the Africa Competitiveness Report by the World Economic Forum, the World Bank, and the African Development Bank.

[14] The relationship between 'doing business' reforms and investment, industrial development, and growth has not been well established empirically. Doing Business (2011) asserts that 656 articles have been published in peer-reviewed academic journals and about 2,060 working papers have been written using the eight years of available data. It is notably selective, however, in reviewing the evidence presented in these papers. Notably, a number of rapid industrializers in South East Asia and Central America score as badly on the Doing Business surveys as many African economies (See Page 2011).

[15] For a fuller exposition of these arguments see Page (2011).

[16] An important exception is the penetration of fixed-line and mobile telephones, where SSA leads low-income countries by as much as 13 per cent. The largest gaps are for rural roads (29 percentage points) and electricity (21 percentage points).

point. Real expenditure on tertiary education in Africa fell by about 28 per cent 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 2007b).

The skills gap poses a major potential constraint to Africa's industrial development. Employer surveys report that African tertiary graduates are weak in problem solving, business understanding, computer use, and communication skills (World Bank 2007b). Cross-country research indicates that there is a strong empirical link between export sophistication and the percentage of the labour force that has completed post-primary schooling (World Bank 2007b). 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), and more robust evidence shows that among firms owned by indigenous entrepreneurs, those with university-educated owners tend to have higher growth rates (Ramachandran and Shah 2007).

4.1.3 Regional integration

The small size of Africa's economies and the fact that many are landlocked make regional approaches to the common problems that affect trade and industrialization—infrastructure in trade corridors, institutional and legal frameworks (customs administration, competition policy, and regulation of transport) and trade related services—imperative. For exporters in landlocked countries poor infrastructure in neighbouring, coastal economies, incoherent customs and transport regulations, inefficient customs procedures, and 'informal taxes' in transport corridors slow transit times and raise costs.

Tangible progress on trade logistics in Africa's regional groupings has been slow. Investments in regional infrastructure are hampered by the technical complexity of multi-country projects and the time required for decisions by multiple governments. Institutional reforms—such as common standards, regulations, and one-stop border facilities—have also failed to materialize. Africa's development partners have also not been helpful, preferring to deal with individual countries rather than regional organizations and limiting financial commitments to trans-border projects.

4.2 Learning to compete

It is not surprising, given Africa's past experiments with industrialization that African governments and the international development community have chosen to focus on the regulatory environment. Reforms to reduce the role of government in economic decision-making are easily measured and understood.[17] They may not, however, correctly identify the binding constraints to industrial development in Africa. Shifting focus to the obvious deficiencies in infrastructure, skills, and regional integration is an important first step toward accelerating the pace of industrialization. But public actions to improve the investment climate may not be sufficient to reverse Africa's increasing marginalization in global manufacturing.

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17 The annual World Bank Doing Business report goes so far as to publish a league table of the 'cost of doing business' and a list of 'top reformers'.

In low-income countries there are large differences in productivity levels across firms, even in the same industry. While poorer countries have some firms that achieve world class productivity levels, they also have a higher percentage of low productivity firms.[18] Closing the productivity gap between African industry and the rest of the world will be essential, if Africa has any hope of breaking into global markets for manufactured goods. Today, new entrants to manufacturing are no longer only competing with the high-wage OECD, as China was when it entered the market. They are competing with 'factory Asia', and in the absence of more rapid firm level productivity growth, the differences in wages between East Asia and Africa may not be sufficiently large to offset Asia's productivity advantage.

The problem of breaking in raises an old policy question with a contentious history: can public policy help African firms learn to compete? The debate about what, if anything, governments can do to increase firm level productivity is at the heart of the decades-long controversy over industrial policy. Advocates of selective policies to promote productivity growth emphasize the success of some East Asian economies including China. Skeptics remain unconvinced.[19] However, an industrialization strategy for Africa need not confront the choice between 'picking winners' and 'levelling the playing field'. Rather, it can deploy the existing arsenal of public policies—including those related to the investment climate—toward three broad strategic objectives focused on learning to compete: creating an export push, encouraging industrial agglomerations, and attracting task-based production.

4.2.1 Creating an export push

There is substantial evidence that African manufacturing firms improve their productivity by exporting (Soderbom and Teal 2002; Milner and Tandrayen 2004; Mengistae and Pattillo 2004). Bigsten et al. (2004) find that, controlling for self-selection, African firms enhance their productivity by around 9 per cent per year if they export. The public policy implications of learning by exporting are straightforward but powerful. An 'export push' strategy, involving a concerted set of investments, policy and institutional reforms designed to increase the share of manufactured exports in GDP, can generate higher levels of economy-wide total factor productivity and more rapid growth.

Creating an export push will require coordinated action across government to succeed. Trade reforms have brought tariffs down in Africa, and its trade regimes discriminate against exports to about the same degree as those of other regions worldwide, but a number of at the border reforms—especially to trade-related institutions—still remain to be undertaken to reduce anti-export bias. Duty drawback and tariff exemption schemes are often complex and poorly administered, resulting in substantial delays. Export

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18 Hsieh and Klenow (2009) for example show that these gaps are larger in China and India than in the USA, and that they have the potential to explain between a quarter and a third of the differences in aggregate productivity between the USA and China and India in the manufacturing sector.

19 The report of the Commission on Growth and Development (2008) tries to have it both ways, concluding that the balance of the evidence suggests that proponents of selective industrial policies have failed to establish their general efficacy, but that some policy interventions have yielded positive results in individual country or institutional settings.

procedures—including certificates of origin, quality, and sanitary certification, and permits—are also burdensome (Clarke 2005).

Beyond the border, surveys of manufacturing firms in African countries highlight—in addition to the obvious deficiencies in infrastructure—a number of areas of trade logistics that impose penalties on exporters; port transit times are long, customs delays on both imported inputs and exports are significantly longer for African economies than for China, and markets for transport services and handling are often insufficiently competitive (Yoshino 2008).

Africa's success in boosting non-traditional exports may, however, ultimately depend as much on the actions of its international partners as on its own efforts. Aid agencies will need to support strategic investments in trade related infrastructure and institutions, mainly under the aegis of an adequately funded WTO 'Aid for Trade' initiative. In addition more advanced economies can reduce escalating tariffs directed at higher stage processing of Africa's commodity exports and could offer a measure of trade preferences for its non-traditional exports.[20]

4.2.2 Encouraging industrial clusters

Manufacturing and service industries tend to concentrate in geographical areas, driven by common needs for inputs and access to markets, knowledge flows, and the need for specialized skills (Fujita, Krugman, and Venables 1999; Sonobe and Otsuka 2006). There are significant productivity gains to firms from industrial agglomeration, making the public policy challenge posed by agglomeration daunting (Glaeser et al. 1992; Henderson 1997; Bigsten, Gebreeyesus, and Soderbom 2008). Starting a new industrial location is a form of collective action problem; if a critical mass of firms can be persuaded to locate in a new area, they will realize agglomeration economies, but no single firm has the incentive to locate in a new area in the absence of others. Because Africa has few modern industrial clusters, it is both more difficult for existing African firms to compete and more difficult to attract new industry to Africa.

Given the low level of industrial export dynamism in most of Africa, linking export promotion and spatial policies in an export processing zone (EPZ) may be an attractive way of encouraging agglomeration. The main benefit of an EPZ is that it provides a clear focus for government investments and institutional reforms designed to encourage the location of firms in a specific area. It is also subject to an efficiency test—firms located in the cluster must be able to export. Case studies suggest that concentrating investment on high-quality infrastructure in a limited physical area is crucial. They also suggest that improving social services in an industrial zone to levels above national standards is highly desirable (UNIDO 2009).

4.2.3 Attracting trade in tasks

In some manufacturing activities the production process can be decomposed into a series of distinct steps, or tasks (Grossman and Rossi-Hansberg 2006). As transport and coordination costs have fallen, it has become efficient for the production of different tasks to be located in different countries, each working on a different step in the process. Task-based production has expanded dramatically in the past 20 years. In 1986–90

[20] See Collier and Venables (2007) for such a proposal.

imported intermediates constituted 12 per cent of total global manufacturing output and 26 per cent of total intermediate inputs. By 1996–2000 these figures had risen to 18 per cent and 44 per cent, respectively. Exports use a substantially higher share of imported intermediate inputs than production for the domestic market, a ratio of about 2 to 1 (UNIDO 2009).

For countries that have failed to industrialize task-based production is a potential lifeline. It is easier to specialize in a single task than in the entire range of tasks needed to produce a product. But trade in tasks has also amplified the importance of trade logistics. Countries at the final stages in the production chain of a task-traded good are unlikely to be competitive if their trade logistics costs on imported intermediates are high, and countries hoping to enter upstream in a global value chain cannot afford to have high trade logistics costs for their exports. End stage tasks are highly mobile, and African economies can gain a foothold in task-based production through concerted programmes of investment promotion, provision of infrastructure, and improvements in trade-related institutions, beginning with the creation of world class EPZs.

5 Conclusions

This paper began by asking, should Africa industrialize? The answer to whether to industrialize is relatively straightforward: for the vast majority of the region's economies the lack of structural change, industrial diversity and sophistication are powerful constraints to growth. The answer to how to industrialize is more complex. For several reasons agriculture is unlikely to lead industrialization in Africa, but it has important links to a successful industrial transformation. Improvements to the investment climate—the physical, institutional, and policy environment within which firms operate—are still needed, but public policy needs to shift from a focus on stroke of the pen changes to regulations to embrace actions to close the infrastructure gap, create new skills, and achieve meaningful regional integration.

To break in to global markets Africa must raise the productivity of its enterprises. Here the role of public policy is more controversial. Africa's past experiments at industrialization were largely unsuccessful, and there has been a tendency to dismiss the idea of industrial policy as inappropriate or unworkable in Africa. This view of industrial policy as 'picking winners' misses the point. What is missing in Africa beyond the investment climate is a coherent, strategic set of public actions to support productivity growth. Creating an export push, encouraging industrial clusters, and attracting task-based production offer an opportunity to give Africa a new start on learning to compete.

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Table 1: Selected Indicators of industrial development (2005)

	Mfg exports per capita 2005 (US$)	Growth of per capita Mfg exports 2000–05 (%)	Share of Mfg exports in total (%)	Share of medium/ high-techno-logy in total Mfg exports (%)	Mfg. value added PC 2005 (US$)	Share of Mfg in GDP 2005 (%)	Change in Mfg share of GDP 2000–05
Africa average	39.0	1.65	54.9	13.3	63.6	07.6	0.45
All developing countries	487.2	10.05	75.8	57.3	372.9	21.7	1.14

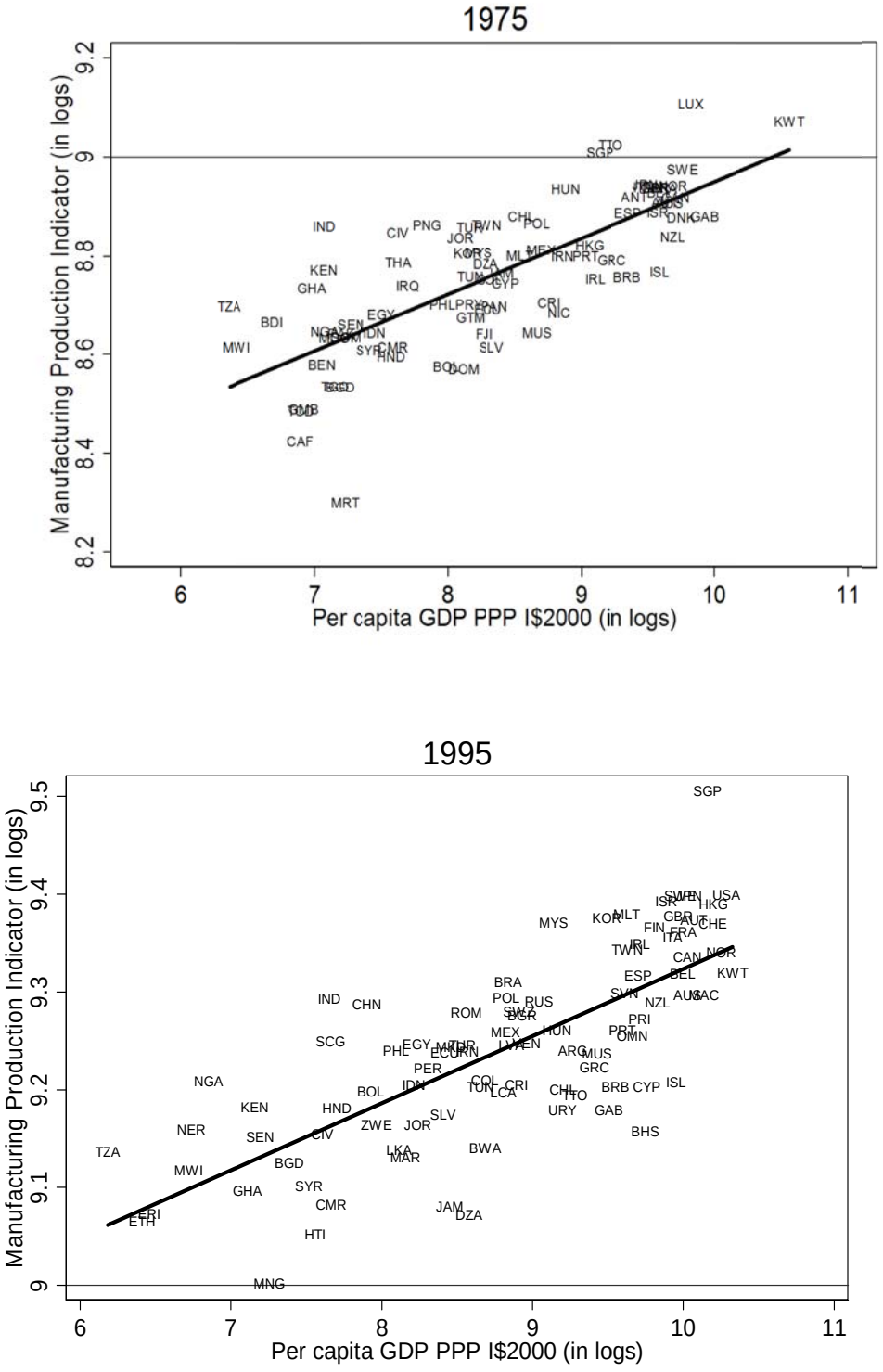
Source: UNIDO (2009), author's calculations.

Table 2: Impact of unreliable infrastructure services on the productive sector

Service problem	SSA	Developing countries
Electricity		
Delay in obtaining electricity connection (days)	79.9	27.5
Electrical outages (days per year)	90.9	28.7
Value of lost output due to electrical outages (per cent of turnover)	6.1	4.4
Firms maintaining own generation equipment (per cent of total)	47.5	31.8
Telecommunications		
Delay in obtaining telephone line (days)	96.6	43.0
Telephone outages (days per year)	28.1	9.1

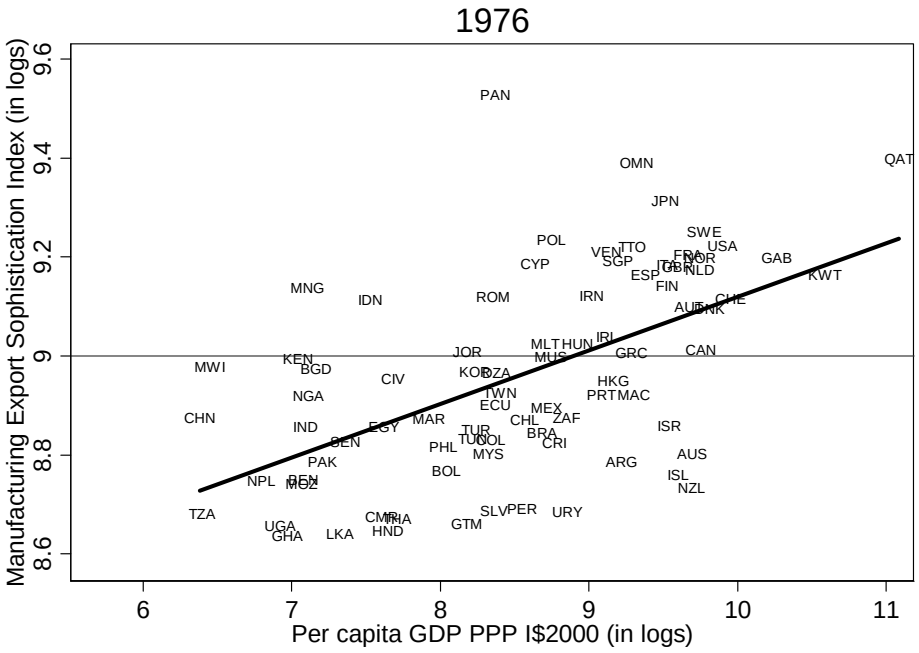
Source: World Bank (2007a).

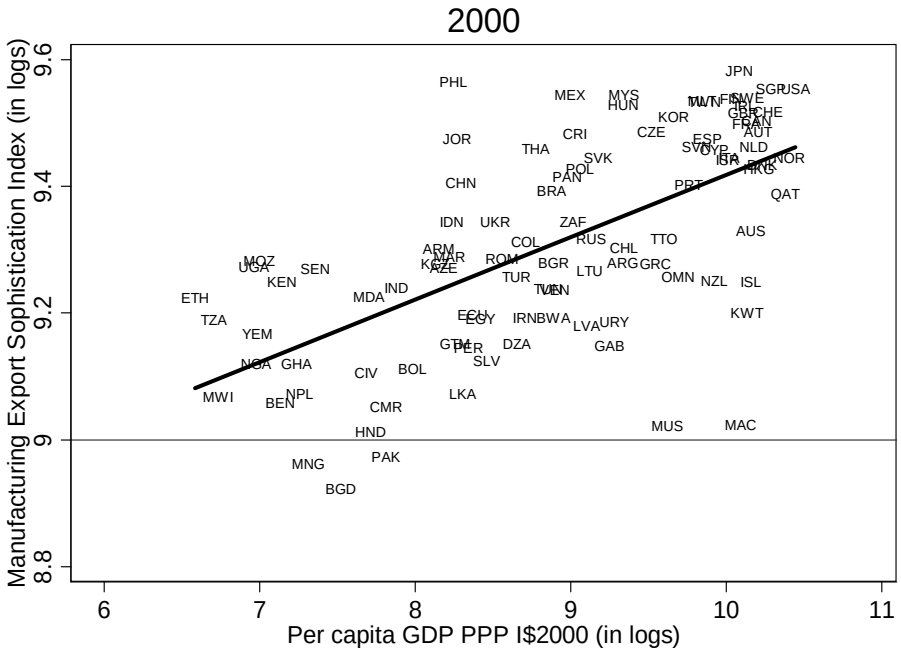
Figure 1: Production sophistication and per capita income 1975 and 1995



Source: UNIDO (2009).

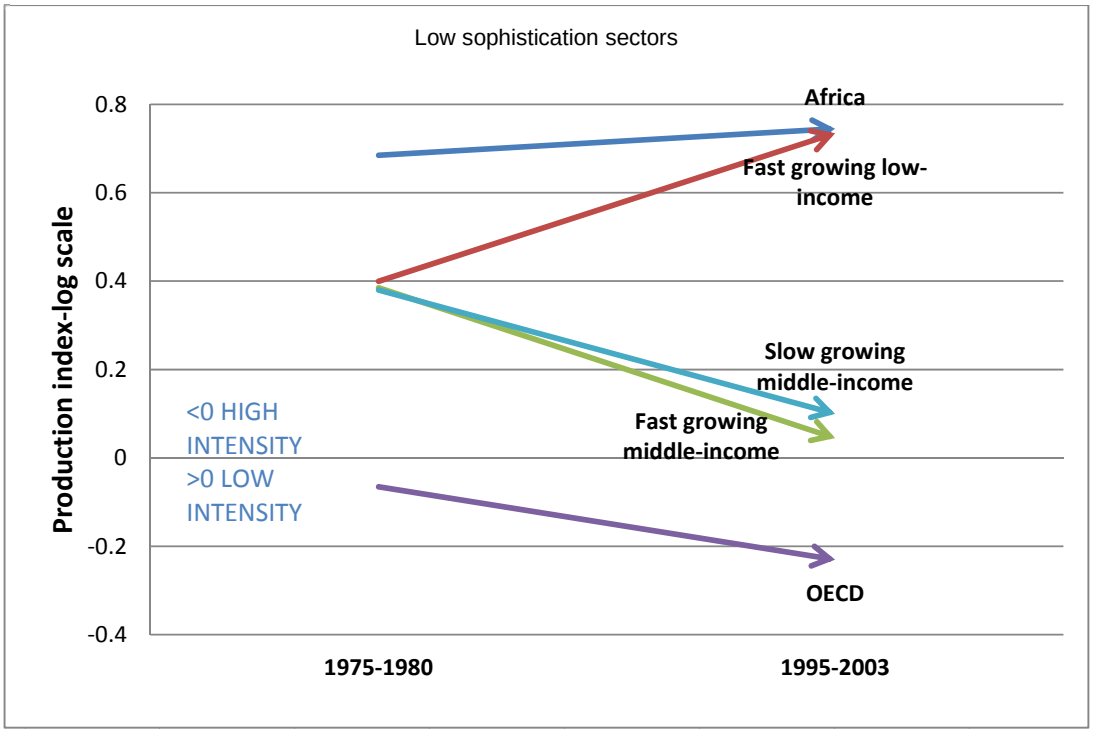
Figure 2: Export sophistication and per capita income 1976 and 2000

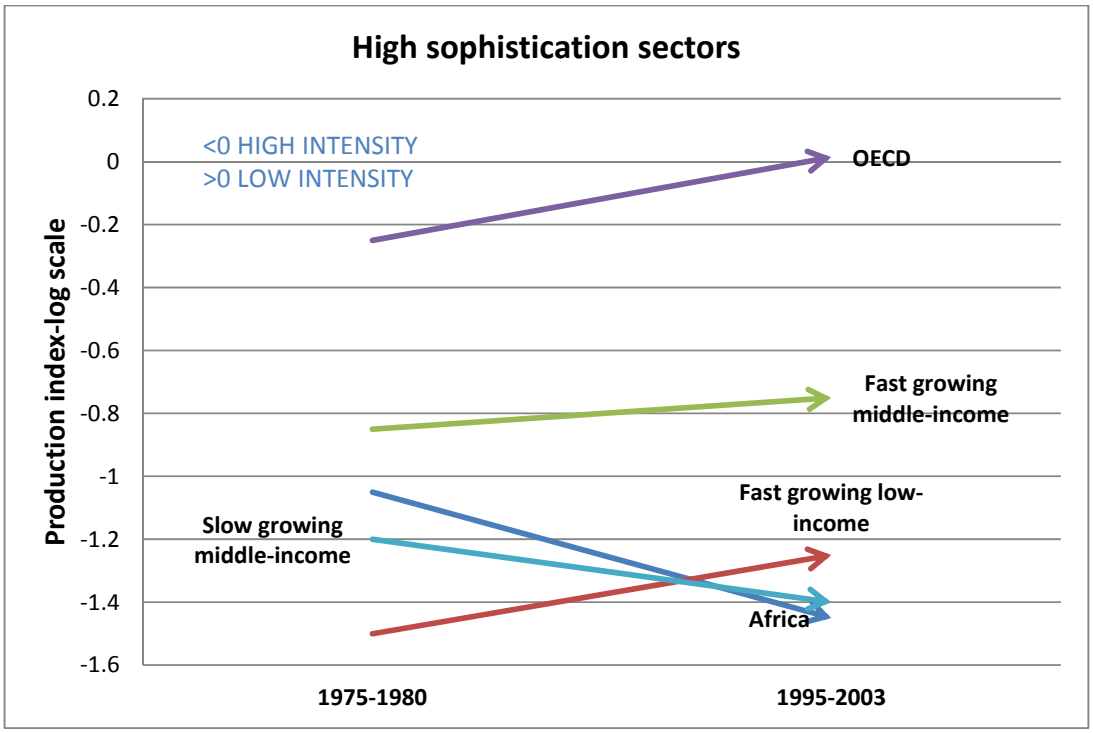




Source: UNIDO (2009).

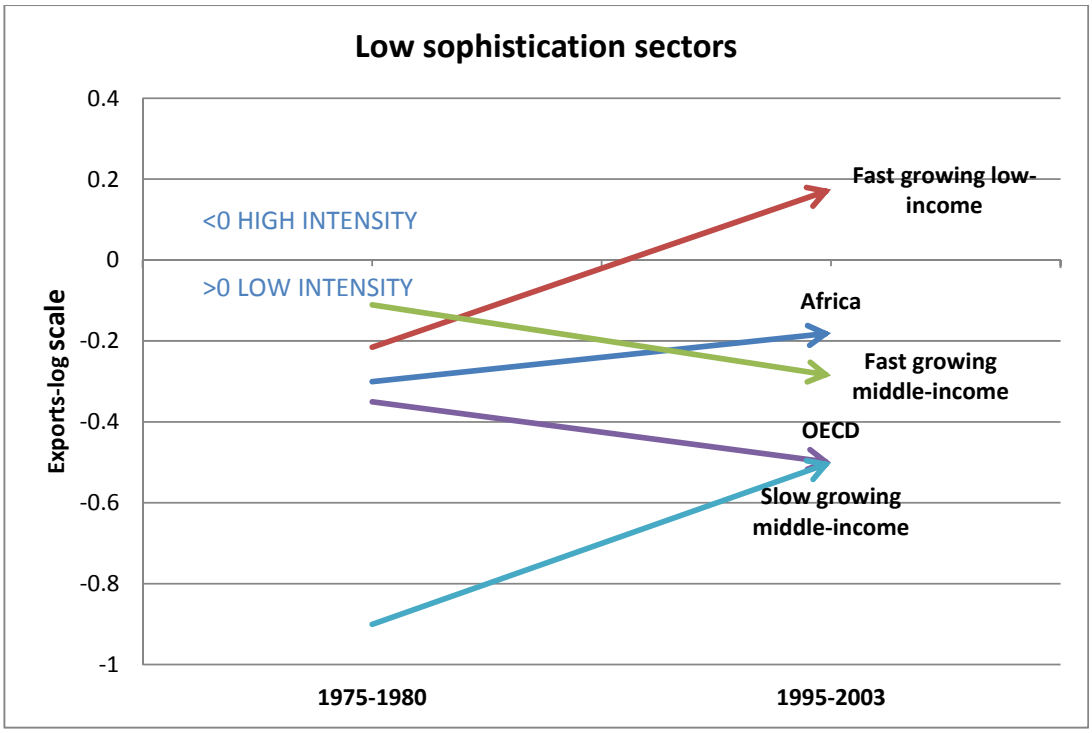
Figure 3: Production intensities by level of sophistication

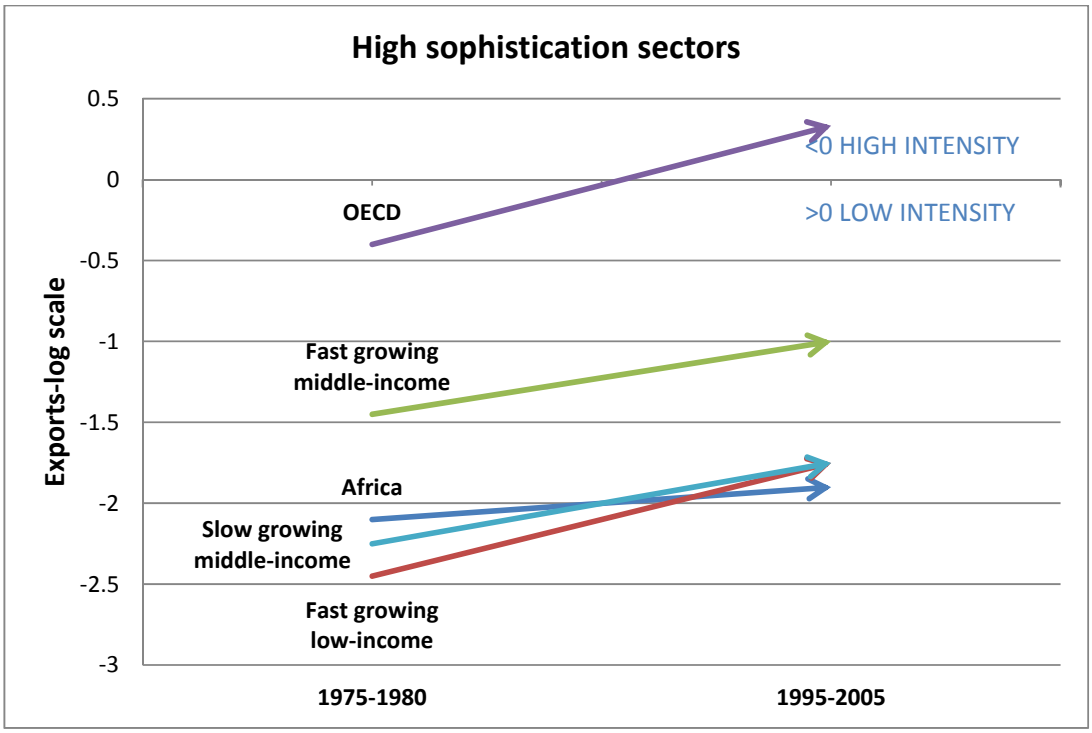




Source: UNIDO (2009), authors' calculations.

Figure 4: Export Intensities by level of sophistication





Source: UNIDO (2009), authors' calculations.

Notes to Figures 3 and 4: The vertical axis represents the logarithm of production intensity, such that a value of zero indicates world average intensity. A value of 0.5 (1) is equivalent to 165% (265%) of world average, while a value of -0.5 (-1) equates to 61% (37%) of world average intensity. The division between low- and high-sophistication is based on the sector rankings presented in UNIDO (2009). The 'high-sophistication' group is made up of the fabricated metals (381), machinery (382), electrical machinery (383), transport (384), equipment (385), furniture (332) and printing & publishing (342) sectors. the 'low-sophistication' group is made up of the food (311), beverages (312), tobacco (313) textiles (321), leather (323), footwear (324) and rubber (355) sectors.