

INDUSTRIAL TRANSFORMATION IN SUB-SAHARAN AFRICA AND ITS IMPACT ON THE ENVIRONMENT

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Introduction

There has been a growing concern throughout the world about the impact of industrial development on the environment, particularly with the rapid industrialization of many developing countries. In Sub-Saharan African (SSA), recent studies on the relationship between industrial development and the environment confirm in fact that some of the policy measures associated with industrialization could lead to serious environmental degradation (UNEP 1995).

While certain policies relating to industrialization -- defined as the process by which the manufacturing sector is transformed -- leading to the growth of economies might have a positive effect on the environment, there is also evidence that uncontrolled industrial transformation -- while also contributing to the growth of the economy -- can have a negative impact on the environment.

The importance of manufacturing to stimulate rapid growth results from a number of factors, including its influence on the balance of payments, its increased short-run supply elasticities, its superior ability to generate technological advances and take advantage of scale economies, as well as being able to stimulate production more widely through linkages with other parts of the economy (Killick, 1993). In Africa, however, its evolution has been limited. Africa remains the least industrialized region in the world, and imports virtually all investment as well as most consumer goods. Available literature suggests that Africa's poor industrial performance is either a result of exogenous shocks, or due to the protectionist import substituting industrialization strategy followed by most governments after independence. In other words: the adverse external environment

confronting Africa and the policies pursued by African governments both inhibited the technological performance of individual firms.

Industrialization in Sub-Saharan Africa (SSA)

A 1989 World Bank Report commented that during the colonial period, industrialization centered mainly in the manufacturing sector, with a principal focus on export processing (Cameroon, Ivory Coast, Ghana, Nigeria, Senegal and Zaire) and light engineering linked to mining (Zaire, Zambia and Zimbabwe). In the 1960s, following independence, protective policies were implemented and multinational companies were prompted to produce consumer goods locally, leading to an expansion in production. The state also became increasingly involved in industrial production, and by the 1970s some African economies had embarked on direct state investment in the heavy industries which dominated capacity creation, in particular the Ivory Coast, Ghana, Nigeria, Tanzania and Zambia.

In Ghana, state participation in manufacturing dated back to the colonial period when the Industrial Development Corporation was set up to invest public money in industrial enterprises. By 1966, wholly state-owned public enterprises accounted for nearly one fifth of total manufacturing output, with another one eighth coming from mixed enterprises. In 1966, there were 53 state enterprises, 12 mixed enterprises and 23 public boards. By 1968 the public sector contributed 26% of GDP. As of 1989, the number of public enterprises in manufacturing was larger than 15 years previously. Most of them were grouped under Ghana Industrial Holding Corporation (GIHC) which was involved in the detailed management of the enterprises for which it was responsible, (Killick, 1989).

In the post-independence period, industrialization strategies in Africa were focussed on creating physical capacity. It was assumed that lack of capital constrained growth and import-substituting industrialization (ISI) would attract foreign investment through

protected markets. In the initial stages ISI results were encouraging, with manufacturing value added growing at more than 8% per annum in the 1960s -- i.e. nearly double the rate of GDP growth. In 1965, manufacturing exceeded 15% of GDP in twelve countries (Botswana, Cameroon, Chad, Ivory Coast, Ghana, Kenya, Madagascar, Mauritius, Senegal, Togo, Zaire and Zimbabwe), and by 1973 in another six countries (Burkina Faso, Ethiopia, Mozambique, Rwanda, Swaziland and Tanzania), World Bank (1989).

By the end of the 1960s, production had become more diversified in terms of products although consumer goods remained dominant. The share of intermediate goods industries rose in the 1970s from 30% to around 40%, mainly through investment in oil refining in a few countries. Public investment in heavy industry was financed through agricultural taxation and foreign borrowing, but the capacity created did not correspond to local demand and supply conditions, and much of it could consequently not be sustained.

Hence, import substituting industrialization that replaced imported consumer goods with locally produced goods did not lead to economic independence or technical efficiency. It depended on imports of intermediate inputs, spare parts and equipment, and was vulnerable to shortages of foreign exchange as export commodity prices fell and oil prices rose. The growth of manufacturing value-added in low income Africa fell to 2% a year in the first half of the 1970s and was negative in the second half. Manufacturing value added in middle income oil importers fell from 8% to 4% over the same period.

For SSA as a whole, the value added in industry grew at 2.4% between 1975-84, 1.8% between 1985-89 and 0.6% in 1990. De-industrialization (a decline in manufacturing output) occurred in ten countries during the 1970s and in another eleven in the early 1980s. Those most affected were Benin, Ghana, Liberia, Madagascar, Mozambique, Tanzania, Togo and Zaire, with some of them reporting capacity utilization rates below 30% (World Bank, 1989).

Factors Inhibiting Industrial Performance

The decline in industrial performance was attributable to a number of factors. Agricultural stagnation led to falling incomes, which constricted demand for manufactured goods. Manufacturing is in fact strongly dependent on agriculture as a source of final demand, for supplies of raw materials, labor and capital and also as a source of foreign exchange necessary for earlier stages of industrialization.

African industry is also subject to structural weaknesses and other operational constraints. These structural constraints include a heavy dependence on imported raw materials, equipment and skills, which severely limits linkages with the rest of the economy and the potential contribution of manufacturing to the balance of payments. This excessive dependence on imported inputs has also made industry vulnerable to foreign exchange crises and growing debt problems.

Beyond this, it is evident that the levels of installed capacity far exceed the requirements of the economies in terms of both the size of domestic markets, and of the availability of the needed imported inputs. Collier and Gunning (1997) report that unreliability of supplies is an important cause of low capacity utilization rates. Firms face unreliability in their supplies from other domestic firms, and in Zimbabwe, for instance, metalworking firms were dependent on a single domestic supplier while competing imports were banned. Firms responded by carrying large stocks, on average three months worth of supplies. In Zimbabwe a third of the firms rated shortage of local inputs as a reason for low utilization rates which characteristic also for the rest of the continent, 60% in Cameroon (1995) and 50% in Ghana (1992).

Technology in use is also inappropriate and industrial skills are limited. There is a bias towards final stage processing of consumer goods such as assembly plants for vehicles and electronic goods, relative to processing of local raw materials and production of intermediate and capital goods (Killick, 1993).

ISI policies such as heavy protection, extensive regulation and directed investment have also contributed to the poor performance of African industry, compounding more fundamental problems such as weak links to the domestic economy, high costs of production and lack of incentives to raise productivity. Collier and Gunning (1997) found that lack of openness was the single most important cause of slow growth. At the firm level, there was evidence of dramatic effects of foreign exchange controls and licensing, with tax controls drastically reducing competition. In Zimbabwe only one third of firms considered the price of their products as market determined at the time when the controls were lifted. Heavy protection shielded industry from competition, allowing some firms to be profitable although inefficient. Around 70% of manufacturing output in Zimbabwe was produced in industries where the four largest producers accounted for at least 80% of industry production. By 1982, 46% of manufacturing value-added in the Ivory Coast was produced in sectors in which a single firm held more than half the market.

Weak infrastructure and poor provision of services and utilities also impacted negatively on performance. In Nigeria, 78% of firms have standby generators, constituting high fixed costs which bear particularly on small firms accounting for a quarter of the value of their equipment. Inadequate telephone services were identified by 47% of Zimbabwean firms as their most serious problem. Collier and Gunning (1997) identified the main constraints on firm growth as high risk, poor public services and lack of social capital. Firms face high risks and have limited capacity to bear them. Risks are inflated by lack of publicly provided contract enforcement, by poor infrastructure and by the vagaries of the macroeconomic environment and the corresponding policies. Liberalization is reducing costs but is also reducing the protection from which existing firms benefited.

The industrial structure in Africa is also characterized by a dualistic structure with large numbers of informal and small scale enterprises co-existing with small numbers of relatively large scale modern plants and with few linkages between them. In addition

heavy investment in state owned industries may have inhibited private investment which has remained at very low levels. Killick (1989) suggests that the creation and maintenance of a large state industrial sector may have the effect of discouraging private investment. This could be due to uncertainties about the future security of ownership, government attitudes towards private enterprise and profit, and the extent to which private concerns will be allowed to compete fairly with public enterprises. He argues that it is unlikely that public ownership has contributed positively to industrialization.

Some Positive Developments

Although modern manufacturing in Sub Saharan Africa remains small, and stagnated at around 10% of GDP and 9% of employment between 1965 and 1987, the situation differs among countries within the region. Many have thriving informal manufacturing sectors that meet local needs at low prices. Progress has been made in building up the labor force with industrial skills, developing local sources of supply and moving up the learning curve. A 1989 World Bank study reveals that small scale industries in Ghana were successful in surviving the economic crisis of the late 1970s and early 1980s. The informal industrial sector has been a source of labor-intensive technological innovation. An example is the "Suame Magazine" in Kumasi, comprising 5000 craftsmen. As much as 80% of Ghana's aging vehicle fleet is serviced and rebuilt through these informal garage complexes, in which specialists carry-out the mechanical-, body-, electrical- and other work. The government has initiated programs through which mechanics in informal workshops can upgrade their skills and learn basic accounting and management methods as well as providing credit.

There have also been other positive developments in African manufacturing: a Tanzanian automobile radiator producer, for instance, uses Indian technology and trainers to develop small scale but efficient production; more than 10% of the output is exported to neighboring countries, India, the Middle east and the UK. In Botswana, a garment manufacturer sells its fashion designs in London and New York. Cote d' Ivoire exports

cocoa products and chocolate from unexportable beans. Nigeria and Zimbabwe export clothing, Senegal plastics and Kenya jewelry and basketry. African industry has taken advantage of market opportunities and adapted to locally available material. Small enterprises in Nairobi turn waste packing materials into low cost housing; firms in Cote d'Ivoire and Ghana provide specialty food for Africans overseas. A firm in Zimbabwe exports custom made parts for old automobiles to Europe. Import liberalization in Ghana, Kenya, Madagascar and Nigeria has reduced scarcity rents, increased access to needed inputs and forced monopolistic firms to cut costs to compete (World Bank, 1989).

Impact of Structural Adjustment Programmes (SAPs) on African Industrialization

There is evidence through the 1990s that SAPs including macroeconomic and trade liberalization have led to increased capacity utilization as more raw materials and intermediate goods became available, Pack (1993). Macroeconomic policies that eliminate foreign exchange shortages and quantitative restrictions can have an immediate effect when plants are underutilized because of shortages of raw materials or spare parts.

Adjustment programmes have had both positive and negative effects on industry, and the net effect varies widely by product and firm. Devaluation, for instance, raises the profitability of import substitutes as well as exports, and higher agricultural prices raise the demand for basic consumer goods, but stabilization measures may dampen overall demand. The lending associated with SAPs relieves foreign exchange constraints and improves access of firms to needed inputs, although liberalization of imports increases the competitive pressures on inefficient firms. The World Bank Report (1989), indicates that industries that faced imported input constraints or who were able to export, responded positively to adjustment, while those that were highly protected suffered because they could not compete. This applied particularly to public enterprises and in five of Zambia's less efficient para-statal capacity utilization fell from 56% to 25%.

Evidence suggests that manufactured exports have responded strongly to improved incentives with overall output increasing although much of the increase represented the recovery of export markets and expansion of existing operations. The average capacity utilization rate in Nigerian industry increased by 30 to 40% mainly in consumer goods industries. SAPs have resulted in structural shifts within African industry as highly protected, import dependent firms have contracted and exports and processing of domestic inputs have increased (World Bank (1989)).

The Role of Trade

Export trade can help industry transform by infusing new technology and competition, and by enabling some industries to expand beyond the domestic market. Sub regional markets can represent an important stepping stone to international competition, and help building up regional self reliance.

Statistics on Africa's manufacturing exports give an indication of overall inefficiency levels. Poor export figures indicate that African industry is inefficient. While the value of manufacturing exports from other developing regions was expanding, the nominal value of African industrial exports remained static, and its share in world markets and in developing country exports plunged to minimal levels -- a fact no doubt related also to the appreciation of real exchange rates in Sub-Saharan Africa over this period. As a result, African manufacturing is almost wholly dependent on selling to the domestic market.

An exception to this was Mauritius, which successfully built up a manufacturing base by opting for an export oriented industrialization strategy. Prior to Independence in 1968, Mauritius was a sugar-based economy. Its low income and small size offered little opportunity for efficient import substitution. The Export Processing Zone Act of 1970 aimed to attract domestic and foreign investors in export processing. Incentives provided included tax holidays on retained earnings and dividends, duty-free imported inputs, free repatriation of capital and dividends, flexible employment and land and factory space.

Exchange rate and wage policies were also designed to ensure the profitability of export oriented production.

The results achieved in the 1970s were impressive. Industrial investment quadrupled in a few years and was financed largely through profits from the buoyant sugar industry. Real GDP grew at an average annual rate of around 10% during the first half of the 1970s. Manufacturing growth halted in 1979-82 as the decline in sugar prices, the second oil price shock and worldwide recession generated serious financial and economic imbalances. The government responded rapidly with short term stabilization measures, exchange rate adjustment, trade policy reform, and an effective income policy to hold down labor costs. Industrial investment surged in 1983-84 with export processing industries increasing from 195 in 1984 to 408 in 1986 and to 586 in 1988. Led by woven and knitted garments manufactured exports grew at 30% a year and overtook sugar as Mauritius main export (World Bank, 1989).

Technological Capability in African Industry

The present technological capability of African industry remains weak, and future industrial expansion in the continent will be dependent on the creation of indigenous technological and managerial capabilities, as opposed to continuing dependency on the importation of foreign technological know-how. Failure to build up indigenous technological capability increases the vulnerability of African industry to changes in technology, income, tastes and in global patterns of competition, (Copley 1992).

ISI strategy has led to limited flexibility in product or process technology, excessive reliance on foreign capital, technology, intermediate inputs and managerial experience, a down grading of the informal sector as a source of technical solutions and emphasis on output maximization rather than technological learning, Copley (1992). It is also argued that little consideration was given to substituting or upgrading locally available technologies. The source of investment finance determined the choice of production

technologies that resulted in over-designed plants with respect to local market conditions, and the use of heterogeneous technologies that complicated coordination, inventory management and maintenance.

In a review of several case studies, Copley (1992) found little evidence of technical change and production related learning in African manufacturing firms, (technical change being defined in terms of improvement in plant performance such as factor productivity or capacity utilization). A study of three Ethiopian textile factories found that in the period under study 1978/79 to 1985/86, both labor productivity and total factor productivity were either stagnant or falling in all three plants. A study of sugar processing in Tanzania found plants that exhibited falling rates of capacity utilization from 1970 onwards. These trends were also found in studies of oil refining in Sierra Leone, timber industry in Ghana and small scale soap making in Ghana.

However, there were variations in the technical performance of individual firms even within the same industry. In Tanzania, a study found one of four subsidiaries of the state sugar company managed to increase capacity utilization during the early 1980s at the same time that another three subsidiaries exhibited rapid declines in capacity utilization. In a study of the timber industry in Ghana it was found that both capacity utilization and conversion rates (physical productivity of installed machinery) varied dramatically between the two companies studied. While the larger and more diversified of the two companies experienced worsening performance even before nationalization, the second, smaller company -- with a longer history of local management -- was able to maintain adequate capacity utilization and conversion rates even at the height of Ghana's economic crisis.

Overall, the case studies showed little evidence of increasing technical capability in African enterprises either in terms of movement towards internationally competitive levels of production efficiency or in terms of degree of technological self reliance of case study firms, (Copley 1992). The dependence on imported production technology led to

the importation of 'packages' of technical inputs including not only production hardware but also expatriate technical and managerial assistance. Training of local staff was insufficient. Case studies provide little evidence of systematic substitution of local inputs for imported ones. There was also a problem of access to spare parts and intermediate inputs which took on crisis proportions under foreign exchange squeeze of the late 1970s and 1980s.

Despite the changes induced by structural adjustment programmes, Pack (1993) found no evidence of an improvement in total factor productivity or firm-level choice of technology. Sustained industrialization can only be achieved if Africa generates technological competence and they argue that emphasis should be placed on small scale industrial activities particularly in rural areas. Efficient pricing policies are not sufficient to foster productivity growth and efforts should be devoted to increasing productivity of existing plants and sectors.

Industrial Transformation and Environment Problems in Africa

A number of reasons have been advanced for the high vulnerability of SSA for environmental problems in SSA connected with industrial development. These include:

Desire for higher standard of living

To achieve higher standard of living translates into a higher consumption demand, and calls for a higher output of goods and services from industries. There follows the need to increase capital stocks for production, signifying more inputs and greater investment. This in turn places a greater burden on the natural resources, since the cost of resource depletion and pollution are not usually adequately reflected in the budget. It follows that, while economic policies or practices that draw heavily on the environment may improve short-term benefits in terms of an increased output, in the long run the cost of sustaining such production and meeting acceptable environmental requirements is quite substantial.

Social equity demands

The need for government to redistribute equally resources for the welfare of the public encourages shortsighted poverty reduction strategies that are ultimately detrimental to the environment. There is compelling need to promote small-scale industries that utilize low-cost materials at the expense of environmental degradation. In Uganda, for instance, many poor people are engaged in charcoal making, a practice leading to a rapid depletion of forest resources. Similarly, brick making, especially in urban areas is also environmentally destructive. In SSA, governments tend to pursue welfare policies that go beyond their means, and this in turn is often associated with an excessive exploitation of natural resources.

Industrialization vs. Urbanization

The concentration of industries in few urban areas with a large proportion of the population living in peri-urban areas, and the resulting over-crowding, may lead to environmental problems, including the over-utilization of natural resources, pollution, poor sanitation and other health hazards. Beyond this, concentration of industry in urban areas is generally associated with a neglect of the rural sector, which in turn perpetuates poverty and social inequity -- and poverty in the rural areas is an agent of environmental degradation; indeed, where the rural areas are neglected, it becomes difficult for the economy to improve and attain adequate levels of sustainability.

Liberalization policies and the environment

Economic liberalization is meant to improve existing resource allocation and increase efficiency across sectors, across firms and within firms. Increased efficiency could have a positive effect on the environment, where industrial development leads to efficient resource use, the environment can be protected. Akinlo (1995) found that scale and

allocative efficiencies were positively correlated to the environment, since greater output was achieved with a lower resource use. In the SSA region, however, economic liberalization has not brought about increased efficiency, despite marginal gains in industrial development.

On the other hand, there are also positive effects of liberalization on the environment. The removal of subsidies to industrial firms in the form of preferential access to funds or through protection from foreign or domestic competition for instance, can benefit the environment by eliminating subsidy-generated inefficiencies that aggravate the pollution problem (UNEP 1995). Similarly, removal of subsidies on energy may encourage adoption of cleaner technologies with a higher energy efficiency, in that increased costs would inevitably discourage the wastage of natural resources. And to the extent that the removal of subsidies led a reduction in manufacturing activities, this would also result in the overall decrease in air pollution, and a lower use of energy in manufacturing.

Trade liberalization

Trade liberalization has increased the exposure of manufacturers to new production technologies, spare parts and increased foreign competition. But surveys of several SSA countries seem to suggest that local firms did not always shift to new technologies after the introduction of trade liberalization policies. Many industries and industrial practices in the region go back many years, and contribute little or nothing to an environment-friendly development.

Industrial waste and environmental management

Reduction in the cost of waste disposal is one of the advantages often cited as a benefit from new environment-friendly policies, to the extent that they encourage the adoption of more efficient and cost saving methods. Efficient waste disposal systems mean less air- and water-pollution, and better sanitation -- although a recent survey in Uganda found

that eutrophication (over-fertilization of the water system) had increased as a result of technologies. (EPRC/UNEP 1998): the concentration of phosphorus in lake water had more than doubled, as had the rate of algae production; the type of algae had changed from diatoms to bloom-forming and potentially toxic green algae -- a kind of alga which is not only unsuitable for consumption, but also reduces the habitable capacity of the water for fish by depleting the oxygen in the water when it decays.

Conclusions

- It is clear that African industry has performed poorly in relation to other regions of the world. ISI shielded industries from competition and state owned enterprises had little capacity for international competitiveness and environmental protection. This meant that industry could achieve profitability without efficiency because it was favored by the state and had little domestic competition.
- Industrial strategy in Africa has tended to overstress physical capacity (plant and machinery) while neglecting the acquisition of technological skills. The informal sector has played a dynamic role in providing income earning opportunities and serving the demand of the low income population for inexpensive manufactures. Small and medium scale enterprises (SMEs) have the capacity to adapt techniques to local resources and products to changing niche markets at home and abroad. They can also build the technical, managerial and entrepreneurial experience necessary to expand the large scale sector efficiently. Regulatory reform and institutional support would help informal and SMEs as well as large scale industries to grow.
- The desire to achieve higher standard of living requires higher output of goods and services from industries, which places a greater burden on the natural resources. It follows that, while drawing heavily on the environment, the cost of sustaining such production while meeting acceptable environmental requirements is quite high in the long-run.

- Similarly, social equity demands in the sense of a more equitable distribution of resources for public welfare, may encourage shortsighted poverty reduction strategies that are ultimately detrimental to the environment. There may also be a tendency to encourage small scale industries that utilize low-cost materials, thus contributing to environmental degradation.
- The concentration of industries in few urban centers, with a high concentration of the population in peri-urban areas, has led to environmental problems as a result of overcrowding associated with the over-utilization of the available resources, pollution, poor sanitation and other health hazards. Such over-concentration of industries has also led to the neglect of rural areas, thereby perpetuating poverty and social inequity the rural areas -- itself an agent of environmental degradation; it is indeed all too evident that if rural areas are neglected, it will be difficult to achieve an improvement and the ultimate sustainability of the economy.
- On the other hand, economic liberalization associated with an increased efficiency across sectors has had a positive effect on the environment, whenever it meant a more efficient resource use, and improved environmental protection. Similarly trade liberalization has enhanced the exposure of manufacturers to new environment-friendly production technologies, which are environmentally friendly, although the experience of SSA countries seem to suggest that this has not always been the case for some local firms.
- Reduction in the cost of waste disposal is one of the advantages arising from new policies, to the extent that it does in fact result from the adoption of more efficient and cost saving methods.
- Finally, it may be concluded that industrial strategy in Africa needs to address functional issues such as those related to human, technological and institutional capabilities, and not concentrate simply on creating or rehabilitating industrial capacity. It is essential to build

sufficient flexibility into the process by which industrial transformation takes place, emphasizing competition and the systematic build-up of core capabilities, which will in turn minimize environmental degradation

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