Productivity growth in Nigerian manufacturing and its correlation to trade policy regimes/indexes (1962–1985)

By

Louis N. Chete
Economic Development Department
Nigerian Institute of Social & Economic Research (NISER)
Ibadan, Nigeria

and

Adeola F. Adenikinju
Centre for Econometric and Allied Research (CEAR)
Department of Economics
University of Ibadan, Ibadan, Nigeria

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Abstract

While the centrality of productivity enhancement to growth acceleration is one issue around which broad consensus exists in theory and empiricism, the role of trade policy in fostering productivity growth has received only modest attention. Recently, however, a considerable body of knowledge has accumulated on the importance of trade policy to the productivity process.

To be sure, there are two divergent perspectives. One view posits that trade liberalization will stifle industrial productivity by opening up the economy to superior foreign products, compelling infant industries to close up. The other, and more pervasive, holds that outward-oriented trade policy will engender overall industrial efficiency in the economy by exposing local firms to competition and thereby improve the allocation of resources across sectors.

This paper computes total factor productivity growth (TFPG) for the aggregate manufacturing sector of Nigeria and across the various subsectors and correlates these with specific indexes of trade policy. The results generally corroborate the mainstream view of a positive correspondence between trade liberalization and productivity growth.

1. Introduction

Productivity enhancement remains crucial to the drive for rapid industrialization and economic growth in less developed countries. The growth literature is definitive on the centrality of productivity improvement to the fostering of growth. Indeed, this is one of the most significant stylized facts that have emerged from the empirical literature.[1]

Perhaps cognizant of the foregoing, several policy articulations in Nigeria have placed productivity concerns at their centre. In point of fact, however, except for the setting up of institutions like the National Productivity Centre,[2] efforts in this regard have usually not exceeded the level of rhetoric. Indeed, at some point, official verbalizations have tended to accord attention to the mobilization of resources in preference to the efficient use of the available quantum. Nevertheless, productivity issues have received greater emphasis since the adoption of the economic reform programme with the move towards a market economy and the accompanying stress on efficiency.

These reform efforts explicitly emphasize the need to improve the competitive performance of industry. As a corollary, adjustment at the enterprise or industry level can be conceptualized as the process of reallocating resources in accordance with changing conditions and improving cost competition through total factor productivity change.

Why study productivity

As evident from the above, research on the productivity phenomenon has been the preoccupation of several scholars for decades, although these inquiries made no, or at best tepid, allusion to how trade policy impinges on productivity. In more recent times, however, a great number of studies have emerged that regard the role of trade policy as central to the productivity process. A survey of the literature reveals two conflicting positions. One view contends that trade liberalization will stifle industrial productivity since it opens up the economy to superior foreign products compelling infant industries to close down. The other holds that outward-oriented trade policy will induce overall industrial efficiency in the economy by exposing local firms to competition and thereby improve the allocation of factors across sectors and increase the value of domestic production.

Productive efficiency can be conceived of as arising from scale efficiency and technical efficiency (Corbo et al., 1988). A less protectionist trade regime increases scale efficiency for a number of reasons. First, because trade enlarges the domestic market, which might be too small for the efficient production of goods that show increasing returns to scale, and second, because in domestic markets characterized by excess profits arising from

protection and free entry, trade reduces excess profits and discourages entry by small, inefficient firms.

A more liberal regime contributes to greater technical efficiency for a variety of reasons. First, greater competition from abroad forces domestic firms to adopt newer, more efficient technology that reduces x-inefficiency and waste. Second, in the case of developing countries, freer trade eases constraints imposed by the availability of foreign exchange and hence enables a country to import foreign goods that embody a more advanced technology than domestic capital goods. Third, a more open economy results in faster adoption of technological progress.

Purpose of this study

For Nigeria, the association between trade policy and productivity has been largely conjectural. To address this knowledge gap, this study attempts to establish whether trade policy leads to productive efficiency in the manufacturing sector of the Nigerian economy.

The broad objective of this study is to investigate the role of specific trade policy impulses—exchange rate, tariff and non-tariff barriers—in enhancing or impeding productivity in the manufacturing sector of the Nigerian economy. Specifically, the study:

- Characterizes trade policy reforms in Nigeria with attempts to attribute productivity changes to different phases in trade policy evolution.
- Estimates trends in productivity performance in the organized manufacturing sector at a detailed level of disaggregation with a view to understanding the productivity phenomenon over time and across industries.
- Correlates productivity growth in the manufacturing sector with indexes of foreign competition such as export growth, degree of openness, and tariff and exchange rate indexes.

Consistent with these objectives, the report is organized as follows: In the following sections, the theoretical framework is sketched and some related studies are reviewed. In Section 5, the manufacturing sector is examined in perspective. Trade policies are characterized in Section 6 while Section 7 is devoted to the methodology, including the presentation of the database and articulation of the model. Section 8 presents results from the model estimations and Section 9 from correlation analysis between productivity estimates and indexes of trade policy. Section 10 proffers some policy advice and concludes.

2. Theoretical framework

The economic theory of production provides the analytical framework for most empirical research on productivity. At the core of the theory is the production function, which postulates a well-defined relationship between a vector of maximum producible outputs and a vector of factors of production. Historical analyses of total factor productivity change conceptualize it as the change in output level controlling for input levels, i.e., the vertical shift of the production function.Consequently, factor productivity has been given such labels as the "residual" or "measure of our ignorance".

Understanding the character of factor productivity has been a critical concern to economic scholars. As Nelson (1981: 1032) observed:

> The first kind of question probably has received the most attention. It is noteworthy, therefore, that despite all the effort to make the "residual" go away it still is very much with us. And despite all the effort to give substance to its interpretation as "technological advance" or "advance of knowledge", that interpretation is far from persuasive. Everybody knows that the residual accounts for a hodge-podge of factors, but these are difficult to sort out. If this "measure of our ignorance" is not completely mysterious, it certainly is not well understood.

A number of studies have attempted to characterize productivity change as embracing technological advance, changing composition of the work force, investments in human capital, reallocation of resources from lower to higher productivity activities, and economies of scale (Nelson, 1981). To Nadiri (1970: 12), "productivity change is both the cause and the consequence of the evolution of dynamic forces operating in an economy—technical progress, accumulation of human and physical capital, enterprise and institutional arrangements".

Despite the haziness underlying the broad issue of productivity, the specific theme of trade policy and productivity growth has much more robust and clear-cut theoretical formulations underpinning it. One such theoretical construct is the x-efficiency argument. This was alluded to in the preceding section and further elaboration can be sought in Tybout (1991, 1992). To recapitulate: development economists for a variety of reasons routinely argue that trade protection reduces industrial sector efficiency. In markets characterized by entry barriers, the absence of foreign competition allows domestic producers to enjoy monopoly power and excess profits. Consequently, these firms may fail to produce at minimum efficient scale (achieve "scale efficiency") and/or to get the

maximum possible output from their input bundles (achieve "technical efficiency" or "x-efficiency").[3]

This scenario is reversed when there is more liberalization and greater opening up to international competition. There is an implicit "challenge response" mechanism induced by competition, forcing domestic industries to adopt new technologies to reduce x-inefficiency and generally to reduce costs wherever possible. According to this argument, export expansion is good and so too is import liberalization. While the policy of increasing imports may restrict the market for domestic goods, it also increases competition and hence induces greater efficiency (Nishimizu and Robinson, 1983).

Increasing returns formulation provides another line of argument common in the development literature. The contention here is that production costs will decline when markets are widened as a consequence of freer trade. Kaldor (1967) attributed this to the presence of scale economies, while Vedroom (1947) expressed it in terms of labour productivity (the phenomenon was subsequently called "Vedroom's law" after him). The argument is usually cast in terms of the benefits of expansion in demand through increased exports.

A third theoretical postulate linking trade and productivity is based on the literature on foreign exchange constraints. In developing countries, intermediate and capital goods imports are not readily substitutable with domestically produced goods. In a sense, these imported inputs embody technologies that are unavailable to domestic producers and can only be obtained through imports. Consequently, policies that curb the availability of such imports, or make them more expensive, will lead to poor productivity performance. By contrast, policies that increase the availability of imported inputs or lower their cost (e.g., increased foreign aid or an export-led development strategy) will lead to cost reductions to domestic industries and hence to better productivity performance.

Technological catch-up models constitute another strand of the theoretical framework. Rodrik's (1988) work contains a framework in which the representative firm's rate of catch-up to international productivity levels depends positively on its market share. In his view, trade reforms would likely accelerate the transition to state-of-the-art technologies among exportables and decelerate the process among import competing sectors. Another formulation by Rodrik (1988) contends that one way domestic producers compete is through choice of technique. Hence, producers could tacitly collude when protected from foreign competition by failing to modernize their plants; trade liberalization may induce defection from the collusive equilibrium.

It is pertinent to note that the foregoing theoretical formulations are not mutually exclusive. The current state of knowledge does not make it possible to discriminate finely among them. Indeed, it may not be possible to state with any real confidence what is the direction of causation, as the possible relationships are myriad.[4]

3. Review of related studies

The literature on this theme has been growing. Copious documentation can be found in Havrylyshyn (1990). Tybout's (1991) contribution was in the exploration of new research directions, while Edwards (1989) was preoccupied with the survey of the empirical literature linking economic growth to trade policy.

Since the Bhagwati (1978) and Krueger (1978) studies of trade regimes pioneering the explicit analysis of the relationship between trade policy and productivity growth, a considerable body of knowledge has accumulated on the subject. Expectedly, these studies are distinguished by the polarization of views about the magnitude and direction of causation between both variables.

Nishimizu and Robinson (1983), for example, explored the impact of trade regimes on sectoral TFP growth within a quantitative framework in a study embracing Korea, Turkey and Yugoslavia with Japan as the comparator. Their analysis, conducted within the purview of inter-industry differences in TFPG at the two-digit level, leads them to conclude that substantial portions of the variation in TFP growth rates are explained by output growth allocated to export expansion and import substitution in Korea, Turkey and Yugoslavia, but interestingly not in Japan. Proceeding to obtain the elasticities of TFPG with respect to "export expansion" and "import substitution" for the different industry groups, Nishimizu and Robinson conclude that import substitution regimes seem to be negatively correlated with TFP change, whereas export expansion regimes are positively correlated with TFP change.

Studies in a similar mould include that by Bergsman (1991) conducted for Brazil. Having identified two categories of firms, the low-cost inefficient firm with high profit and the high cost "quiet life" inefficient firm, Bergsman found that protection affords both firms more imports, which one used to be technically lazy and comfortable and the other to achieve higher profits through greater efficiency.

Krueger and Tuncer's (1982) study of Turkey also bears noting. Using sector level data, they provided stronger support for the efficiency gains to be derived from liberalization and concluded that periods of greater liberality have coincided with periods of faster growth in total factor productivity. Parallel conclusions have also been reached by Condon, Corbo and de Melo (1985) for Chile, Page (1980) for India, and Pitt and Lee (1981) for the Indonesian weaving industry.

There are contrary views on the association between trade liberalization and productivity growth, however; Tsao (1985) finds for Singapore, a country with extremely rapid growth of industrial exports, that productivity growth in the 1970s is negligible or negative in some sectors of manufacturing. Pack (1988: 4) also wrote that "comparisons

of total factor productivity growth among countries pursuing different international trade orientations do not reveal systematic differences in productivity growth in manufacturing...". After reviewing studies based on within-country temporal correlations, Pack (1988) and Havrylyshyn (1990) both conclude that there is no strong evidence linking productivity and openness.

It is evident from this review that barring differences in methodological approaches and coverage, there is no consensus on the impact of trade policy on productivity growth. The link is therefore clearly an empirical issue. By way of adding to the growing evidence on this theme, this study explores the trade–productivity nexus in the Nigerian manufacturing sector.

4. Overview of Nigeria's manufacturing sector

Nigeria's manufacturing value added (MVA) of an estimated $3.4 billion in 1985 ranks her as Africa's largest manufacturing economy after Egypt and twelfth among developing countries.[5]

Yet despite two decades of growth boosted by import substituting policies, Nigeria's manufacturing sector remains heavily import dependent. This has been the inevitable outcome of a perverse incentive structure that accelerated the growth of import intensive consumer goods and light assembly industries contributing relatively little value-added under high protective walls while decelerating growth of local resource-based industries. For example, the share of food and textile products in manufacturing output fell from 51% in 1973/74 to 36% in 1977/78, while the share of durable goods with low value added rose from 7% to 19% during the period. Within the durable goods subsector itself, the share of transport equipment, which has low value added, rose from about one-tenth of one percent to 11% during 1971/72–1977/78. The net effect of this is that import dependency was fostered in the manufacturing sector in the 1970s.

The manufacturing sector encapsulates a wide range of industrial activities, from informal sector enterprises using simple technology to heavy capital goods industries in the automotive and electrical equipment sector. Out of this, a wide spectrum of light consumer goods dominates the manufacturing profile. These have been nurtured and reinforced by regimes of "easy" import substitution, localization of assembly and final processing of relatively simple products. The earliest attempt at manufacturing saw the establishment of agro-based industrial concerns such as vegetable-oil extracting plants, tanneries and tobacco processing units. Textiles, breweries and cement manufacturing concerns soon followed.

The structure of manufacturing production has been a derivative of the various developments plans. The First National Development Plan (1962–1968) emphasized light industry and assembling activities. The second plan (1970–1975) had a somewhat similar thrust and focus, but the emphasis shifted in the third plan (1975–1980) towards heavy industries. Major projects were initiated in the steel and petroleum refinery sector. For the fourth plan (1980–1985), the broad direction was in consonance with the third: it retained the stress on heavy industries. But several of the grandiose plans were short changed with the onset of profound economic crisis in the early 1980s. The ensuing balance of payments difficulties forced the authorities to reschedule or outright jettison some projects. The iron and steel subsector was particularly seriously hit by these developments.

Table 1 provides details of the manufacturing structure for selected years. Consumer goods industries dominate the sector in terms of both value added and employment.

These industries accounted for as much as 75% and 70% of the sector's total value added and employment, respectively, in 1984. The leader in the subsector is food, beverages and tobacco, contributing 32 and 20% of value added and employment in 1984. It is followed by textiles and wearing apparel, paper products and printing, plastic and rubber products, etc. In the food subsector, the key activities include baking, grain milling, processing of dairy products and sugar, and confectionery processing. Beverages inclusive of beer and soft drinks contribute as much as 20% of the manufacturing sector's value added. The textile industry also contributes significantly to value added and employment.

The share of intermediate goods[6] in value added declined from about 24% in 1971/72 to 19% in 1984. Similarly, their share of manufacturing employment also fell from 29% to 23% over the same period (Table 1). Metalworking, and chemicals and paints were the most important subsectors in this category in terms of their relative contribution to value added, while metalworking, sawmill and wood products, and building materials were the leading subsectors in terms of employment in the 1970s. Cement processing constituted a very important activity within the building materials category; cement plants were expanded and new ones established in the 1970s in an effort to meet the housing and infrastructure development programme. Today, many of the cement plants face the

Table 1: Distribution of manufacturing value added and employment by industry grouping

Industry grouping	1971/72		1977/78		1980		1984	
	Value added	Employ-ment	Value added	Employ-ment	Value added	Employ-ment	Value added	Employ-ment
Consumer goods	74.5	70.3	65.7	71.8	62.6	69.9	74.9	69.9
Food, beverages & tobacco	26.6	35.7	26.5	21.0	27.6	19.9	32.1	19.6
Textiles & wearing apparel	27.7	18.0	14.6	26.4	8.9	19.7	15.2	18.3
Leather goods & footwear	2.3	0.7	1.2	1.8	0.7	1.3	2.5	3.8
Paper products & printing	7.6	4.6	5.2	5.6	4.3	6.6	5.2	6.7
Wood and metal furniture	6.1	2.1	3.8	5.2	3.7	6.6	2.1	3.8
Plastics & rubber products	5.1	2.3	3.3	6.1	4.1	9.1	2.9	4.5
Other non-durable goods	4.6	6.2	10.2	5.2	12.2	5.8	13.5	12.2
Television and radio	0.6	0.8	0.9	0.5	1.0	0.9	1.4	1.0
Intermediate goods	24.2	29.0	25.8	23.1	15.8	23.5	18.5	22.8
Chemicals and paints	1.9	11.5	7.9	2.4	3.0	2.2	1.0	1.3
Leather tanning & finishing	0.6	0.4	0.4	0.4	0.2	0.2	0.1	0.3
Tyres and tubes	1.5	2.4	0.8	1.0	0.6	0.9	0.8	0.6
Sawmills and wood products	6.1	2.1	0.8	5.0	3.4	7.5	0.4	1.9
Building materials	4.0	3.7	4.9	6.1	0.4	0.7	3.8	2.2
Metalworking industries	8.7	8.2	8.7	8.8	4.6	6.9	8.5	12.2
Miscellaneous	1.4	0.7	0.3	0.4	3.8	5.1	4.0	4.2
Capital goods	1.3	0.7	8.5	5.1	21.5	6.6	6.6	7.4
Machinery & equipment	0.3	0.2	3.5	1.6	0.6	1.1	1.1	1.0
Electrical equipment	0.6	0.4	1.0	0.9	0.7	1.1	0.9	1.3
Transportation equipment	0.4	0.1	4.0	2.6	20.0	4.4	4.6	5.1
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: World Bank (1990).

problem of low capacity utilization despite the presence of considerable excess demand, which has induced high retail prices and windfall profits for middlemen. In the middle of 1989, the retail price of a 50kg cement bag was approximately ₦40, while controlled ex-factory prices were only ₦17.50 per bag.[7]

Capital goods industries are still relatively less important.[8] As a share of value added, they rose from less than 1.3% in 1971/72 to 9% in 1977/78, reaching a high of 22% in 1980, before declining to 7% in 1984. The poor performance of the heavily import-dependent vehicle assembly plants accounts for most of the decline in the group's share. The group's share in employment is about 7%.

Other features of the manufacturing sector include low value added, high production costs deriving from the exorbitant cost of plant and equipment, high cost of construction and of expatriate skilled labour, the fact that firms provide infrastructure investment[9] themselves, and the high geographical concentration of public investment around highly capital-intensive sectors by international standards (steel, fertilizer, pulp and paper, cement, petrochemicals, etc.). According to the 1984 survey of manufacturing enterprises by the Federal Office of Statistics, domestic value added was only 14% of the value of gross output and over two-thirds of the raw materials were imported.

To offer insights into the relative position of manufacturing in the output profile, Table 2 shows the structure of the gross domestic product (GDP) for Nigeria between 1960 and 1990. From a modest 4.8% in 1960, manufacturing contribution to GDP increased to 7.2% in 1970 and to 7.4% in 1975. In 1980 it declined to 5.4%, but then surged to a record high of 10.7% in 1985. By 1990, the share of manufacturing in GDP stood at 8.1%.

Table 2: The changing structure of GDP in Nigeria, 1960–1990, by sector of origin

Sector	1960	1970	1975	1980	1985	1990
Agriculture	62.9	48.8	30.1	22.2	35.1	39.0
Mining & quarrying	1.2	10.1	31.6	26.8	16.1	13.2
Manufacturing	4.8	7.2	7.4	5.4	10.7	8.1
Construction	4.8	5.1	5.5	8.5	1.8	1.9
Electricity, gas & water	0.4	0.7	0.4	0.5	0.7	0.6
Transport & communication	4.9	2.8	3.2	4.1	4.8	3.4
Trade & finance	12.4	12.8	22.7	25.0	19.8	21.4
Public administration & defence	3.3	6.5	6.6	4.5	6.1	8.4
Others	5.3	6.0	15.2	3.0	4.5	4.0
GDP at factor cost	100.0	100.0	100.0	100.0	100.0	100.0

Source: Federal Office of Statistics, *Annual Abstract of Statistics*, various years, Lagos.

A cursory examination of the foregoing statistics reveals that as a share of GDP, manufacturing performed best between 1985 and 1990, which corresponds to a period of trade liberalism. This conclusion is tentative, however, and will need to be corroborated by more rigorous analysis.

Contained in Table 3 are selected indicators of economic growth in Nigeria between 1960 and 1989. As evident from the table, the mean annual growth rate of manufacturing

was 9.1% between 1960 and 1970. In the decade 1970–1980, which reflected the oil boom era, manufacturing output accelerated by 12%, but in the 1980–1989 period, which largely approximates the crisis years, manufacturing grew by a dismal 0.8%.

The rapid growth recorded in the 1970s is phenomenal by African standards. However, this performance is partly due to the manufacturing sector's small base (Oyejide, 1975) as it was not reflected in its relative contribution to the GDP. Structural imbalances emerged in subsequent years and almost completely eroded this performance.

Table 3: **Selected indicators of economic growth in Nigeria, 1960–1989 (average annual growth rate in percent)**

Period	1960–1970	1970–1980	1980–1989
GDP	3.1	6.5	-0.5
Agriculture	-0.4	0.8	1.3
Industry (including mining)	12.0	8.1	-2.1
Manufacturing	9.1	12.0	0.8
Services	4.9	9.7	-0.4
Private consumption	1.1	6.6	-4.8

Source: World Bank: *World Development Report,* 1982 and 1991.

The drastic reduction in imports following the introduction of austerity measures in 1982 and general policy reversals in the sector had telling impacts on the manufacturing sector, exposing its weaknesses. Further, the sharp depreciation of the naira adversely affected most manufacturing concerns except for a few consumer goods, mainly because of the escalating cost of imports and lack of spare parts, machinery and raw materials, weak demand resulting from declining domestic purchasing power, high interest rates, and gross underutilization of capacity (see Table 4).

Table 4: Average capacity utilization, 1986–1988

Subsector	Average capacity utilization (%) (weighted average)[a]		
	1986	1987	1988
1. Food, beverages & tobacco	44.237	50.859	55.7111
2. Non-metallic mineral products	81.136	83.166	79.306
3. Wood products & furniture	37.014	42.836	53.706
4. Electrical & electronics	37.335	37.845	27.265
5. Domestic & industrial rubber	59.774	68.974	78.924
6. Paper products & printing	3.164	19.294	22.155
7. Leather products	50.364	50.444	49.485
8. Textiles	47.893	56.755	64.107
9. Basic chemical & pharmaceutical	15.492	21.322	35.333
10. Engineering[b]	30.00	25.00	20.00
Aggregate average (percent)	42.5340	47.4046	50.6461

Notes: a. Weighted firm value of output and subsectoral value added weights.
b. Estimates from sector study.
Source: World Bank (1990).

5. Trade policies

Since independence in 1960, Nigeria's trade policies have evolved remarkably. Three overriding considerations have, in general, conditioned trade policies. The first was a preference for protectionist policies at independence to stimulate industrial development consistent with the import substitution industrialization strategy of the time. The second was the oil boom phenomenon with the attendant economic buoyancy and prosperity, which prompted a relatively lax policy in the 1970s. And the third factor was the switch in trade policy stance in response to the external balance position. In periods of major economic distress and balance of payments straits, trade policies have in general assumed a restrictive posture evidenced by the compression of imports through quantitative restrictions.

For ease of characterization, this review is partitioned into subperiods: 1962–1972, 1973–1981, 1982–1985. These periods loosely approximate particular episodes: the pre oil boom years, the oil boom period and the pre adjustment era.

1962–1972 - The pre oil boom years

Broadly, the thrust of trade policy during this period was on revenue generation and protection of domestic industries in line with the import substituting industrialization strategy. Consequently, high tariff and non-tariff barriers characterized the period. Tariffs as high as 120% were imposed on commodities like textiles, beverages and tobacco (Kayode and Teriba, 1977).

Nigeria had a selective (non-uniform) single column tariff system in 1965 consisting of both specific and ad valorem rates. Before 1962, the rates were generally low—usually not higher than 33 and one-third percent—and remained stable as long as the revenue generating objective was met. Between 1964 and 1965, however, tariff rates were altered at least twice yearly. This trend, which has persisted, has been attributed to weaknesses inherent in Nigeria's tariff policy-making machinery (Oyelabi, 1971). Prior to 1966, tariffs had the effect of controlling the composition of imports. But when, from 1967, balance of payments and foreign exchange difficulties became acute, the tariff structure was redesigned to control both the composition and the volume of imports. Thus, it is possible to identify some stages in the evolution of tariff policy during this period. During the first phase dating back to the 1950s and leading to 1961, changes in the tariff structure were infrequent and conditioned by revenue generating considerations. A further objective of protecting the country's nascent industries was added in the second stage beginning in

1962. Consequently, tariff rates were revised upwards over this phase. A third objective of stemming external disequilibrium gained prominence at the third stage beginning in 1967. Deficits occurred because the foreign exchange reserves built up in earlier years were depleted as a result of rapid industrialization between 1960 and 1965. Besides, inflow of capital virtually ceased because of political instability engendered by the two coups d'etat of 1966 and, finally, huge resources were deployed in the purchase of military hardware during the civil war.

However, with the cessation of hostilities and expansion of the oil industry in the 1970s, the use of tariffs as a major source of government revenue declined. Furthermore, strong inflationary pressure arising from war-created scarcities of commodities became so politically explosive that tariff rates had to be revised downwards and quantitative restrictions were removed in 1971.

1973–1981 - The oil boom

This period corresponds to the oil boom era, when enormous financial resources accrued to the government. This provided the impetus for considerable liberalization of imports. The role of tariffs as a source of revenue to the government was tempered as the economy became more open. With a favourable balance of payments position, government control on the economy was relaxed. The exchange rate was devalued by 10% in 1973, in response to the United States devaluation of the dollar by the same percentage. The fixed exchange rate led to the over-valuation of the naira by about 45% in the 1970s.

Specific tariff policy measures included the reduction of import duties on a wide range of commodities, industrial raw materials, food and other consumables. For example, duties on industrial raw materials were reduced to a uniform rate of 10% in 1974. Duties on building materials were also slashed by 60%. In 1975, licensing requirements for a number of items were liberalized, while trade bans imposed on some others were lifted. Thus, licensing requirements for stock fish were removed and the ban on importation of corned beef, margarine, edible nuts, etc., was lifted. In 1976, import and excise duties on food and other commodities associated with agriculture and food processing activities were considerably cut, and import levy was abolished for stock fish, baby food and other products. Besides, duties on means of transportation such as trucks, lorries, vans and their spare parts were slashed from 33 and one-third percent on average to 10%.

However, following government's resolve to encourage the growth of local industries by protecting the domestic market for specific industries in 1977, nominal tariff rates on a wide variety of imported finished goods were raised. They included clothing, flash batteries and electric filament. Import licensing requirements were reintroduced for a number of consumer goods, while the importation of all cars above 2,500cc was banned. Other prohibited items included lace, net fabrics, galvanized buckets, carbon paper, beer bottles and textile fabrics of all types. Selective tariffs were imposed on a wide range of commodities for the purposes of changing the consumption pattern of Nigerians towards homemade goods, preventing the erosion of foreign exchange reserves, avoiding the

dumping of stale products into the country's shores, consolidating the import substituting industrialization strategy and freeing foreign exchange for development purposes. A number of items were also banned outright and import licensing slammed on a couple of others pursuant to these objectives.

There was also an exchange rate switch, albeit temporarily, during 1977/78 from a fixed rate to a managed float. From 1979 until 1986, however, the naira was pegged to a basket of hard currencies.

Persistent balance of payments deficits occasioned by dwindling oil revenue between 1976 and 1978 prompted greater trade restrictiveness. Non-tariff quantitative import restrictions became dominant as an instrument of trade policy. Plummeting foreign exchange reserves and increasing debt service payments, coupled with the reluctance of the country's trading partners to extend further trade credit, forced the authorities to adopt extremely stringent quantitative restriction measures to curb importation. Some 82 items were prohibited absolutely. These included cigarettes, live poultry, textile fabrics of all types, ornaments, bottled beer and stout, jewellery, and others.

1982–1985 - Period of adjustment

Because of persistent external disequilibrium—huge balance of payments deficits and depletion of external reserves to the level that it could hardly finance one month's imports—an Economic Stabilization (Temporary Provisions) Act was enacted in 1982. This act imposed a blanket ban on "non-essential" imports and the list of goods requiring licences soared to 235 items. Tariff increases were effected on 49 items and new duties were placed on some others. Compulsory advance deposits for imports were imposed on certain classes of imports as follows: raw materials 25%, spare parts 25% later reduced to 10 and 15%, food (except rice) 50%, medicaments 50%, building materials 50%, capital goods 50%, motor vehicles and trucks 20%, motor cars 25%.

In 1983, an additional 152 commodities were added to the list of imports subject to specific import licence. Industrial materials or intermediate goods that had largely been under open general licence (OGL) were brought under specific import licence (SIL) to enhance control over foreign exchange expenditure. The OGL was subsequently abolished in 1984 and all imports were brought under SIL. Further, in 1984, the new military administration promulgated the Foreign Exchange Anti-Sabotage Decree, 1977, under which illegal traffickers in foreign exchange and exporters who failed to repatriate export proceeds could be prosecuted. Despite these measures, the Nigerian economy continued to experience problems of low domestic output, high rates of inflation and unemployment, and inadequate foreign exchange earnings. Domestic output declined by 8.5% in 1983 and 5.5% in 1984.

6. Methodology

Our account of the study methodology begins with a description of the database and our steps to cope with missing or incongruent data. It also presents the model used for the study and describes the variables.

The data base

The period of analysis stretches from 1962 to 1985. The first Survey of Manufacturing Industries (SMI) in Nigeria was conducted in 1962, while the last one available in processed form was in 1985. There was no survey in 1986. Those conducted between 1987 and 1990 are currently being analysed by the Federal Office of Statistics. The decision to begin our analysis from 1962 as against 1970 proposed in our earlier presentation is informed by the need to allow for a greater degree of freedom through increased observations and thus improve the quality of our inferences.

Time series data were collected for value added, capital stock, employment, and wages and salaries at industry level. These are complemented with data on the manufacturing sector price index, imports, exports, exchange rate, etc., sourced in the main from the IMF's *International Financial Statistics* and to a lesser extent from the Central Bank of Nigeria's *Statistical Bulletin*.

As indicated earlier, the industry level data were obtained from Nigeria's industrial surveys. The surveys cover manufacturing establishments employing ten or more persons and have been conducted annually except for 1979 and 1986. Observations for the missing years were obtained through interpolation of the data for the boundary years. The SMI defines our variables of interest as follows:

- Value added as gross output net of intermediate inputs.
- Labour input as total number of people employed in the establishment, including working proprietors, active partners, unpaid family workers, apprentices and others who work in the establishment for at least one-third of normal working time.
- Wages and salaries as gross cash payments to employees before any deductions, as well as other labour benefits such as remuneration for the time no work was done, bonuses, gratuities, etc.
- Net capital expenditure as the value of all capital goods expected to have a productive life of more than one year, including major additions, alterations and improvements to existing assets that extend their normal economic life or raise their productivity, but excluding all fixed assets sold.

A major limitation of the SMI data is the variation in response and coverage. This is expected as a result of exit of old firms and entry of new ones. Since the variation in coverage is not too pronounced, especially after 1978, it may not alter our results significantly. As Ahluwalia (1991: 31) noted, "this problem is not of much significance in the analysis of productivity growth because factor inputs are also subject to the same variation".

There is also the problem of variation in the classification of industries since 1980. Prior to 1980, there were 47 industrial classifications as some categories of industries were merged, e.g., ISIC code 3113 and 3134 (canned fruits and soft drinks) or ISIC codes 3822, 3823 and 3829 (agricultural machinery, metal woodworking machinery, and machinery and equipment, respectively). From 1980, these classifications increased to 66 when each ISIC code was treated in isolation. To redress the variation, we simply reaggregated the 66 classifications to 47. Next, we aggregated the 47 three-digit ISIC codes to 16 two-digit ISIC groups as:

1. Food manufacturing
2. Beverages
3. Textiles
4. Leather and leather products
5. Wood and wood products
6. Paper and paper products
7. Industrial chemicals
8. Other chemical products
9. Rubber products
10. Non-metallic mineral products
11. Other non-metallic mineral products
12. Basic metals
13. Fabricated metal products
14. Electrical machinery
15. Transport equipment
16. Other industries

Data on value added, wage payments and capital were deflated using the manufacturing sector price index.

Another variable of relevance is the capital stock and here we note that capital stock estimation has always been an issue of considerable controversy in the theoretical and empirical literature. These controversies derive largely from its nature—malleability, measurability and aggregation difficulty.[10] Generally, it is hard to estimate capital stock, especially in developing countries, and particularly at a detailed level of disaggregation as conceived in this study. This explains why some studies explicitly exclude the capital variable because such data are at best unreliable or outright misleading.[11]

The methodology adopted for our purpose is a second best one and is dictated by data availability considerations. We used data on book value of fixed assets, which was published in the SMI for selected years, 1962, 1966, 1968/69 and 1972. But for the remaining years, inclusive of 1968, 1969 and 1972, the reported data were on net capital

expenditure. Taking 1962 as base, we cumulated net capital expenditure over the years. The series generated was then deflated using the manufacturing sector price index to derive gross capital expenditure at constant prices.

The model

Two broad approaches to estimating total factor productivity growth (TFPG) can be distilled from the literature, the parametric approach and the non-parametric approach. However, the latter, which incorporates the growth accounting method, seems to be more popular (see Solow, 1957, and Kendrick, 1961).

Both approaches adopt similar methodology for estimating TFPG except that while the non-parametric approach imposes strong assumptions of competitive equilibrium and constant returns to scale,[12] the parametric approach eases the constraint of perfect competition and allows for the assumption of constant returns to scale to be empirically invalidated. Notably, too, both approaches decompose sources of growth of output into growth of factor inputs and that of TFP.

For this study, we use both approaches. First, we estimate TFPG using the non-parametric approach. This is derived as follows:

Assume a production function at the sectoral or industry level:

$$Q = f(v,t) \tag{1}$$

Q is value added, v is a vector of primary inputs and t is the time index measuring productivity growth broadly defined (which embodies technological innovation or improvement and the efficiency of existing technologies).

Equation 1 can be respecified in growth terms to isolate the role of TFPG:

$$\lambda Q,t = \frac{\dot{Q}}{Q} - \sum_{J=I}^{K} \theta_j \frac{\dot{v}_j}{v_j} \tag{2}$$

Here, dots denote total derivative with respect to time, θ_j measures the elasticity of output with respect to input j and λ_j[13] measures the elasticity of output with respect to time. Under perfect competition, where factors are paid their marginal products, θ_j may be replaced with factor shares ($s_j = w_j v_j / PQ$) and we then estimate the TFPG using a divisia index:

$$\lambda Q,t = \frac{Q}{Q} - \sum_{j=I}^{k} S_j(\dot{v}_j / v_j) \tag{3}$$

The "hat" on $\lambda Q,t$ indicates that it is an estimator and its implementation requires

that instantaneous time derivatives be replaced with discrete changes using a superlative index, such as the Tornquist index where s_j is replaced with averages of current and previous period shares. One flexible functional form for which the Tornquist index is exact is the translog production function, which can be stated as:

$$\Delta \log TFP_t = \Delta \log Q_t - [(S_L(t) + (S_L(t-1)/2] \\ \Delta \log L_t - [(1 - S_L(t)) + (1 - S_L(t-1))/2] \Delta \log K_t \quad (4)$$

where S_L is the share of labour income in value added, L is labour input, K is capital input, t is time and other variables are as previously defined.

The S_L denotes the weighting system for the factor inputs. Following the lead in Ahluwalia (1991), we eliminated the noise element in the estimates by analysing the trend growth rates derived from estimating a semi logarithmic equation:

$$\log TFP = a + bT \quad (5)$$

A multiplicative time dummy variable was then used to test for shifts in the TFPG during the period of the analysis. A hypothesis to inquire if the period of "liberalized" trade policy induces shifts in TFPG was tested. Hence a dummy D with values of 1 for the period 1973–1981 and 0 for other periods was created. Thus Equation 5 is respecified as:

$$\log TFP = a + bT + cD + dTD + e_t \quad (6)$$

where *TD* is the multiplicative time dummy.

Acceleration in growth of TFP is indicated when the coefficient of the multiplicative dummy is positive and statistically significant. This approach allows us not only to obtain estimated compound growth rates over the period of the analysis, but also to ascertain if the differences in growth rates of the two periods are significant.

A check on the estimates derived from the growth accounting method is provided by directly estimating a production function. For the purposes of this study, we chose a transcendental logarithmic (translog) production function because of its attractive properties. The translog function is flexible and does not impose *a priori* restrictions on the output elasticities of factor inputs.

The translog function is specified as:

$$\text{In } V_t = \alpha_0 + g_t + \alpha_k \ln K_t + \alpha_1 \ln l_t + (\tfrac{1}{2})\alpha_{kk}(\ln K_t)^2 + \\ (\tfrac{1}{2})\alpha_{ll}(\ln L_t)^2 + \alpha_{kl} \ln K_t \ln L_t + \in_t$$

where V_t is value added in real terms, t represents time, and K and L are capital and labour, respectively. The coefficient g represents the exponential rate of Hicks neutral technical change. The error term $\in_t$ is white noise.

Although we recognize the bias introduced into our estimates owing to underutilization of capacity,[14]the severe constraints imposed by the dearth of data on capacity utilization over the study period foreclose the possibility of isolating its effect. Thus, our TFPG estimates encompass the traditional components of technical progress, better utilization of capacities, learning by doing, improved skills of labour, etc.

The last step in our analysis is to establish the quantitative relationship between TFPG generated and specific indexes of trade policy such as index of openness, average tariff index, black market premiums, real exchange rate, etc. The Spearman's rank correlation index is used for this purpose.

7. Model results and analysis

In this section, we present and analyse results obtained from the estimation of the model outlined above. The analysis is conducted at two levels. First is the analysis of trends in productivity growth in the manufacturing sector at the aggregate and disaggregated levels and second is the search for shifts in productivity growth during the period of the study.

A second stage of the analysis involves the investigation of numerical and directional relationships between TFPG and specific indexes of trade policy.

Analysis of TFPG at the aggregate level

During the period 1962 to 1985, the manufacturing sector value added grew by a mean annual rate of 4.04% in real terms. This respectable growth rate masks wide variations in the intervening years. For example, value added declined by 2.7% between 1965 and 1966, and negative growth rates were recorded for 1971, 1973, 1980 and 1981. The highest growth rate was registered in 1974, when value added accelerated by a phenomenal 164.6%. This is attributable largely to the influence of the first oil boom. Growth, however, declined sharply from 7.6% in 1980 to -7.2% the following year.

Table 5 gives a breakdown of the growth rate of value added and its components between 1962 and 1985. From the table, it is evident that growth in factor inputs, capital and labour, completely dominates growth in value added over the period. For example, capital and labour grew at an average annual rate of 5.80% and 4.37%, respectively, against a negative growth rate of 0.057% per annum for TFP.

Table 6 sets out the performance of the manufacturing sector over the different trade policy regimes identified earlier. Expectedly, the manufacturing sector performed best during the oil boom era, 1973–1981, a period also characterized by considerable trade liberalization. Value added grew by a mean annual rate of 12.21%—the highest for the different trade policy regimes. A combination of factors accounted for this. First, the liberalization of trade fostered competition among domestic industries. Second, the industries enjoyed easier access to imported technology and intermediate inputs. Consequently, TFPG grew by 0.13% during this period, reflecting the impact of these factors.

Table 5: Growth rates of manufacturing value added, factor inputs and productivity indexes (average annual rates of growth 1962–1985)

Variable	Growth rates[1]
Value added	4.04
Capital	5.80
Labour	4.37
TFP	-0.057
Labour productivity[2]	-0.30
Capital productivity[3]	-1.79
Capital intensity	1.46

Notes:
1. Growth rates are computed using regression estimates of the logarithmic time trends on the basis of the equation LnX = a + bt, where X is output or input, t is time, and Ln stands for logarithmic transformation. Using OLS estimates, b can be interpreted as growth rate.
2. Labour productivity is computed as value added over labour.
3. Capital productivity is computed as value added over capital.

Table 6: Growth rates of relevant variables for the manufacturing sector, across trade policy regimes

	Growth rate			Contributions to value added growth	
Period	Value added	Labour	capital	Factor inputs[1]	TFPG
1962–72	6.69	4.63	8.90	6.67	0.02
1973–81	12.21	2.23	16.05	12.08	0.13
1982–85	12.09	0.29	23.47	13.02	-1.93
1962–81	9.45	5.88	12.47	9.38	0.07
1962–85	9.93	5.67	14.47	10.22	-0.09

Notes: 1. Computed as the difference between value added growth rate and TFPG.

The period 1962–1972 witnessed moderate growth in value added of 6.69%. TFPG was also quite low although still positive. The growth rate of capital during this period was lower than for any other period, reflecting the near cessation of capital inflow and a high incidence of capital flight engendered by political instability, which characterized some parts of this period.

The TFPG estimate for the recessionary period 1982–1985 showed a huge decline in productivity of 1.93% per annum. This suggests that the extensive trade restriction measures of this period negatively affected TFPG. This conclusion is reinforced by the estimate for the longer time periods. While TFPG was positive, although low, during 1962–1981, it actually declined by 0.09% per annum during 1962–1985.

Overall, the results suggest positive correspondence between trade liberalization and productivity growth.

The analysis of partial productivity trends provides an interesting supplement to the analysis of trends in TFPG. A secular decline in capital and labour productivities was recorded in the manufacturing sector over the period 1962–1985. This decline was

particularly marked for capital productivity, which fell by a mean annual rate of 1.79% (see Table 5).

There is need for circumspection in the interpretation of the robust growth of the capital–labour ratio (or capital intensity). This is because high capital intensity tends to overstate labour productivity and understate capital productivity (Ahluwalia, 1991). The high capital intensity of the Nigerian manufacturing sector may be a reflection of the industrial policy of the period based on import substitution industrialization, thereby protecting domestic industries behind high tariff walls.

Analysis of TFPG at a disaggregated level

A more detailed analysis of the evolution of relevant variables for the manufacturing sector is presented in Table 7. The food manufacturing subsector, which accounts for nearly one-fifth of manufacturing value added, experienced one of the lowest growth rates of value added, factor inputs and TFP. The value added mean growth rate of 1.52% and TFPG of -0.05% over nearly two and a half decades are low indeed. Two sectors, non-metal minerals and electrical machines, recorded the highest growth rates of value added of 8.85% and 8.51% per annum, respectively.

The impressive performance of the non-metal minerals subsector is possibly due to its low import content, which insulates it from the vicissitudes of the external environment. This is further illustrated in Table 7, where growth rate of the sector's value added fell by less than 3% when the sample size was adjusted to reflect the recessionary period, 1982–1985. The equally good performance of electrical machinery (radio, television, other electrical apparatuses and supplies) in both periods reflects strong domestic demand for the commodity consequent upon windfall incomes made possible by the oil boom and salary awards. Other sectors that registered high positive growth in value added include textiles, other chemical products and other non-metal mineral products.

Like the aggregate manufacturing sector, growth of factor inputs rather than TFPG is dominant in accounting for growth in value added. This implies that manufacturing sector growth represents movement along the production curve rather than a shift of the production function. For example, for electrical machinery, the 8.51% per annum growth rate was shared among its components: capital, 8.8%, labour, 7.8% and TFPG, 0.22%. Several sectors that registered modest growth in value added, nevertheless recorded negative TFP growth. These include paper and paper products, industrial chemicals, and fabricated metals.

The industries with the fastest growing TFPG include rubber and rubber products (1.31%), other non metals (1.16%), and wood and wood products (0.32%). Among them, they account for about 15% of manufacturing value added. In general, consumer goods sectors recorded the lowest TFPG rates. Incidentally, these sectors are the most protected, thereby reinforcing the asymmetry between trade restrictiveness and productivity growth.

To isolate the effect of the depression years, we looked for significant difference between the growth rates for the periods 1962–1981 and 1962–1985. The results show that for most of the sectors, growth rates of value added and factor inputs declined in the

period 1982–1985. This is more so for labour, where employment fell in almost all the sectors except transport equipment.[15] The declines originated from retrenchments and plant closures—a feature of this period. Bakeries and flour mills and many related lines were particularly hit by the recession.

Table 7: Growth rates of value added, factor inputs and TFP for various sectors of Nigeria manufacturing

Sector	Share in manufacturing value added	Period	V	K	L	TFPG
1	18.2	1962–81	1.71	4.15	5.31	-0.26
		1962–85	1.52	4.40	4.52	-0.05
3	14.6	1962–81	5.01	7.33	6.36	0.07
		1962–85	4.09	6.02	4.51	0.15
4	3.2	1962–81	3.97	5.06	3.65	0.09
		1962–85	4.36	4.98	4.22	-0.03
5	1.8	1962–81	3.30	4.66	3.59	0.32
		1962–85	1.51	4.77	2.47	-0.05
6	6.0	1962–81	4.97	7.85	4.30	-2.34
		1962–85	4.35	6.95	4.05	-0.05
7	0.5	1962–81	4.74	4.33	6.28	-0.04
		1962–85	3.44	4.61	4.34	-0.15
8	12.8	1962–81	6.95	6.12	5.95	-0.29
		1962–85	6.37	7.96	5.24	-0.28
9	5.0	1962–81	5.44	4.57	6.11	1.76
		1962–85	4.42	4.49	4.18	1.31
10	0.6	1962–81	11.50	4.03	5.94	-0.28
		1962–85	8.85	7.41	4.91	-0.13
11	6.6	1962–81	4.32	5.67	6.48	1.25
		1962–85	5.05	5.10	5.92	1.16
13	5.8	1962–81	5.69	6.75	6.51	-0.15
		1962–85	4.56	6.31	4.68	-0.05
14	2.2	1962–81	10.34	9.12	8.56	0.35
		1962–85	8.51	8.88	7.82	0.22
15	10.7	1962–81	1.71	1.72	-0.22	0.15
		1962–85	1.56	5.27	2.42	0.07

Notes: 1. Growth rates are calculated as a semi logarithmic function:
$LnX = a + bT$
Sectors 2 (beverages) and 12 (basic metals) not estimated due to short time series data.

Table 8 presents an analysis of partial productivity trends and capital intensity for the various sectors.

Table 8: Analysis of partial productivity trends (1962–1985)

Sector		V/K	V/L	K/L
1	Food manufacturing	-2.8	-3.0	0.11
3	Textiles	-1.93	-0.41	1.52
4	Leather & products	-0.62	-0.41	0.76[a]
5	Wood & products	-3.26	0.96[a]	2.30
6	Paper & products	-2.60	0.30[a]	-0.90
7	Industrial chemicals	-1.16	-0.09[a]	-0.26[a]
8	Other chemicals	1.59	1.13	2.72
9	Rubber products	-0.007[a]	0.24[a]	0.30[a]
10	Non-metal minerals	1.45	3.93	2.49
11	Other non metals	-0.006[a]	-0.87	-0.08[a]
13	Fabricated metals	-1.75	-0.01[a]	1.62
14	Electrical machinery	-0.38[a]	0.69[a]	1.07
15	Transport equipment	-0.79	2.00	2.79

Notes: a not significant at 5% level.
V/K = Capital productivity
V/L = Labour productivity
K/L = Capital intensity

For most of the sectors, capital productivity declined except for non-metal mineral products (inclusive of pottery, china and earthenware, glass and glass products). The generally low factor productivities for most sectors are due, in part, to the low average capacity utilization in most sectors especially post 1981 and the use of obsolete technology. The low labour productivity is sometimes used to justify the low real wages in the manufacturing sector (World Bank, 1990).

The results for the search for shifts in the growth of TFPG are reported in Table 9. The table reveals that the hypothesis of a shift (acceleration) of TFPG during the oil boom is rejected for most of the sectors except rubber products, non-metal minerals, wood and wood products, and transport equipment.

Overall, our investigation of TFPG in Nigerian manufacturing shows that rather than productive or technical efficiency embodied in TFPG, expansion of factor inputs, i.e., increase in employment, and acquisition of more capital (rather than a more intensive use of existing capital facilities), has been the driving force behind growth in value added.

Table 9: Investigation of acceleration in growth of total factor productivity (1962–1985)

	Dependent variable: log (TFP index)				
Sector	Intercept	Time	Dummy	Dummy X Time	R^2
1	2.08 (0.05)	0.0071 (0.002)*	0.163 (0.123)	-0.0086 (0.079)	0.58
3	2.10 (0.068)	0.0148 (0.002)*	0.102 (0.168)	-0.0060 (0.011)	0.73
4	2.09 (0.06)	0.011 (0.002)	0.227 (0.157)	-0.015 (0.01)	0.63
5	1.95 (0.06)	-0.011* (0.002)	-0.410 (0.155)*	0.0378 (0.010)*	0.75
6	1.95 (0.10)	-0.041 (0.003)	0.24 (0.25)	-0.015 (0.016)	0.97
7	2.05 (0.08)	-0.0057 (0.003)	-0.053 (0.202)	0.0077 (0.013)	0.24
8	2.07 (0.059)	0.027 (0.002)*	0.023 (0.144)	-0.0065 (0.009)	0.92
9	2.03 (0.04)	0.016 (0.001)*	-0.16 (0.11)	0.012 (0.0068)*	0.90
10	1.97 (0.12)	0.0099 (0.004)*	0.475 (0.284)	0.031 (0.018)*	0.40
11	1.99 (0.058)	0.0198 (0.002)*	-0.0155 (0.143)	0.00046 (0.009)	0.87
13	2.09 (0.054)	0.00759 (0.0017)*	-0.004 (0.133)	0.0057 (0.0085)	0.63
14	2.11 (0.08)	0.0022 (0.003)*	-0.208 (0.197)	0.013 (0.013)	0.82
15	2.00 (0.09)	0.012 (0.003)*	-0.498 (0.21)	0.029 (0.014)*	0.59

Notes: * Significant at 5% level.

Production function approach to the estimation of TFPG

This section provides an alternative measure of TFPG using the parametric approach. Here, we estimate a more generalized production function, i.e., the translog production function. The estimates for the various industrial groupings are presented in Table 10.

Table 10: Estimates of TFPG: A translog production function specification

Sector	TFPG
Food manufacturing	0.02*
Textiles	0.18
Leather and leather products	0.23
Wood and wood products	-0.04
Paper and paper products	-0.006
Industrial chemicals	-0.007
Other chemical products	-0.17
Rubber products	2.25
Non-metallic mineral products	-0.10
Other non-metallic mineral products	1.36
Fabricated metal products	0.21
Electrical machinery	0.42
Transport equipment	0.33

Notes: Overall manufacturing -0.105.
* Not statistically significantly different from zero at 5% level.

Generally, it is difficult to make a direct comparison between the growth accounting estimates of TFPG and the production function estimates because of their disparate assumptions about the economic and technological environment under which industries operate. Despite this, the translog production function yields estimates that are close to those obtained under the growth accounting method. And, except for a few sectors—food manufacturing and leather and leather products—that experienced sign reversals, the hierarchical order of performance of the various sectors is generally the same.

Rubber products remain the leading sector, although its TFPG rose to 2.25% as against 1.61% per annum obtained through the growth accounting method. The overall manufacturing TFPG estimate under the translog approach remains negative at -0.105%.

8. Productivity and trade policy indexes: Some quantitative relationships

Here we analyse the correlation relationships between productivity growth and indexes of trade policy. The idea is to establish the degree of correlation between them. Specific trade policy indexes used include the index of trade openness, real exchange rates (RER), nominal rate of protection (NRP), import duties, growth rates of exports and imports, and non tariff barriers (NTBs) index, proxied by the black market premiums.

As evident from Table 11, the real exchange rate (RER) declined significantly over the reference period, particularly after 1981. The index of openness experienced similar decline but recorded its highest values during the oil boom period, 1974–1981, a period characterized by substantial trade liberalization. However, with the onset of profound economic crisis since 1981, the index declined consistently as concrete steps were taken by government to compress imports. Thus the growth rate of imports fell by 17–19% between 1982 and 1984.

The black market premium was relatively modest prior to 1976 but began to explode a year later. The fall in 1972 was due to the depreciation of the then Nigerian pound by the end of October of that year. A combination of political factors, corruption and subsequent loss of confidence in the naira prompted this.

But more important for the purposes of this study are the relationships between these indexes of trade policy and productivity growth. And here we recall some of the hypotheses articulated in our theoretical framework section, one of which is the positive association between export and TFP. The other is the positive correspondence between import growth and TFP. Parallel to this is the negative relationship between TFP growth and import substitution policies.

To gain insight into whether these relationships are confirmed or refuted, a correlation analysis was carried out. The correlation matrix (Table 12) relates TFP growth rates of the manufacturing sector at an aggregate and disaggregated level to the various indexes of trade policy identified earlier. The results are quite revealing.

For the aggregate manufacturing sector, the results are generally consistent with fore-knowledge. There is a positive, though weak, correlation between TFPG and growth in exports and imports. Exports have a higher magnitude, however. Furthermore, appreciation of the real exchange rate induces positive correlation with TFPG. Similarly, negative correlation exists between import duties and TFP growth rate. All these accord with expectations.

Between black market premiums and TFPG a negative correlation obtains. This is suggestive of the fact that as the official market is repressed and foreign exchange administratively allocated, manufacturers would suffer productivity losses, as they may not be able to afford the higher parallel market rates to finance necessary imports.

Table 11: Trends in the indexes of trade policy (1963–1985)

YEAR	RER[1]	Index of openness[2]	GREXP	GRIMP	Import duties[4]	Black market premium[3]
1963	100.0	100.00	0.11	0.02	0.29	
1964	101.14	111.67	0.15	0.23	0.27	
1965	99.89	121.00	0.25	0.08	0.30	
1966	93.52	112.12	0.06	-0.07	0.29	
1967	97.94	118.26	-0.15	-0.13	0.23	
1968	97.43	105.10	-0.13	-0.14	0.25	41.41
1969	90.77	110.37	0.51	0.29	0.29	60.00
1970	84.61	219.80	0.39	0.52	0.32	86.67
1971	76.34	125.26	0.46	0.43	0.29	73.71
1972	72.69	117.95	0.11	-0.08	0.26	38.18
1973	80.26	117.24	0.59	0.24	0.28	26.61
1974	84.87	150.08	1.54	0.42	0.32	34.12
1975	70.38	147.16	-0.17	1.14	0.19	42.42
1976	57.98	160.02	0.37	0.38	0.17	41.54
1977	56.90	169.30	0.15	0.39	0.14	107.45
1978	51.10	150.26	-0.17	0.14	0.13	71.60
1979	52.45	143.83	0.64	-0.24	0.18	74.91
1980	51.94	171.71	0.37	0.48	0.11	71.64
1981	50.15	176.89	-0.22	0.42	0.16	46.74
1982	46.42	137.56	-0.26	-0.17	0.15	83.33
1983	45.76	107.62	-0.09	-0.12	0.17	475.83
1984	52.41	95.85	0.21	-0.19	0.13	367.14
1985	28.94	99.20	0.25	0.11	0.13	315.19

Notes: 1. See Olopoenia (1992).
2. Total trade–GDP ratio.
3. See *Picks Currency Yearbook*, various issues, for parallel market exchange rates.
4. Import duties revenue–import ratio (computed from Central Bank of Nigeria data).
GREXP and GRIMP represent growth rates of exports and imports, respectively.

Source: *IMF Financial Statistics*, 1991.

Table 12: Correlation matrix of growth rates of TFP for the manufacturing sector and indexes of trade policy

SECTOR	GREXP	GRIMP	PREMIUM	DUTIES	RER
1	0.1249	-0.2959	0.3353	0.2524	0.0335
3	0.0783	0.1209	0.3302	-0.1427	-0.025
4	0.0868	0.1965	-0.1511	0.0710	0.0773
5	0.1946	-0.1342	0.2451	-0.0387	-0.0236
6	0.2715	-0.0544	0.5753	-0.0047	0.0034
7	-0.1913	0.0842	-0.0790	-0.0730	0.0124
8	-0.1523	0.2894	-0.2464	0.1691	0.3355
9	0.3515	0.1290	0.2037	0.0549	0.0275
10	0.2059	0.0315	-0.1317	-0.0007	0.0537
11	0.3424	-0.0277	-0.1768	-0.0529	-0.2754
13	0.1657	-0.0639	-0.1254	0.0093	-0.0403
14	0.1813	-0.0090	-0.1366	0.1184	0.1781
15	0.1188	0.2250	-0.1300	0.0391	0.0256
Overall manufacturing	0.1790	0.1428	-0.1272	-0.2061	0.1977

At a disaggregated level, the correlation matrix shows wide variation across sectors. For all sectors, except industrial chemicals and other chemicals, there is a positive correlation between growth rates of exports and TFPG. The highest rate (0.35) was recorded in the rubber products sector, which incidentally is the sector with the highest TFPG rates. Also evident from Table 12 is the positive correlation between growth of imports and TFPG, with the highest correlation index recorded in the other chemical products industrial group. In general, sectors that are most heavily dependent also suffer most from import compression. This is obvious from the column on black market premiums where non consumer goods sectors, which are usually heavily dependent on imports, had negative correlation with TFPG, reflecting the higher cost of financing imports through the parallel market.

Domestic industries also enjoy protection from outside competition. This is achieved through selective import bans and prohibitive tariff rates. The protection regime has a major influence on the current structure of manufacturing and incentive for investment in different activities. Table 13 presents average nominal protection rates (NRP) for selected industries for 1962 and 1984 and compares them with our TFPG estimates.

The table reveals that average NRP rose in 1984 compared with its 1962 level. The consumer goods (first four sectors) enjoy comparatively higher rates of protection than intermediate and capital goods sectors. Their TFP performance is strikingly low, however. The latter two sectors can also be regarded as import substituting sectors and have generally experienced respectable growth in TFP in comparison with other sectors.[17]

Table 13: Nominal protection rates for selected industrial groups

SECTOR	NRP (1984)[1]	TFPG	NRP (1962)[2]
Food manufacturing	42.3	-0.05	50.0
Textiles	45.7	0.15	35.0
Leather products	44.4	-0.03	33.3
Wood products	43.0	-0.05	50.0
Paper products	30.3	-0.05	20.0
Industrial chemicals	23.4	-0.15	33.0
Other chemical products	38.0	-0.28	-
Rubber products	38.3	1.16	21.4
Electrical machinery	32.3	0.22	33.3
Transport equipment	45.8	0.07	30.0

Source: 1. World Bank (1991: 58).
2. Oyejide (1975).

9. Policy implications and conclusion

An allusion to some issues of policy relevance emanating from the foregoing analysis is necessary. A deliberate policy of repressing the exchange rate at the official market inevitably leads to the escalation of the parallel market rate. This invariably feeds into the cost profile of manufacturers who are compelled to source their foreign exchange requirements from the parallel market because of supply bottlenecks at the official window. Thus, inefficiency in foreign exchange allocation is capable of stymieing productivity in the manufacturing sector.

Second, a policy of import compression through quantitative restrictions (non-tariff barriers, quotas, bans, etc.) is inimical to the growth of productivity in the affected sectors. This submission is particularly true for sectors with high import dependency ratios. The corollary of this: a positive association between import growth and productivity improvement is starkly apparent from the results of our correlation analysis.

Finally, for most of the 1970s and up to the mid 1980s, the exchange rate was grossly over-valued as indicated by trends in the RER. Therefore, the positive correlation between RER and TFPG in the manufacturing sector indicates that the over-valuation of the naira during this period negatively affected the competitiveness of domestic industries and therefore the growth of total factor productivity. The implication of this is that an unfettered market-determined exchange rate would promote growth in TFPG.

In summary, this study has been preoccupied with investigating the link between trade policy and productivity growth in the manufacturing sector of the Nigerian economy. Because of the relative paucity of studies explicitly devoted to this theme on the foreign scene and a near complete absence of similar works on the domestic front, we set a modest objective for the research. Our chief concern was the estimation of total factor productivity growth (TFPG) for the aggregate manufacturing sector and across the various subsectors using alternative methodologies. Next, we proceeded to correlate these estimates with specific indexes of trade policy. This is expected to provide the backdrop for the formulation and estimation of regression relationships envisaged to be part of the agenda for the next phase of the study.

Notes

1. This view was expressed by Nishimizu and Robinson (1983), but other conclusions are tempered by the problem of comparability associated with differences in period, sectoral coverage and methodology.

2. Other institutions include productivity committees at the federal and state levels, the Productivity, Prices and Incomes Board, and a National Productivity Day.

3. See Corbo and de Melo (1985) for a catalogue of several sources of inefficiencies in regulated economics.

4. Nishimizu and Robinson (1983).

5. World Bank, *World Development Report* (1988).

6. Included in this category are chemicals and paints, leather tanning and fishing, tyres and tubes, sawmills and wood products, building materials, and metalworking industries.

7. Policy Analysis Department, Federal Ministry of Industries, Parastatal Study Phase One: Cement, June 1989.

8. They consist of machinery and equipment, and transportation equipment.

9. According to a Nigerian Industrial Development Bank (NIDB) estimate, about 20% of initial investment costs of industrial enterprises in Nigeria goes to self-provision of infrastructural services.

10. See Harcourt (1972) for a detailed review of this controversy.

11. See, for example, Walters (1963).

12. As a consequence, the approach has attracted criticisms from Griliches and Jorgensen (1969) and Nelson (1981).

13. An earlier study on production functions in the Nigerian manufacturing sector (Iyaniwura, 1974) failed to reject the assumption of unitary elasticity of substitution.

14. Capacity utilization estimates have not been available until very recently and therefore do not fall within the time frame for this study. References made to capacity utilization in earlier years are scattered and far between, making it difficult to make consistent and informed statements on its impact on TFP. Besides, the use of net capital expenditure as a proxy for capital services helps to sidetrack the problems of capacity underutilization (see Olaoye, 1985).

15. For a capital-intensive industry like transport equipment, the employment elasticity of value added is relatively low. The 1.56% average growth rate in this sector was largely accounted for by the growth of capital stock (5.27%) and that of labour (2.42%).

16. This works through the expansion of the domestic market for the import substituting sectors and thus enables the industries to move up the learning curve and exploit the benefits of economies of scale.

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Appendix: Supplementary tables

Table A1: TFPG in Nigerian manufacturing: A comparison of previous estimates

Study	Period	Domar[a]
Olaoye	1962-80	2.06
Adesina	1962-84	5.33
Adesina	1962-84	2.53
Current	1962-85	-0.057
Current	1962-80	0.07

a. Domar index assumes unit elasticity of substitution among factor inputs. it is defined as the ratio of value added to a weighted (geometric mean) of the two factor inputs.
Sources: Authors' calculations; Olaoye (1985); Adesina (1992).

Table A2: TFPG Rates in selected countries (%)

Country	Period	TFPG
Hong Kong[1]	1960-70	2.29
Singapore[1]	1957-70	3.75
South Korea[1]	1960-70	3.47
Taiwan[1]	1960-70	3.59
China[2]	1953-85	-0.89
Kenya[1]	1964-83	2.60
Tanzania[1]	1966-80	-0.51
Zambia[1]	1965-81	-5.60
Zimbabwe[1]	1964-81	0.03
Nigeria	1962-85	-0.057
India[3]	1959-66	-0.4
India[4]	1959-79	-0.2

1. Cited in Shaaeldin (1989).
2. See Kuan et al. (1988).
3. Alhuwalia (1991).
4. Nishimizu and Robinson (1983).

Table A3: Total factor productivity growth in manufacturing: Some international comparisons (Percent per annum)

Sector	Indonesia 1975–82	Zambia 1965–80	India 1959–79	Egypt 1973–79
Food	-1.7	-4.5	-1.5	5.6
Beverages	-0.7	-0.1	0.7	6.0
Tobacco	0.9	-0.1	0.0	6.0
Textiles	3.5	-1.2	1.3	2.0
Wood & products	-0.6	-0.6	-0.3	-4.8
Furniture & fixtures	-1.1	-1.8	3.8	–
Paper & products	-1.0	6.5	0.9	2.4
Printing & publishing	-2.0	-2.9	1.8	–
Leather & footwear	-3.3	8.4	-0.4	-1.2
Rubber	3.4	1.0	-2.7	-1.6
Chemical & products	3.8	-6.6	-1.3	5.2
Non-metallic minerals	3.4	-3.8	-0.4	-0.2
Metal products	0.9	-9.2	-0.8	0.5
Electrical	6.2	-9.8	1.2	3.8
Transport	4.7	3.7	1.0	4.5

Source: From Ahluwalia (1991).

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