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Third World multinationals: Technology choice and employment generation in Nigeria

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THIRD WORLD MULTINATIONALS: TECHNOLOGY CHOICE AND EMPLOYMENT GENERATION IN NIGERIA

CONTENTS

1. Introduction

This paper is concerned with technology choice and employment generation effects in developing countries by multinationals from the Third World. It reviews the relevant literature on the recent phenomenon of the Third World multinational enterprise and examines several cases of such multinationals operating in Nigeria. It also seeks to compare technology choice (and by implication employment generation) by these enterprises and by subsidiaries of multinationals from the industrialised countries.

2. Third World multinationals: general characteristics

Third World multinationals and foreign direct investment from developing countries are relatively recent phenomena that have attracted serious attention from researchers only starting with the second half of the 1970s. Nothwithstanding its relatively recent arrival on the international investment scene, such investment seems to be increasing rapidly. For the beginning of the 1980s, Wells[1] has identified over 2,000 foreign subsidiaries of such firms, half of which are in manufacturing. But he estimates the total population at three to four times that number. Most of these enterprises (Wells' estimate: 95 per cent) operate in other developing "host" countries that are further down the scale in development as compared with their developing "home" country.

The general characteristics of investors from developing countries have been studied rather extensively. Thus, Wells[2] has identified their capability for operating in small markets, ability for efficient small-scale manufacturing through adaptations in large-scale technology to small volume production, flexibility of production lines, greater labour-intensive production, experience in putting to use locally available standard inputs, adaptation of products to local conditions; and their managers' special skill in using a technology mix of new, old and firm-designed machinery which originates from various countries. Lecraw[3] has concluded that, in general, the Third World firms covered by his study used more labour-intensive technology, imported fewer foreign inputs, produced more unbranded, low R and D, and lower quality products (that competed on the basis of prices in the host country markets) than firms from industrialised countries. Also, Third World multinationals were more profitable than other multinationals or local firms, had lower foreign equity participation, exported much less of their output and

hired a larger percentage of their employees from home countries. Two major characteristics of Third World multinationals - both beneficial to the host country - were (a) their expertise in the use of technology to manufacture products that were suitable to the level of income of the majority of people in the host country, and (b) their extensive use of locally-produced raw materials and machinery. White[4] arrived at very similar findings in his study of firms from Latin American countries, viz: (1) Mastery by Third World multinationals of imported technologies that have been adapted to meet local constraints, such as availability and cost of raw materials, relative prices of production factors, size of market, and preferences of local consumers; these led to a new "technological package" that could be transmitted to other markets as appropriate. (2) Knowledge of diverse sources of technology and machinery, ability to select most appropriate plants, and the experience of managers and technicians of putting up such plants and commissioning them. (3) Appropriate technology for small-scale production. Special skills in choosing technology no longer used in industrialised countries, characterised by small scale, little automation and low labour costs. (5) Ability to proceed with low investment in equipment and buildings and with less automatic machinery adapted to several processes at the same time. (6) Finally, lower costs of engineers and managers.

In all the cases reviewed by White the firms had small-scale production and less automated and more labour-intensive processes or lower investment cost than the multinationals from industrialised countries.

The Latin American firms studied also favoured local participation and often transferred technology without any contractual obligation for their local partners or without pay. In addition, White has also identified the ability of Third World multinationals to adapt products to local markets and to combine cost competitiveness with marketing skills. Their marketing advantage, arising from a similarity of their home and host market conditions has also been underscored in the Nigerian experience by Nambudiri et al.[5]

Sung-Hwan Jo[6] characterised Korean foreign direct investment by their export of skilled labour and their labour-intensive modern technology. Hong Kong multinationals showed a pronounced adaptation of technologies and management skills to the conditions in the host developing countries.[7] In their defensive investments, these multinationals used more labour-intensive and less sophisticated products than those from the industrialised countries. Other foreign investment[8] from Third World

countries was characterised by transfers of dated machinery, at least in the early 1970s. At the same time the firms were considered efficient providers of intermediate technology at the lower and intermediate stages compatible with the host country's stage of economic development. This was a reflection of the similarity of the home and host countries' technical capabilities. Another study found that Indian joint ventures in Indonesia seemed to have a higher number of workers per unit than, for instance, Japanese joint ventures.[9]

The brief survey of the characteristics of Third World multinationals brings out several factors that may have a direct bearing on the nature of their technology choice and employment generation: compared with multinationals from industrialised countries, those from the Third World tend to use more labour-intensive technology, more local materials as productive inputs and less automated production processes. All thee factors tend to directly generate employment. Other factors associated with Third World multinationals, such as small-scale manufacture, use of second-hand machinery, lower investment in equipment, and progressive schemes of integration, may have an indirectly positive impact on the level of employment generation.

3. Technology of Third World multinationals

Wells'[10] review of Third World multinationals elaborates on some of the above characteristics that relate specifically to the technology used. In his opinion, labour intensity, small scale and flexibility are striking characteristics of the technology transferred to other developing countries. In at least one of the countries studied, foreign investors from other developing countries used more labour-intensive technology than did both local firms and subsidiaries of multinationals from industrialised countries. Small-scale manufacturing to produce low volume is also associated with labour intensity. Additionally, there was evidence that capacity utilisation was substantially higher in Third World multinational firms. Flexibility in technology choice also led to an intensive use of machinery. Both high capacity utilisation and intensive use of machinery (e.g. through operating a third shift) could lead to the absorption of a larger labour force than otherwise. The frequent use of second-hand machinery by Third World multinationals (developed for an earlier stage of manufacturing and since replaced in multinationals from industrialised countries by more modern machinery) is likewise comparatively more labour intensive. Not surprisingly, therefore, the technology choice of Third World multinationals had the result that they tended to invest less per job created than other multinationals.

4. Multinationals and their different economic environment in developing host countries: Brazil, Hong Kong and Nigeria compared

The two case studies of Brazil[11] and Singapore[12] prepared for the ILO deserve attention because of the contrast they provide to the Nigerian situation which will be described later.

The Brazilian economy is far more industrialised and its manufacturing industry is oriented primarily toward the domestic market. Government policy has been more concerned with economic growth than with direct employment generation as such. Therefore, there has not been any major concern about the choice of technology from the viewpoint of employment generation. While labour costs have been much lower than in the home countries of the multinationals, the study contends that low wage levels have not automatically led to the choice of more labour-intensive technology. Also, there have been fewer opportunities for the scaling down of production than in smaller countries. Apart from tariff protection, firms have had the benefit of subsidised credit, favoured exchange and tax exemptions - all tending to reduce fixed cost of production. Public sector firms in different branches often determined the technology to be adopted, assured market protection, and stimulated the private company to develop import-substituting products.

The more recent emphasis on export promotion has made external markets and international patterns of cost of production a basic reference point for firms; particularly for multinationals that have outstanding positions in the export of manufactured goods.

The three case studies from Brazil (all three multinational affiliates or subsidiaries of firms from industrialised countries) suggest the following tentative generalisations:

(a) Technology choice is conditioned by technical progress at the world level and by the goods that are produced, particularly so if a policy of world-wide product homogeneity is followed by the multinationals.

(b) Attempts to adapt products to local conditions may have some influence on employment.

(b) Attempts to localise input production may lead to technology adaptation; and supplies of such inputs indirectly generate greater employment.

Singapore has switched in the past decades from an import substitution policy to an export-oriented industrialisation strategy. The firms selected for study were from the electronics industry which is technologically very dynamic. The products manufactured in Singapore by the sample firms are not for domestic consumption but rather for a world-wide export market. Government policy is well defined toward phasing out low-wage, low-skill, labour-intensive industries and encouraging high value-added, high-skill and capital-intensive industries. A policy has been followed of increasing wage levels steadily. Training has been instituted to increase the skill levels required. Investment incentives to create demand for more skilled labour and training to supply such skilled manpower have been matched as two facets of the development strategy.

All three firms have been moving labour-intensive parts of their production to other developing countries with lower labour costs and the high-skill and capital-intensive parts to countries such as Singapore. World market factors, such as changing consumer preferences and competition based on product quality and performance, have also played a role in making such product allocations to different countries necessary. The choice or allocation of a product line to a country by a multinational primarily determines the technology to be used. The size of the market determines the scale of production and to some extent the technology. The choice of more labour-intensive or more capital-intensive technology is influenced not only by local costs, but also by the levels of productivity, high labour turnover rate, infrastructure costs and risks of operating in a country. Infrastructure costs include elements such as freight, fuel, transport, utilities, housing for expatriates, etc., all of which add to the total non-wage costs. The study noted the impact of multinational operations on employment in the retail trade and service sectors through the development of suppliers.

Bello and Iyanda's[13] study of two multinational enterprises in Nigeria, undertaken for the ILO, covered one of Asian management and control and the other from an industrialised country. The study focussed primarily on the relative volume of direct and indirect employment generated by these multinationals. The two enterprises belonged to two different industries and the study did not attempt any comparison between the subsidiary of a developed country multinational and that of a Third World multinational.

The study reported that, although official agreements between governments and multinational firms (particularly where the government is in partnership) require that proportions of local inputs of manufactured goods be specified

and increased over time, governments by and large made no intervention in the choice of technology as such. Expectations with respect to backward linkages to the local economy are not often met, however, for a variety of reasons. Thus, better technologies frequently imply the use of less but more highly trained labour. The difficulty of finding a pool of experienced technicians for operating more sophisticated machinery is often a constraint for technology choice and backward linkages. Some evidence of increased manpower absorption resulting from the use of manual labour in peripheral areas of technology was noted. Finally, in the cases studied, the introduction of a higher level of technology resulted in no loss of jobs due to retraining efforts.

Another study by the same authors[14] focussed on the employment effects of multinational enterprises in general. Some of the study's findings seem also relevant in the context of this paper. For instance, although multinational enterprises employed fewer workers per unit of paid-up capital than indigenous enterprises (244 vs 766 per ₦1 million of paid-up capital), the multinationals tended to be larger in terms of employment per enterprise. The indigenous firms also studied were found to be more labour-intensive and to generate, therefore, more employment per standardised capital or sales unit. By comparison, the multinationals generated a larger percentage of employment in the managerial category and trained more of their managerial personnel. Indigenous firms concentrated much more on training their blue-collar workers. The multinationals surveyed offered higher job security and fringe benefits than the local firms. An interesting finding was that some foreign multinationals contributed to employment generation by directly or indirectly helping many indigenous persons to become entrepreneurs themselves, and therefore employers.

A recent study by Nambudiri et al[15] on the operations of Third World multinationals in Nigeria found that these enterprises imported machinery from developed countries so as to be able to compete with other firms. Their products were often more functional in terms of local demand patterns. The technological decision makers of the Third World multinationals were invariably drawn from the home country. They not only had the experience of using machinery but were also well informed about the international availability of the desired machines and equipment. The enterprises demonstrated an ability to adapt their scales of operation over a wide range and many seemed to follow a strategy of entering markets in a small way with gradual expansion later. The enterprises also claimed to have lower costs for managerial and technical staff and lower overheads than multinationals from the industrialised world and

some advantage from an intimate knowledge of the host country markets which were found to be similar to the ones in their home country. This apparently helped the enterprises in appropriate product selection, distribution and catering to the special requirements of the local market.

5. The manufacturing sector of the Nigerian economy[16]

The manufacturing sector of the Nigerian economy being the main sector of operation of multinationals, it seems useful to review it briefly as a background for the case studies presented in the following part of the paper.

Four National Development Plans have guided Nigerian economic development since 1962. The First (1962/63 to 1967/68) and the Second (1970/71 to 1973/74) were rudimentary compared to the Third Plan (1975-1980) and the Fourth Plan (1981-1985), now in progress. The four Plans allocated ₦2.2 billion, ₦3.2 billion, ₦30 billion and ₦70 billion respectively.* The size of the Third and Fourth Plans reflected the increase of government revenues from the oil industry.

Included in the list of the eleven specific objectives of national economic development spelled out in the Fourth National Plan, are: (i) reduction in the level of unemployment and underemployment (third on the list); (ii) development of technology (tenth); and increased productivity (eleventh). The major objectives for the manufacturing sector included its growth from a share of 7 per cent to a minimum of 12.9 per cent of GDP, an increase in local material and manpower use and an increase of employment opportunities.

The manufacturing sector is dominated by a handful of industrial groups. In terms of value-added, individual industries held the following position in 1975: textiles - 14.06 per cent; beverages - 0.11 per cent; confectionery - 7.17 per cent; soaps, etc. - 5.93 per cent; structural metal products - 3.75 per cent; dairy products - 3.75 per cent; and printing - 3.51 per cent. Total manufacturing thus amounts to 43.52 per cent. Over 90 per cent of the industrial output is accounted for by consumer goods and hardly any capital or intermediate goods are produced. There is a very large concentration on relatively light industries to the neglect of heavy industries.

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* Present exchange rate 1 ₦ = US$ 1.48.

The consumer-oriented manufacturing sector is primarily directed toward the domestic market, with little or no export. However, there is considerable market preference for imported goods for reasons of higher quality and relatively lower prices.

From the point of view of employment, the major industries contributed as follows: textiles - 22.15 per cent; oil - 6.16 per cent; saw million - 5.76 per cent; tyres, tubes, etc. - 5.50 per cent; printing - 5.09 per cent; fabricated metal products - 3.80 per cent; sugar, confectionery - 3.2 per cent. The relatively high level of employment in some of these industries can be ascribed to a low level of mechanisation and labour-intensive techniques employed.

The Plan emphasises the fact that the Nigerian manufacturing sector is still largely dominated by low-technology industry, in comparison to five other similar developing countries, which were only slightly above Nigeria in terms of levels of industrialisation. The shortage of skilled manpower is considered the most serious bottleneck for the capacity of the economy to absorb an increasing volume of investment made possible by increasing oil revenues.

Industrial costs constituted 53 per cent of total industrial output. For every Naira of value added, the country spent 60 kobo on import of raw materials. Ninety-eight per cent of the total labour force is Nigerian, but the remaining 2 per cent of foreign labour accounts for virtually all the technological and management expertise in the sector.

A part of this high cost may be explained by the rising wage cost. During the Third National Plan, the government formulated an incomes policy. In 1974, the public pay revisions had resulted in a major escalation of prices. To avoid such large explosive changes, it was decided to ensure that wage adjustments should be more gradual in the future. The new policy resulted in a virtual wage freeze between 1977-79. Since then lower income workers were allowed wage increases aimed at closing the gap between them and higher paid workers. Collective bargaining, within the limits set by government, has also been permitted. Finally, in 1981-82, a new minimum wage was accepted for the entire country, set at the level of ₦125 per month. Between 1973 and 1982, the minimum wage for industrial labour moved up from ₦30 per month to ₦60 in 1974 and ₦125 in 1981.

Contributing also to the high cost of industrial production is the underdeveloped infrastructure. Water, electricity and communication problems have forced many industries to become self-sufficient in these areas,

which adds to investment cost. Furthermore, there is the high cost of expatriate technical and managerial personnel, of imported spare parts and of R and D carried out abroad in order to find solutions for local technical problems.

Beginning in 1977, there has also been a limitation on dividend payments. Currently a maximum of 60 per cent of the after-tax profit can be distributed. The government has also initiated a productivity campaign aimed at increasing the levels of productivity in industry and in other sectors.

While the government recognised the need for some degree of protection, it holds the view that permanent high protection for industry is clearly undesirable. It expects manufacturers to achieve higher levels of price and quality competitiveness.

The government has followed an indigenisation policy since 1972 determining the relative percentage of capital ownership among Nigerian and foreign investors. All business enterprises are now classified into three schedules (two before 1977). Businesses in Schedule I are expected to be owned 100 per cent by Nigerians; Schedule II and Schedule III businesses require a minimum ownership of 60 and 40 per cent respectively by Nigerians. Generally Schedule I includes low technology industries and Schedule III includes those with the highest levels of technology.

The economic environment for foreign investors in Nigeria may be summarized as follows:

(1) The large development effort envisaged by the Third and Fourth National Plans represent major opportunities for the foreign investor, in a country which has limited technological and management expertise but is favoured with a variety of natural resources and the largest single national market in Africa.

(2) Government has a high avowed priority for increasing employment opportunities through industrialisation. At the same time, it emphasizes the need for raising the level of technology in the manufacturing sector.

(3) The indigenisation policy provides the security of 60 per cent ownership to foreign investors operating in Schedule III businesses, limited to higher technology industries. Short gestation periods - and therefore the short pay-back periods - and the large consumer market favour the growth of light consumer industry.

(4) Government policy favours minimal protection, but never long-term or complete. Firms are expected to become competitive in price and quality with manufacturers outside the country.

(5) Manufacturers face rising wages of local labour, low productivity, shortages of skilled manpower, dependence on imported raw material and other inputs such as spare parts, relative costly managerial and technical staff recruited from outside the country and, in general, very heavy infrastructure costs.

6. Case studies of Third World multinationals operating in Nigeria

In total five enterprises/units of enterprises will be studied, three of which are from the Third World. The first, Enterprise W, manufactures fuel filter inserts. The second enterprise - of which Unit Y will be studied - is in the aluminium industry. Enterprise Z is in the textile industry. For illustrative purposes, two more enterprises have been included in the sample. Enterprise X, which is from an industrialised country, is also in the aluminium extrusion industry and Enterprise H, which has a process for aluminium hollow wares, in fact belongs to the same group, as does Unit Y.

The selection of enterprises/units established for the study allows a comparison of technology choices by Third World firms at different time periods in the Nigerian economic environment - as well as some comparisons with technology choice/employment generation of subsidiaries of industrialised countries' multinationals.

Case studies

(1) Enterprise W

(i) General characteristics

Enterprise W was established in January 1980 to manufacture fuel filter inserts for heavy commercial vehicles in Nigeria. It went into operation in June 1981 and in July 1982 it was working at a two-shift capacity. The company was the first viable fuel filter manufacturing unit in the country and therefore can be considered a pioneer in the field. At the moment, there is no other firm manufacturing fuel filters in Nigeria. However, a second enterprise is expected to enter the market shortly after a planning/implementation phase of three to four years. It will operate on a larger scale and is the Nigerian subsidiary of an enterprise under Asian management based in East Africa.

Automobile component manufacturing is just beginning in Nigeria. With two passenger car manufacturing enterprises (Peugeot and Volkswagen) and several heavy vehicle assembly plants (Fiat, Mercedes-Benz, Leyland) and a rapidly-increasing number of transport vehicles on the road, the market for products such as fuel filters was seen as being fairly large. Until Enterprise W started production, the entire demand for fuel filters was met by imports, both for original equipment as well as for replacements. The original equipment market segment was considered difficult to enter since original equipment manufacturers are reluctant to disclose their specifications to outside manufacturers. When product samples are sent to original equipment manufacturers for tests, the results are seldom communicated to the component manufacturers. In general, firms entering component manufacturing have experienced serious handicaps in this area.

Enterprise W was established by two expatriate (Asian) managers, who have engineering degrees and several years of technical and managerial experience in their home country and five year's management experience in the light engineering industry in Nigeria. Between the two, they held 40 per cent of the capital; the balance being held by Nigerian investors. Although the enterprise may not be described as a Third World multinational in the full sense of this term, it is the result of the entrepreneurial spirit and investment of two highly qualified and experienced managers from an Asian country. Its characteristics correspond closely to those of a multinational subsidiary from the Third World.

The founders of the enterprise knew the market for automobile fuel filters in their home country very well, where both were associated with the automobile components industry. The Nigerian market situation appeared to them as a good opportunity to transfer their production skills. Their evaluation of the market potential contrasted sharply with the assessment of a leading automobile components manufacturer from the Federal Republic of Germany who had also investigated the Nigerian market for the possible manufacturer of fuel filters. At the expected size of the market, its estimates of costs and prices were reported to be very much higher than those of imported products. With only a 10 per cent duty on import of fuel filters, too little tariff protection was available, in the enterprises' opinion, for locally manufactured goods.

Indeed, substantially higher import duties were levied on the raw materials used in the manufacture of fuel filters (impregnated paper - 40 per cent; expanded wire mesh - 66 per cent; felt - 40 per cent; tin

plate - 25 per cent; glue - 33 per cent). However, Enterprise W was allowed to import paper at a duty of 10 per cent on an approved users' permit granted to it. It may be stressed that none of the raw materials are produced in Nigeria for the moment; and thus little backward linkage exists for the time being between Enterprise W and the local economy.

The Nigerian market for automobile components favours traditionally high-quality products and is very brand conscious. Nevertheless, the market has been flooded recently with relatively lower quality and lower priced products. Enterprise W had to put up with intensive competition both from the established high-quality brand products and the cut-rate. relatively low-quality products, both types of which were being imported into the country. Finally, spurious products were also not uncommon to the market.

Enterprise W estimated the market size at 2.5 to 3 million filters for commercial vehicles alone. This was based on a predicted number of commercial vehicles of 1 million. The company's initial plan was to aim for 20 per cent of the market of 500,000 to 600,000 fuel filter inserts. This represented an average output of 2,000 filters per day and 300 days of output per year. As entry into original manufactuer's segment of the market was extremely difficult, the company's target was the replacement market only.

(ii) Technology choice

The enterprise's plan for the manufacture of fuel filters inserts called for a production of 2,000 to 3,000 filters a day. Many of the filter manufacturing companies in Europe, with which the founders were familiar, operate at a level of 20,000 filters a day. Thus the plant was conceived as a small-scale operation right from the beginning. The founders of the company were familiar with all aspects of the technology, so no payment was required for any acquisition of technology.

In the early phase of exploring the prospects for establishing the plant, the directors learned of a defunct plant, which had started in 1964 but had closed down after two years. That plant had attempted only basic assembly not the manufacture of filter inserts. Their machinery was for sale. Enterprise W bought some selected pieces of this machinery which they supplemented with essential parts of new machinery. Conveyor lines, work tables and other fixtures needed in the factory were locally fabricated through subcontracts to local blacksmiths and small workshops. As a result of the purchase of second-hand machinery and the use of local inputs it proved possible to limit the total investment

in the plant and machinery to ₦150,000 and the total project costs to ₦700,000, including the land, the building and stand-by generator. (This contrasts with a reported ₦2 million investment in the plant of the enterprise - referred to above - which is expected to enter the market soon.) No further capital investment was needed to achieve the originally planned capacity. At a capacity level of 1.8 million filters, however, an additional investment of ₦70,000 was considered necessary for two pieces of machinery used in basic metal operations. All new machinery for Enterprise W was ordered from Europe. An Asian source for machinery would have had too long a lead-time for procurement.

Keen price competition on the market put pressure on the company to cut the cost of manufacturing as much as possible. Finally, the managers of Enterprise W discovered a cheap local source of tin plate, i.e. the waste of a large metal processing firm that could be effectively utilised. The company estimated at 15 per cent the related savings.

As original equipment manufacturers were unwilling to provide specifications, the company sent its product samples for testing to the manufacturer of paper - a key ingredient. The reports received were quite satisfactory on the quality of the product.

Enterprise W also used locally-manufactured materials to package the unit products and for bulk packing. Still, the locally-made packaging was found to be costly, since it was estimated that it accounted for not less than 20-25 per cent of the total manufacturing cost.

(iii) Employment

At the time of this study the plant employed 24 production workers, 4 sales representatives and 4 accounting staff. All were locally recruited and trained from the area where the plant is located. The plant also employed 4 managerial staff, all of whom were expatriates. In all, the direct employment provided by Enterprise W was 36 employees.

The indirect employment generated by the enterprise is difficult to pinpoint precisely both as regards its backward and its forward linkages. As regards the latter aspect, the company has three distributors, two of whom were already established in the automobile spare parts business. The third distributor added fuel filters as a new line of products to his existing line.

(iv) Marketing

Enterprise W faced considerable initial barriers to entry. Both the high-priced established brands as well as the cut-rate products offered stiff competition. It had to gain acceptance through the free distribution of its products to large commercial transport companies. However, this acceptance came quickly when customers found the products to be of reliable quality and lower-priced than the established imported brands.

(2) Enterprise X

(i) General characteristics

Enterprise X was registered in 1973; construction started in 1974 and the plant went into operation in 1975. It produces aluminium extrusions used for a very wide variety of purposes, e.g. manufacture of windows, furniture and tubes. Enterprise X is the subsidiary of a large aluminium manufacturing company from a developed country (the sixth largest in the world). It is included in the present study as it allows a comparison with a similar production unit of a Third World multinational which will be dealt with as "Unit Y" in the following section. The parent company operates in several countries. It also processes a bauxite mine in another African country. However, Enterprise X was its first venture into extrusion in West Africa. Another subsidiary of the parent company has been operating in Nigeria for the past 21 years, first selling and later manufacturing building materials. This provided Enterprise X with considerable knowledge of the Nigerian market.

Enterprise X was the first aluminium extrusion plant to operate in Nigeria. Unit Y was the second plant, which went into operation in 1980. (A third such plant has been set up in the meantime but has not started production as yet; and a fourth plant is in the planning stage. The third and fourth plants are located in different provinces, while the first two are located in the capital.)

The total market for aluminium in the country was currently estimated by Enterprise X at 25-30,000 tons a year for all types of uses. The two operating extrusion plants together had an estimated capacity of 5,000 tons a year, leaving a substantial demand for extrusion still to be met by imports. Imports of extrusions and extruded products are considered to be hampering the progress of firms in the industry. For large construction projects (e.g. a large modern hotel project) all requirements tend to be imported.

Enterprise X falls under Schedule III and thus 60 per cent of the capital ownership could be held by the foreign partner. Three large development banks, including an international bank and a multinational enterprise with trading interest in Nigeria, share the investment with the parent company. Enterprise X has technical collaboration agreements with the parent company.

Although the company was the pioneer in manufacturing aluminium, it considered Nigeria as a relatively small market. Enterprise X was therefore set up with only one extrusion press. In most plants that the company operates in other developing countries, such as Brazil and Saudi Arabia, two to three extrusion presses are found in each plant.

Enterprise X has three major sections: (1) a remelt section; (2) an extrusion section; and (3) an anodising section.

(ii) Technology choice

The remelt section melts down scrap to make billets. The cast billets are cut out to a suitable size and then processed in a homogeniser to give uniform quality. The remelt section currently handles 25 per cent of the total aluminium input into the factory. The remelt section represents 10 to 15 per cent of the total investment. It employs ten people on two shifts.

The extrusion section has a single press of 1,500 tons pressure capacity and a rated capacity to handle 3,300 tons of aluminium billets a year. The press was acquired from the United States and was also considered standard-type equipment in Europe. However, technical features of the press are perhaps five to eight years behind what would be standard today in Europe. But it was felt that the degree of automation in the press (primarily in terms of the control systems) was more compatible with the conditions prevailing in Nigeria. More sophisticated electronic controls were not envisaged as they are still liable to malfunction and, more importantly, cannot be easily replaced or repaired locally.

The anodising section initially had less capacity than the press section. In late 1978 a colouring process was introduced. The anodising section was expanded in 1982 and now balances the capacity of the extrusion section.

All material handling is done with the aid of cranes and fork-lift trucks.

The plant operated three shifts until recently, but is currently operating at two shifts (except in the anodising section which still operates three shifts) and producing at about 60 per cent capacity. The current cut-back is a reaction to certain austerity measures introduced by the Nigerian government in April 1982.

(iii) Employment

The labour force of Enterprise X on a two-shift basis, divided into supervisory, operating, inspecting and other categories, is given in Table 1. In all, the enterprise employed 180 people at the time of the study (July 1982).

Table 1: Enterprise X: Employment in factory (at the time of study - July 1982)

Section	Super-visory	Opera-tions	Inspec-tion	Other	Totals	
A. Shifts(2)	2	8	-	-	10	
Non-shift	1	-	-	-	1	11
B. Shifts(2)	2	14	2	6	24	
Non-shift	2	1	1		4	28
C.						
Non-shift	1	3	-	-	4	4
D. Shifts(3)	3	6	3	6	18	
Non-shift	1	1	-	-	2	20
E. Shifts(2)	2	8	-	2	12	
Non-shift	1	-	-	-	1	13
F. Non-shift	1	4	-	-		5
G. Non-shift	5	19	-	6		30
				Total		111

Note: Sections A, B, D and E are production departments.

Sections C, F and G are production support departments.

The training of the first-shift labour took one year; when this was completed, a second-shift operation was started. In Europe, the training of one shift of workers would have been accomplished in six months, followed by a second shift.

The company started off with 13 expatriates but has now brought this number down to six. The respective positions were: general management, works manager, die specialist, product development manager, chief engineer and works engineer.

The project, prepared initially before the oil price increase, was estimated to cost ₦3.5 million but overran its budget. At current prices (1982) the plant actually cost ₦10 million. The firm uses 20-30,000 pounds of chemicals. These are imported. Local importers charge prices that are almost four times their original prices in the country of manufacture.

The cost of labour in the entire process is estimated at 15 per cent of total manufacturing cost. The initial assumption that labour was relatively cheap is no longer true and management has had to pay considerable attention to these costs. As regards indirect employment effects of Enterprise X, it may be added that the company has 200 customers. The five largest customers have a labour force of between 300 to 500 people and are engaged in making products such as windows, etc., but not exclusively of aluminium. It is estimated that they again have about 70 small customers who use their extrusions in manufacturing various products. The production development manager's services of Enterprise X are particularly useful for all these customers.

(3) Unit Y

(i) General characteristics

As already mentioned, Unit Y, which was established by a Third World multinational in 1980, also produces aluminium extrusions. It is one of the divisions of the second multinational operating in this field in Nigeria in addition to Enterprise X (discussed above). Other divisions in Nigeria of the present enterprise of Unit Y include those related to chemicals, building materials, aluminium hollow wares, paints and an aluminium rolling mill that supplies sheets (circles) to the hollow ware division. The parent company of Unit Y is a multinational with its head office (under Indian ethnic management) in East Africa and operations in African,

Asian and European countries. It manufactures a wide variety of products. The parent company predominantly draws on experienced technical and managerial personnel from India to man the top echelons of its operation in the various countries where it is established. When Unit Y was established, the company's hollow-ware unit had successfully operated in Nigeria for almost a decade and the multinational was thus quite familiar with the Nigerian market conditions. In fact, this hollow-ware division, Enterprise H, has also been included in this survey and will be studied more closely in the next section.

Unit Y has two major sections: (1) the extrusion section; and (2) the anodising section.

(ii) Technology choice

The extrusion section converts the billets of aluminium into the desired type of extruded sections. The main equipment at the time of this study was a 1,800 ton (pressure capacity) press. The billets are pre-heated and loaded into the press. They are then extruded into profiles through appropriate dies. The extruded profiles are then cut to the required lengths and aged in an aging furnace for four hours before they are sent for anodising.

Unit Y chose a press of Japanese make as it appeared to be the cheapest and most efficient equipment for its purpose. The press acquired by Unit Y has a rated capacity for handling 3,000 tons of billets a year.

The anodising section had a capacity of 950 tons per year. The lower capacity for anodising was decided on for two reasons: (1) some part of the production could be sold without anodising, and (2) it would reduce initial investment.

The plant building did not incorporate overhead cranes and so other means of materials handling had to be relied upon.

(iii) Employment

The Unit reached a two-shift level of operation within the first two years. Currently, the extrusion section operates two shifts and the anodising section three shifts. The workforce, at the current level of operation, in different categories is given in Table 2. The total employment at Unit Y at the time of study (July 1982) was 93. At that moment the plant was

operating at about 50 per cent capacity. The expatriate managers and technicians of Unit Y had experience in aluminium extrusion in their home country. The Unit manager had worked for several years in India with a subsidiary of a multinational.

Table 2: Factory employment of Unit Y (at the time of study - July 1982)

Section	Super-visory	Opera-tions	Inspec-tion	Other	Totals	
A. Shift (2)	2	20	-	-	22	
Non-shift	1	-	1	-	2	24
B. Shift (3)	3	15	-	-	18	
Non shift	1	-	1	-	2	20
C. Shift (1)	1	10	1	-	12	
Non-shift	-	-	-	-	-	12
D. Shift (1)	1	4	-	-	5	5
E. Shift (3)	3	9	-	-	12	
Non shift	-	2	6	-	8	20
				Total		81

Notes: Sections A, B and C are direct production departments.

Sections D and E are production support departments.

The training of the workforce was done in Nigeria by the expatriate staff. Unit Y had an option to recruit several people who had prior experience in the aluminium extrusion line in Nigeria. However, it was decided to recruit people without prior experience and train them from scratch. One of the considerations for not hiring experienced workers was the higher initial salary expected by them.

The company started off with six expatriate managerial and technical employees. The number was reduced to five after six months and to four after a year. It was expected to reduce expatriate staff to three in another year.

The investment required for the whole project was of the order of ₦3 million. At the time of study, the Unit did not have a remelt section. The scrap generated was shipped to the aluminium rolling mill (another division) which recycled the scrap into billets for re-use. A more automated press, available at the time the unit was established, could have reduced the employment to a crew of three per shift. (The press in Unit Y was operated by a crew of ten per shift). Similarly, more sophisticated anodising equipment could have reduced employment to one person per shift (as against an actual number six per shift). Such automated equipment would have increased investment for the press by three times and by five times in the case of the anodising equipment.

In terms of customers, the use of the output and related employment generation, there was little difference between the two multinational units in Enterprise X and Unit Y, which are operating in the same industry.

(4) Enterprise H

(i) General characteristics

Enterprise H is a large and well-established manufacturer of aluminium hollow-ware. Originally established by a United Kingdom group, it ran into loss and was taken over by the multinational from a Third World country which also runs Unit Y. Since that time the enterprise has not only been profitable, but has expanded into several lines, each organised into a separate division. The hollow-ware unit alone employs 450 people.

The most popular line of the hollow-ware unit is a kettle. The unit manufactures 10,000 of these a day. Originally the products came in a variety of sizes and were polished and finished to match imported products. A new product policy adapted the hollow-ware line to produce more functional products to serve the predominantly rural markets. At the same time product standardisation resulted in less variety of models of this product.

(ii) Technology choice

The firm initially imported the spouts for the kettles. As an experimental measure the firm set up a casting facility located in a shed 15 x 25 feet, open on all sides, outside the main plant building. The equipment consisted of four melting crucibles fired by gas burners. Placed around each of the melting crucibles were three jogs that held the casting dies. The crucibles used were locally made.

The jigs enable the dies to be tilted, filled and poured. The dies are imported. Two cutting machines to trim the cast parts and polish burrs and two barrelling machines to polish them complete the additional equipment. The cutting and barrelling machines were locally made. The spout-making facility produces 10,000 spouts in two shifts and fully meets the enterprise's requirements. The entire manufacture uses only aluminium waste from the main plant. Excess aluminium waste is cast into ingots and sold to small aluminium-using units outside the company.

(iii) Employment

The facility employs 24 people in two shifts (6 casters, 2 cutters, 2 sorters and 2 in barrelling). The enterprise is quite satisfied with the quality and output and therefore has not considered any other way of making the spouts.

A more modern technology would consist of the use of a die-casting machine with automatic feed. At one time Enterprise H did consider such an investment, since the current production volume would justify it. The die-casting machine with automatic feed would have had to be imported and its cost was estimated at ₦60,000. Spare parts for such machinery would also have to be imported periodically with an additional cost of ₦15,000 a year. The modern machine would also require more complicated maintenance, location inside a permanent building, a new power supply and more complicated systems of control and operation. For instance, it would normally require a complement of three workers, and difficulties of assigning people to more than one task might indeed raise the number to five workers. The only important benefit to be derived from such a new piece of machinery would have been a slightly better finish of the product. In the end, Enterprise H did not adopt the new machinery because of the anticipated difficulty in maintenance, the need to keep spares available and to carry out complicated repairs.

(5) Enterprise Z

(i) General characteristics

Enterprise Z is the subsidiary of a Third World multinational and operates in the textile industry. It has three textile units in Nigeria - a knitting unit, a weaving unit and a spinning mill. This case study is confined to the weaving unit which was established in 1976 (the knitting unit came earlier and the spinning mill later; the knitting unit was modernised in 1980). The enterprise is controlled by a family of Indian origin based in Kenya.

The weaving unit manufactures a variety of materials used in local dress, mattress covers, lining used in tailoring and other medium-quality, low-fashion fabrics. The fabrics primarily serve the local market. The fabrics produced are not seriously affected by the high quality dress materials that are extensively smuggled into the local market.

(ii) Technology choice

As regards its technological features, the weaving unit has 74 Sulzer looms. The Sulzer looms are high-production looms. Unlike the conventional looms, where a shuttle carries the weft back and forth between two layers of warp, in the Sulzer looms the weft yarn is thrown by a projectile on tension bars. The weft is picked up by a receiving unit and thrown back by a picking unit. The high production rate comes from the speed with which the projectile travels across the warp yarns. The weft yarn is consumed at the rate of 820 to 1,000 metres per minute.

The looms come in a wide range of widths: 85, 100, 130, 153 and 213 inches. The projectile mechanism made such widths possible unlike in the case of shuttle looms. Enterprise Z uses 153 inch width Sulzer looms, which provided flexibility of sectional warping.

Sulzer looms have many advantages over conventional looms. The conventional looms require much more careful and more frequent skilled adjustment to attain high output. Such adjustments depend on the judgment of the loom setter which can be gained only as the result of years of training and experience. In contrast, the adjustments required on the Sulzer loom can be determined more precisely and are much more foolproof.

The conventional looms require many more items of auxiliaries such as shuttles, pickers, picking stick, picking strap and reeds (10 pickers and 10 shuttles per

month). On the Sulzer looms, the average expenditure per loom per shift is estimated by Enterprise Z to be less than ₦1.00. Although a corresponding figure for conventional looms is not available, it is estimated that it would be many times more.

The Sulzer looms give better quality than the conventional looms. Damage due to mechanical stoppage is less than 0.78 per cent, while with conventional looms it can be as high as 40 per cent. Even with the use of casual labour, Enterprise Z reports that damages do not increase much in Sulzer looms.

The greater reliability of the Sulzer machines also enable higher rates of utilisation: as high as 89 per cent compared to 65 to 70 per cent on conventional looms elsewhere in Nigeria. (In India, the best textile mills get an 80-85 per cent utilisation on conventional looms.)

The Sulzer looms eliminate the process of packaging weft yarn. The weft package can be directly used. With a small additional investment, the machine can be equipped to use different varieties and packages of yarn.

The Sulzer looms occupy much less space, as their high production rates make a smaller number of looms adequate to meet the required volume. A number of elements of cost are associated with the space utilised in a textile mill.

The two greatest advantages of the Sulzer looms are their high output and the reduction in the number of workers required. An output of 100,000 metres of 45-inch shirting represents the work of a Sulzer loom for 215 x 3 = 645 shifts. The same output will require a conventional loom to work for 2,775 shifts. Alternatively, the given output represents the work of 215 Sulzer units per day or an output of 925 conventional units for the same period.

(iii) Employment

The labour requirements for both types of looms differ drastically. A comparison of the weaving unit of Enterprise Z's mills and a mill that employs conventional looms in Nigeria is given in tables 3 and 4.

Table 3: Labour requirements for 74 Sulzer looms (textile mills of Enterprise Z)

1.	Supervisor	1	
2.	Maintenance supervisor	2	
3.	Orler	1	
4.	Loom Cleaner	1	
5.	Maintenance helper	1	
6.	Shift supervisor	3	
7.	Head weavers	2 x 3 =	6
8.	Gates	3 x 3 =	9
9.	Cloth doffer	2 x 3 =	6
10.	Weavers	9 x 3 =	27
11.	Weft cleaner	1 x 3 =	3
	Total for 3 shifts		60

Table 4: Labour requirements in a Nigerian textile mill using conventional looms[1]

Total no. of looms = 200 (49" = 120 looms, 55" = 40 looms, 84" = 40 looms)

1.	Supervisor/shift			3
2.	1. Mechanic for every 40 looms or 5 for each/shift		= 5 x 3 =	15
3.	1. Helper for every 40 looms or 5 shift		= 5 x 3 =	15
4.	4 - loom weavers (120 looms)	= 30 x 3	=	90
5.	6 - loom weavers (40 looms)	= 7 x 3	=	21
6.	8 - loom weavers (40 looms)	= 5 x 3	=	15
7.	Cloth doffers	= 2 x 3	=	6
8.	Sweeper	= 1 x 3	=	3
9.	Oiler	= 1 x 3	=	3
10.	Loom cleaner	= 2 x 3	=	6
11.	Weft boys	= 1 x 3	=	3
			Total	180

[1] Production-wise all 200 looms could be replaced by 76 Sulzer looms.

The Sulzer looms cost ₦60-70,000 per unit. Conventional manual looms cost ₦12-15,000 per unit. Taking as a basis for comparison the 200 looms to which table 4 refers and 76 Sulzer looms which could replace them as regards production capacity, the capital investment in machinery alone would be of the order of ₦3 million for conventional looms and ₦5.32 million in Sulzer looms. A shift from conventional to Suzler looms would represent, however, a drop in direct employment from 180 to 63 per cent.

Thus the selection of Sulzer looms represented a considerably higher investment in machinery - with perhaps a lower over-all investment savings in building (built-up area) and associated costs. It entails a reduction in processes, higher output, higher quality and capacity utilisation, but it also implies a drastic reduction in the labour requirement per production unit.

The indirect employment implications of Sulzer looms are also no less significant. Conventional looms use a larger volume of auxiliary materials and spares, as pointed out earlier. In Nigeria, such auxiliary materials are imported and very little is locally manufactured. However, in a country such as India the manufacture of textile auxiliaries is a significant industry. Generally speaking, the shift to Sulzer machines, which use considerably fewer spares and fewer auxiliaries, is likely to remove the scope for the development of a textile auxiliaries' manufacturing industry in the country. Conventional textile auxiliaries use materials such as leather and wood that are normally available indigenously. On the other hand, the precision spares of Sulzer machines are unlikely to be manufactured locally.

It should be added that the output of local cottor is decreasing steadily in Nigeria, forcing the industry to use a variety of types of yarn (construction) and material (composition: rayon, nylon, etc.). More precisely adjustable machinery is more suitable for such yarns.

As a complement to the case study of Enterprise H, a few general comments on changes in the choice of technology by textile mills established in Nigeria may be of interest.

The textile mills established in the earlier part of the 1970s generally selected the conventional looms (Pickanol [Belgium] or Tsudakomo [Japanese]). Many of these enterprises engaged Indian experts to set up mills and employed Indian managers and technicians to run them. The availability of easy credit facilities is also said to have weighed in favour of the selection of such machinery.

The major factor in the increased choice of automatic machinery seems to be the rising cost of employing labour. The monthly minimum wage in 1970 was ₦30. However, by 1975 the minimum wage had been raised to ₦60, and in 1981 it amounted to ₦125 per worker and month. The rise was also reflected in fringe benefits. The 1975 revision specified only night allowance and leave allowance. In 1981 textile workers were entitled to a 15 per cent housing allowance and a daily transport allowance of ₦13 per month.

The four to fivefold increase in wages between 1974 and 1981 has certainly contributed to the option of more automated technology.

Labour representatives were, of course, not involved in the choice of Sulzer machinery at Enterprise Z for the weaving unit, as it was set up as a new entity in 1976. However, the enterprise closed down one of its other units and renovated and recommissioned it in 1981 with Sulzer automatic looms. The relevant labour union did not register any protest on the replacement of conventional looms by more automatic ones. This certainly contrasts with the situation in other developing countries where labour unions often resist introduction of automatic machinery, as it may involve losing jobs and such change-overs to new machinery are usually agreed to only after protracted negotiations between management and labour unions.

7. Analysis and conclusions

The conclusions of the case studies for Nigeria presented in the present report will be put in the context of the various other studies prepared for the ILO project. The major focus of most of the previous studies in the ILO series has been on technology choices by multinational enterprises from industrialised countries and employment generation in developing countries. Wells' study on technology and Third World multinationals[17] focussed on Third World multinationals in terms of a general overview. The questions specifically asked in the present study are:

(i) What are the characteristics of technology choice and employment generation of Third World multinationals in Nigeria?

(ii) In what way, if any, do subsidiaries of Third World multinationals differ from their counterparts from industrialised countries in terms of technology choices and employment generation, direct and indirect?

(iii) What policy conclusions for the goal of increased employment by multinationals do these findings provide in the specific country context?

The paper by Bello and Iyanda concluded for enterprises of all origins that "the most prominent factor that surfaced in the choice of technologies by the MNEs was their own economic considerations".[18] This and an earlier study on Nigeria[19] as well as studies on Brazil and Singapore[20] enable us to identify several factors that enter into these economic considerations in multinational enterprises operating in developing countries.

(1) Volume of production and scope for scaling down

The volume of production has been repeatedly pointed out as a major factor in choice of technology in the above studies. Where the volume of production is small, the plant size has to be adjusted, which therefore acts as a constraint on the kind of technology that could be used. Thus in Brazil there was little or no scope for scaling down and hence no adaptation to smaller-scale technology. On the other hand, in Singapore (which is small) there was no such constraint as the production in question was for the world market.

(2) Market requirements and competitive strategy

In highly-competitive markets, which are found for products such as semi-conductors and consumer electronic goods, quality and reliability of the product may be more important for market success than cost or price considerations (ex. Singapore study). Firms that adopt a competitive strategy of high quality and reliability of products for the world market are practically forced to choose more automated technology. The quality of products in a competitive situation was also highlighted for the three enterprises covered by the Brazil study. On the other hand, the metal products firms covered in an earlier study on Nigeria[21] introduced a slight reduction in the quality standards of the products (but not in the functioning of them) in an attempt to relate the products to their environmental requirements. This was associated with an import of machinery from Third World countries that were more appropriate to the new product standards.

(3) Product standardization vs local adaptation

The Brazil study brought out the impact of product homogeneity on technology choice. When products manufactured in different parts of the world have to be absolutely identical a certain technological standardization is called for. On the other hand, the same study also showed that the use of locally-produced inputs introduced, as a rule, a degree of adaptation of technology. Most importantly for employment generation, the use of local inputs created backward and forward linkages involving a variety of sections of the local economy.

(4) External or internal focus of production

Where the products are manufactured for an export market, as was the case in the Singapore study, or as in the case of export-oriented firms in Brazil, the external markets (and their characteristics) and to a certain degree the international pattern of costs of production become the basic reference for technology choice. On the other hand, in the case of the metal company covered in the earlier study on Nigeria, it was its focus on the internal market that inspired it to adapt the product (and to some extent its machinery/technology) to the local conditions. Naturally this point is also clearly related to the considerations in the preceding paragraph.

(5) Wages and costs of infrastructure

All these directly affect the cost of production. Where, in combination, these costs are high firms tend to adopt more automated and therefore more capital-intensive equipment, provided this is compatible with the facilities for maintenance, the availability of skilled workers and the desired quality standard. The relative cheapness of labour in Nigeria has not been seen as a countervailing factor for automation trends.[22] The Brazil study reiterated that low wage cost does not automatically bring in more labour-intensive technology.

(6) Technical skills and infrastructure

The earlier Nigerian study[23], in particular, brought out the point that an important consideration for the choice of technology is the availability of functionally-qualified technical personnel. This seems to work in two ways. Manufacturers who need to produce as cheaply and reliably as possible may be tempted to use automation in place of labour. However, the maintenance and operation of such equipment will require at least a minimum number of higher-skilled people and some infra-structural facilities as, for instance, service facilities that can readily be called upon.

(7) Level of market protection

The Brazilian study[24] stressed the role of government agencies in determining (indirectly) the technology to be adopted by assuring market protection and stimulating the private sector (including multinational enterprises) to develop import-substituting products.

(8) Government's concern for employment generation

The Brazilian study[25] stated that in this country "there seems to be only occasional concern about level of employment absorption in the context of industrialisation policy". The Nigerian study[26] shows a greater concern by government towards direct employment generation, illustrated by the role the Industrial Training Fund plays for updating skills and by specifying local input requirements for manufacture expected in the case of joint ventures. The most conscious government policy on employment is seen in Singapore (this time, however, related to the reduction of labour requirements), where a deliberate strategy is in force for moving up to capital-intensive technology, a highly-skilled workforce and higher wages as a result of a tight labour market situation and export orientation.

Nigeria provides the largest market on the African continent. The manufacturing sector is still heavily dependent on both imported raw materials, technology and technical/managerial personnel. The need to import such inputs and the underdeveloped local infrastructure make for heavy infrastructural costs for enterprises. The wage cost has gone up considerably - it doubled from 1975 to 1981 - with little increase in productivity during the same period. The skills for managing higher levels of technology are in scarce supply and maintaining sophisticated machinery in service is, therefore, considered difficult. The government's tariff policy provides some degree of market protection but this is not too high and not envisaged for too long a period of time. New industries, without adequate capacity to meet domestic demand, find themselves in competition with imported products for which a strong market preference exists. It is against this environmental situation that the technology choice of enterprises has to be viewed.

Through the cases studied in the present report, Enterprise W's entry into the market for fuel filter inserts, as a pioneer manufacturer in the country, was possible only because it consciously opted to remain a small manufacturer and use a scaled-down technology. The use of second-hand machinery (and even one or two in-house designed machines) helped in keeping down investment cost. Had the alternative concept of a larger-scale plant been chosen, this might have made the entry into the market a relatively unviable venture. This is corroborated by the decision of the (larger) West German firm not to enter the Nigerian market as referred to above. The entry into the market of Enterprise W, even though on a small scale, created 36 jobs directly. Furthermore, indirect employment generation has ensued in the trade and service sector, although it cannot be

measured with the same precision. On the other hand, as none of the raw materials used by Enterprise W are currently manufactured in the country, no backward linkage to the local economy exists, except for the packing cartons which the firm secures from local manufacturers.

The textile industry is the largest employer of labour in the Nigerian manufacturing sector. In the spinning, weaving and finishing of textiles, 19 companies with foreign ownership exist in the country, of which 11 are firms with Third World country ownership. Most of the Third World country firms fell in the middle range as far as size was concerned. The impetus for the development of the textile industry came from the indigenisation of retail trade and incentives provided for industrialisation. A number of the textile firms of Indian origin and control did use Indian consultants and continue to use Indian managers and technical personnel.

Enterprise Z, set up in 1976, installed high-speed Sulzer looms to begin with and did the same in 1980, when they renovated their first unit. This contrasted with textile mills established earlier in Nigeria which had used the conventional looms of European or Japanese manufacture more. The decision made by Enterprise Z to opt for Sulzer looms mainly reflected the increasing wage costs in the mid-1970s. The case study of Enterprise Z indicates that: (i) the switch to Sulzer looms reduces the labour complement drastically; (ii) the machinery is much less dependent on skill and long experience and the judgment of workers for setting and operations; (iii) cost associated with the use of supplies and spares and their procurement and inventory is is drastically reduced; (iv) apart from the direct reduction in the labour requirements, the switch to Sulzer looms also cuts down on demand for spares and supplies that could have eventually been manufactured locally. If such a changeover to more automated machinery would be generalised it may postpone or even prevent the growth of a local spare parts and supplies manufacturing industry - thus taking away a considerable potential for indirect employment generation; and finally (v) the changeover to the more automatic and less labour-intensive equipment does not seem to have received any attention from the government or resistance from the labour unions' side.

These conclusions were further corroborated by the experience of one of the largest textile mills in the country that falls into the category of a Third World multinational (among the 11 mentioned above) for which further details are available. The firm, which started its operation in the early 1970s had a complement of

932 looms. It imported only a very limited number of looms from the home country; the rest were purchased from industrialised countries. Better quality looms and the more favourable terms associated with purchases from developed countries were pointed out as major factors in selecting such sources. Beginning 1978, the firm started replacing conventional looms by Sulzer machines and has so far built up a complement of 100 machines. Very little labour has been displaced with labour strength being adjusted by not filling positions which fell vacant due to turnover. The labour unions did not pose any problems when management introduced labour-saving machinery. The incentive for adoption of high-speed machinery came from increasing labour costs, high maintenance costs, reduced use of spares and supplies and the relatively short life of conventional looms due to poor maintenance capabilities.

The process described in the case study for Enterprise H may in some ways be considered a peripheral one as it focusses on a small, but essential, component which was originally imported. For small production volumes the same manual technology is employed even in a developed country, e.g. in the United Kingdom. However, Enterprise H has retained this mode of manufacturing even though the volume required per day would justify a more automated equipment. There may be three possible reasons in favour of retaining the labour-intensive process: (i) the quality of spouts is consistent with the type of product made and the costs are still low; (ii) the relatively heavy investment required in introducing automated technology. The capital involved may have alternative uses for an enterprise which is constantly seeking new opportunities for investment and growth and which experiences a shortage of capital; and (iii) automated machinery that would substitute the manual process is costly and difficult to maintain due to environmental contraints and increases the chances of breakdown and interruptions of the production flow.

The two case studies from the aluminium extrusion industry provide a comparison of two similar units: Enterprise X from an industrialised, and Enterprise Y from a developing country. Basically the production process of the industry does not provide a wide range of technology choice. The two enterprises have almost identical capacity in their basic equipment - the extrusion press. Two significant differences can, however, be pointed out. First, the enterprise from the industrialised country apparently seems to operate from a broader base, in terms of buildings, full complement of equipment (e.g. remelt facilities) and services. The developing country enterprise, on the other hand, seems to be conserving its investment in buildings and, through a progressive

investment pattern, in equipment also. Secondly, both enterprises display differences in the use of labour, as the following table shows:

Table 5: Comparison of personnel employed

A. Production Departments	No. of shifts	Enterprise X	No. of shifts	Unit Y
1.	(2)	28	(2)	24
2.	(3)	20	(3)	20
3.	(2)	13	(1)	12
	Sub-total	61		56
B. Support Services				
4.	(1)	4	(1)	5
5.	(1)	35	(1)	20
	Total	100		81

Note: This comparison involves only those departments that are common to both Enterprise X and Unit Y.

The difference in the use of labour in the production departments is explainable by the differences in level of capacity utilisation and a tighter approach to the employment of labour in Unit Y. Enterprise X seems to have a broader base in the production support departments.

The main conclusions which may derived from the case studies presented and analysed in this report can be summarised in seven points as follows:

(i) One of the three Third World multinationals strongly displayed several characteristics of technology choice which are also associated elsewhere with subsidiaries of Third World multinationals. These are: small scale of operations, use of second-hand and in-house designed machinery and special attempts at using locally-available inputs.

By the very nature of the machinery used, the operations in such situations are much more labour-intensive than in larger-scale operations. One of the incentives for using second-hand machinery seems to be to limit the amount of initial investment and the resulting improved viability of the project. Together, the small-scale operations and the limited initial investment enabled the enterprise to establish itself as a viable unit in a small market within a short period of time. In this process some new employment was generated.

(ii) The other two Third World enterprises (the textile firm and the aluminium extrusion unit surveyed bought their machinery from industrialised countries but depended on managers and technical personnel from their developing home country. The choice of textile mill equipment from industrialised countries was favoured because of the better quality and terms offered as compared to elsewhere. This seems to be a rather general pattern: firms from Third World countries in Nigeria seem to prefer such machinery as it allows more effective competition with enterprises from industrialised countries and with imported products. Any difference in employment generation between subsidiaries of industrialised country firms and Third World multinationals has to be related mainly to the way the machinery is used.

(iii) The choice of more automated textile machinery in response to rising wage and other costs, by firms of Third World origin and ownership found in the case examinations, represents a typical economic response to the problem of rising costs. This choice was free from any constraints of government policy or labour union problems. But its result was a drastic reduction in direct employment generation as well as in indirect employment potential because of the reduced scope for supply of spares and accessories from indigenous manufacturers.

(iv) As mentioned, smaller size and scaled-down production can generally be associated with Third World firms. Indeed, the textile firm studied for Nigeria is small in size compared to many home country units and other affiliates of industrialised country firms. However, this size relation may not always apply. It was found, for instance, that the two aluminium extrusion units (one affiliated to a Third World

multinational and the other to an industrialised country multinational) were practically of the same size. It would appear that the subsidiary of the industrialised country firm had, in this case, adjusted its scale to the market size by opting for only one extrusion press. As regards employment directly provided, the Third World country unit had a somewhat lower level of employment; but, by and large, the study of the two units does not allow to discern a very significant difference in choice of technology or level of employment generation.

(v) The spout-making facility - a peripheral facility - in the production process of Enterprise H discussed above illustrates an attitude of technology choice that may be the result of an exposure of managers to such production methods in other developing country situations. The attitude calls for experimentation and ability to make do with what is available. The alternate use for scarce capital and ability of the process to meet functional requirements of the product may have been equally important.

(vi) The pressure to conserve capital in each investment, particularly in buildings and a progressive approach to investment favour choice of smaller scale of operation and perhaps the establishment of less-integrated and less-automated units, which all together may tend to generate more employment.

(vii) Finally, the environmental situation for technology choice in Nigeria may be delineated as follows: the Nigerian market is seen as a relatively small one. The major focus of production is toward domestic consumption. Both these factors provide opportunity for scaling down, production modification and adaptation to local conditions and a related adaptation of technology. The absence of infrastructure facilities for immediate supply of spares and repair services and shortage of skilled manpower to operate sophisticated machinery tend to favour a selection of less-automated technology. On the other hand, the minimal level of market protection and the competition with imported products that are needed to fully meet local demand, put pressure on local manufacturers to be quality and cost effective. The rising wage levels, relatively low productivity and the high infrastructural costs are all factors favouring, as time goes on, the choice of more automated technology. The absence of a specific government policy promoting the choice of labour-intensive technology facilities such choices.

8. Some policy implications

(1) The present study suggests that the technology choice/employment generation issue must be perceived differently at various levels and in the different sectors:

(a) In the manufacture of fuel filters, for instance, the adoption of labour-intensive technology operates benefically as long as that technology is capable of producing quality products at a competitive price. Its major benefits are direct employment generation and the effective satisfaction of needs.

(b) In the textile industry employment generation was experienced both directly as well as through linkages with other sectors, such as supply of spares and their manufacture. The switch to capital-intensive machinery in this section reduced both direct and indirect employment generation drastically.

(c) The aluminium extrusion industry has considerable pontential for employment generation through the use of its products in subsequent stages of manufacture. The industry itself offers limited choice in technology; and the increase or decrease in employment due to the use of labour-intensive or automated production processes seems insignificant compared to its indirect employment potential.

An employment-oriented technology policy would have to discriminate amongst choices of technology in different areas. It would have to favour greater labour-intensive technology choices in situation(a) and more capital-intensity in situation (c) above.

(2) National objectives of employment generation through industrialisation can only be realised through concrete policy directives and follow-up measures. Therefore, each major industrial investment project may need to be screened for its direct and indirect employment potentials so as to determine its relative priority in the industrialisation scheme.

(3) The role of tariff protection in stimulating labour-intensive and higher employment-generating technology choices would need to be fully explored.

(4) The government may not be able or wish to act as a watch-dog in all cases of a switch to more automated and employment-decreasing technology by individual enterprises although labour unions are certainly in a good position to perceive these effects.

Footnotes

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[14] O. Iyanda and J.A. Bello: Employment effects of multinational enterprises in Nigeria, Multinational Enterprises Programme Working Paper No. 10 (Geneva, ILO, 1979).

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[17] Wells: Technology and Third World multinationals, op. cit.

[18] Bello and Iyanda: Appropriate technology choice and employment creation by two multinational enterprises in Nigeria, op. cit.

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ANNEX

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