AGRICULTURAL PRICE DISTORTIONS AND THEIR EFFECTS ON THE NIGERIAN ECONOMY: AN EMPIRICAL ANALYSIS

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ABSTRACT

This research examines the effects of agricultural Price Distortions on output in the agricultural sector of Nigeria. Specifically, the study tests the hypotheses that agricultural price distortions are inversely related to output growth in the same sector. The conclusiveness of all previous studies on this problem has not been without doubt largely because their analyses were based on multi-country cross-section data and aggregate price distortion indices. The present study seeks to overcome this failing by disaggregating the price distortions sector-wise for a single country, namely, Nigeria. The study adopts a model based on a modified neoclassical production function where agricultural exports are taken as inputs. Agricultural price distortions cause a wedge between the domestic and foreign price of agricultural exports and thereby reduce the volume of trade and, in consequence, the real GNP as well. And to derive consistent, unbiased, and efficient estimators of the structural equations, the model so developed was estimated by ordinary least square (OLS) method. The analysis confirms the view that agricultural price distortions have a significant and negative influence on agricultural output. An important implication of the study is that reforms of agricultural pricing policies should constitute a major component of any remedial program designed to accelerate economic growth in a country like Nigeria. If her agricultural sector is to become modern and efficient, they should be given the opportunity and the motivation to reduce costs. Indiscriminate reduction of the rate of protection and the reduction of the implicit taxes on exports alone are not the correct or adequate solution. Better physical infrastructure, better education and training, and more modernized agricultural experience can contribute to the ability to reduce costs and raise productivity.

Keywords: Price distortions, Oil boom, misallocated resources, Nominal Protection Rate, Subsidies, Tariff, Economic growth.

INTRODUCTION

Nigeria is the most populous of African countries although rich in natural resources it is the third most densely populated country in the region. With over 160 million people and almost one million square kilometers in size, it is often considered an economic giant. Although arable land is abundant, much of it lies fallow; moreover, a large portion of the cultivated area is used in ways which result in very low productivity per acre. Generally, the overall growth rate of output has been quite uneven over the years. The economy of Nigeria prior to the oil boom (1960-1973) was primarily agricultural. At this period of time, a sizeable portion of the labor force depended for its livelihood on agriculture, and the bulk of foreign exchange resources were provided by the agricultural exports. In Nigeria, as in most of the countries of Sub-Saharan Africa, economic growth cannot be divorced from the performance of its agricultural sector. Therefore, exports of primary commodities, namely cocoa,

groundnut, palm oil, coffee, etc. were the engine of growth. During the early part of this period, over 60% of Nigeria's total exports were made up of agricultural commodities and agro-allied products. In 1960, agriculture contributed 62.9% to the gross domestic product. During the pre-oil boom era, the annual rate of growth of non-oil GDP was 4.3%. In terms of the sector contribution to the non-oil gross domestic product, agriculture was the most important component of the non-oil economy. In 1967, total agriculture accounted for approximately 49% of the total non-oil GDP. By 1973, agriculture's share had declined drastically and accounted for 35.1%. And by 1974, its contribution to the gross domestic product dramatically decreased to 23.9%. This sudden decrease came as a result of the improvement in the oil sector in the late part of 1973 and the early part of 1974. However, with the increased demand for imported consumer goods, a non-agricultural sector consisting of modern services and a small manufacturing sector emerged. The period 1974-1981 represents the oil boom era. By the mid-1970s, the engine of Nigeria's economic growth was its oil exports. By 1981, the oil sector was accounting for over 95% of the total exports. As a result of this, the structure of the Nigerian economy changed dramatically. The period 1982-2010 which represents the post oil boom era experienced a dramatic decline in the agricultural exports and remained relatively low throughout the period.

The pace of economic growth of Nigeria is best indicated by the trend of its gross domestic product (GDP) or gross national product (GNP) during the study period (1967-2010). Generally, these two measures are the best available indicators of general welfare and living standards in any given economy. It is always believed that when GDP and GNP are rising, prosperity looms in the future; while if GDP and GNP decline, recession, hardship and gloom are on the horizon. It was noted that agricultural output declined as a percentage of the non-oil gross domestic product from 62.9% in 1960 to 27.9% in 1986. The decline in the relative contribution of agriculture can be explained in several ways: It implies that the other sectors are growing faster than agricultural sector. This decline could also be as a result of the decline in absolute terms of agricultural output. There may be some elements of distortions introduced by the changes in relative prices during this period; nonetheless, the decline in the relative contribution of agriculture since 1960 is still substantial.

The purpose of this article is, therefore, to establish the extent of the impacts of agricultural price distortions on agricultural output in the Nigerian economy over the study period (1967-2010). The time series analysis is used as a basis for an analytical narrative of the history and reasons behind the evolution of agricultural distortions, bearing in mind that efficiency in resources allocation can be achieved with not only the proper incentives for the right market prices but also on adequate institutions and infrastructure.

The System of Protection and Taxation of Agriculture

The major thrust of pricing policies in Nigeria works through trade policies, and its greatest impact is on the incentives for traded commodities. While trade restrictions have had an impact on the prices of non-traded commodities, they have been indirect, depending on the extent of substitutability between traded and non-traded commodities. Generally, price distortions exist when the prices of traded and non-traded goods do not correctly reflect their scarcity. For traded goods, the scarcity price is indicated by the border prices, that is, the prices at which the goods could be exported or imported. And the reference price for these traded goods is usually the international or border price adjusted for market exchange rates, transport and distribution costs, and country-specific taxes (Burniaux et al., 2009). For non-traded goods, the scarcity (or efficiency) price can be measured by the opportunity cost of

their production when the alternative would be to produce traded goods (Agarwala, 1983). The pricing of 'tradables', as in agricultural outputs presents no problem. Because of trade, the border price will provide a convenient benchmark for pricing. Typical causes of price distortions in tradables consist of price and non-price factors. Price factors include ad-valorem and specific tariffs, producer price supports, surcharges, advance deposits for imports, exports, and import taxes, and multiple exchange rates; while non-price factors are comprised of export and import quotas, licensing, input-subsidies and exchange controls. These described price factors of protection influence foreign trade and resources allocation through their effects on domestic prices. In turn, non-price factors set permissible levels of imports directly in quantitative terms. By limiting the amount imported, they lead to a rise in the domestic prices of commodities subject to such restrictions. In each case, the distortion derives a wedge between the domestic price and the world or border price. Generally, two coefficients were normally used to measure the incentive/disincentive effects of administered prices, taxes and subsidies to producers of traded goods. These are Nominal Protection Coefficient (NPC), which is the ratio of the domestic price to its border price; and Effective Protection Coefficient (EPC), which measures the effects of protection, not only on traded output but also on traded inputs.

Nominal Protection Coefficient (NPC) of any commodity is the ratio of its domestic price to its border price.

$$NPC = Pd/Pb \quad (1.1.1)$$

Where,

NPC = nominal protection coefficient of the commodity;

Pd = domestic price of the commodity;

Pb = border price of the commodity (with the border price being its foreign price times the foreign exchange).

The difference between the domestic producer price and the border price of a comparable product is the ad valorem tariff rate (calculated as a percentage on c.i.f. prices) where the product is not subject to quantitative restrictions. Where there are quantitative restrictions, domestic producer and border prices have to be related directly. Where they are differential indirect taxes, the differential tax rate, expressed as percentage of c.i.f. prices, have to be added to the tariff rates.

The Nominal Protection Coefficient (NPC) can also be expressed as a percentage difference between domestic and border prices, in which case it is called the nominal rate of protection (NPR). Hence, the proportional difference between the domestic price and world price of final goods is as follows:

$$NPR = (Pd - Pb)/Pb \quad (1.1.2)$$

Where,

NPR = nominal rate of protection

More precisely, the relationship between world price of a good (Pb) and the domestic price (Pd) may be expressed as:

$$Pd = Pb(1 + T) \quad (1.1.3)$$

Where,

T = the nominal rate of protection (measure of price distortion).

If the only form of trade intervention is the imposition of ad-valorem tariff, and if this tariff is not prohibitive, the nominal rate of protection will then equal the tariff rate. In practice, the nominal rate of protection will depend upon a number of factors such as excess taxes, quantitative restrictions, that is, import quotas, bans, and some licensing arrangements in addition to tariffs.

There is a wide range of pricing policies in place in Nigeria, which have direct effects on the prices of traded inputs, although they are not effective in many cases. During the period 1960-1973, all cash crops (cotton, groundnut, cottonseed) were exported by marketing boards. Export duties on produce under the control of the marketing boards were abolished in 1973 and were replaced by a produce tax with a maximum rate of 10% ad valorem to ensure higher prices to farmers (international Monetary Fund (IMF), 1974). In 1974, both fiscal and monetary policy instruments were employed to deal with some of the adverse effects of the oil syndrome. On the fiscal side, there were substantial reductions in import duties on a wide range of commodities. There was a 10% reduction in duties on raw materials in 1974 and a 10% reduction in duties on food items in 1975, together with a 5%-10% reduction on other imported consumer goods. In 1981, weighted average tariffs were estimated at about 13.5%, in part due to the fact that public sector imports (including food, machinery, and equipment) were exempted from tariffs. In mid-1982, several policies were put in place by the government to redress the deteriorating balance of payments position of Nigeria. Most of the policies were aimed at controlling imports. Higher or new rates of import duties were placed on 42 groups of items in 1982. Import duties for cotton yarn were raised from 50% to 100% (CBN, 1983). The list of items banned from importation was expanded. Tariffs were revised upwards and the approved user status, which allowed some importers to import duty-free, was abolished. New rates of excise duties were imposed on a number of commodities. In January 1983, the Government introduced further import restrictions in the form of license requirements and higher tariffs aimed at reducing the level of imports. Consequently, import duties continued to rise and use of quantitative restrictions on import were intensified. Tariffs were rationalized in 1984 and the range reduced from zero and 500% to between 5% and 200%. One interesting development of this period was the fixing of a minimum period of three years during which all the customs and excise tariff changes would remain unchanged. Also, in 1984, the issuance of open general license was suspended and imports came under specific import license. As a result of the Second Tier Foreign Exchange market (SFEM) that became operative in September 1986, import licensing was abolished. The import prohibition list was reduced from 72 items to 16 items (IMF, 1985). The implicit taxes on exports due to the presence of the marketing boards were eliminated due to the elimination of these boards in 1986 (IMF, 1986). Because of the depressed economic situation at this time, the Nigerian government introduced the Structural Adjustment Program (SAP) to salvage the economy. This program abolished the marketing boards, removed most quantitative restrictions (QR's) on imports, abolished ex-factory price controls, and reduced the rate of protection of domestic industries. Also, all subsidies were removed and privatization was highly encouraged by the administration at this period. In practice, the relative importance of these different forms of intervention varies considerably between commodities. With the exception of commodities whose prices are effectively determined by the commodity Boards, (i.e. cotton, cocoa, and to some extent, rubber), the government's use of quantitative restrictions has generally been the effective determinant of domestic prices; hence, nominal rates of protection. Because nominal rates of protection take into account the impact of government intervention only on the prices of the output of an activity and do not reflect the effects on input prices, they generally do not provide the most accurate indication of the relative incentives to undertake an activity and, consequently, the

nature of the effects that intervention has on the allocation of resources. Therefore, estimates of effective and net effective rates of protection have been made. In agriculture, effective protection coefficients are generally not available. However, Nominal Protection Coefficient (NPCS) are more widely available since, in agriculture, purchased inputs are generally a small proportion of total value added. Therefore, NPCs are, by and large, satisfactory indicators of the degree of distortion. The government has extended protection to the agricultural sector via tariffs and quantitative restrictions on imports, and it also has extensively subsidized agricultural inputs. During the early part of the 1960s, a considerable increase in the tariff level occurred in order to preserve the balance of payments and to raise fiscal revenue. These policies called for increased agricultural taxation at this period. It was also discovered that in the 1970s, Nigeria was underpricing agriculture. Also, traditional export crops received negative protection in agriculture. Between 1980 and 1986, the nominal rate of protection for agriculture was relatively high and in most cases on the upward trend. In addition to any changes in import policies, this trend has been reinforced by several factors: between 1979 and 1981, the naira nominally appreciated against the dollar by approximately 16%, which ceteris paribus, served to increase nominal rates of protection by lowering parity prices. During 1981 and 1982, while the exchange rate began to depreciate, the world prices of many commodities fell considerably: groundnut by 39%, cotton by 14%, cocoa by 15%, rubber by 19%, and palm kernel by 15%. While world prices were falling, the domestic prices of the commodities were generally increasing. The rise in domestic prices coupled with the decline in world prices more than offset the impact of the depreciation of the naira. By 1981, NPR stood at 46.8 and later went up to 179.5 in 1986 (CBN, 1986).

In this study, the real effects of price distortions in traded commodities in Nigeria are analyzed using NPR to measure the disparity between domestic prices and border prices. It is a weighted index of price distortions of selected commodities, and the behavior of which is taken as representative of the average behavior of distortions of such goods in general. The distortion drives a wedge between the domestic price and the world or border price. While the NPR has its limitations, it provides useful tools of analysis, especially for country like Nigeria where inputs are generally a small proportion of total value added in the agricultural sector. This is a reflection of the relatively low reliance of intermediate inputs with distorted prices, mainly fertilizer, in producing these commodities.

LITERATURE REVIEW

The issue of whether there is a linkage between agricultural price distortions and economic growth has been of constant concern to many economists and also to policy makers over a long period of time. Until the 1930s, free trade was the orthodox position of economists on the question of commercial policy based on the principle of comparative advantage and the liberal tradition of classical economics. However, in the 1930s, the orthodoxy of free trade was challenged by the new heterodoxy associated with the economic problems and theoretical developments of the time. At this time, the great depression revived the mercantilist arguments for tariffs. This laid the foundations for the future analysis of the commercial policy aspects of the problem of promoting economic development in the underdeveloped countries of the world. The theory of optimal tariff rests on the existence of a distortion in international markets such that market prices diverge from opportunity costs. However, there has been growing recognition in recent years among governments of less developed countries (LDC) of the need to undertake "liberalization policies" aimed at reducing domestic market distortions and raising allocative efficiency in resource use.

Protection can be given through tariffs—taxing particular imports but not locally produced versions of the same product or through quantitative restrictions on imports, such as quotas or outright embargoes, limiting the imported supply, or through both together. However, a major disadvantage of widespread use of protection is that it discourages and decreases trade, thereby, destroying or giving up many of the advantages from trade. There is overwhelming empirical evidence that suggests a strong link between price distortions and economic growth, especially in developing countries; Harberger (1959) attempted to explore the possible results of eliminating misallocations of resources in economies like Chile, Brazil, and Argentina. It was concluded that policies aimed at eliminating distortions in the price mechanism can raise the long-term rate of growth of national income. And results from global and single country studies of subsidy reform suggest that on an aggregate level, changes to GDP are likely to be positive due to the incentives resulting from price changes leading to more efficient resource allocation (Von Moltke et al., 2004). Also, there is evidence that tax policy has influenced the pattern of investment with consequent effects on overall efficiency. Lower taxes have resulted in higher real returns to savings and then investments. Higher returns have stimulated a larger aggregate supply of these factors of production and thus raised total output. Also, in low-tax countries, different types of fiscal incentives that were provided appear to have shifted resources from less productive to more productive sectors and activities, thus increasing the overall efficiency of resources utilization. The reverse is the case for high-tax countries. Import duty concessions have been offered by low-tax countries to investors in priority areas, and high tariff protection in high-tax countries, mostly on finished goods. These removed the competitive stimulus for efficiency in production and led to failure to achieve economies of scale. Also, regarding neoclassical analysis, Little et al., (1970), Bhagwati (1978), and Timmer (1980) have stressed the existence of potentially high social costs of domestic price distortions in terms of their resources allocation, national output, and income distribution effects. At the sectoral levels, price intervention policies are likely to create biases in the structure of incentives within the sectors. Each of these policies creates a disincentive effect to output growth, and in combination, they lead to even greater distortions of incentives in all sectors. Bhagwati (1978) and Krueger (1978) showed that those countries that embark on programs of correcting price distortions in the 1960s, for instance, Brazil, Columbia, and South Korea, showed significant gains, not only in output but also in employment from these liberalization efforts. Aguirre and Yucelik (1981), in their review of African experience emphasized that the mixing of revenue and protective functions has led to excessive levels of protection, resulting in damaging effects on resource allocation.

Gillis (1981) and Tanzi (1981) noted the detrimental effects on production, allocation of resources and exports due to the high share of export duties in GDP. Also, it was noted from the discussion of the relationship between price distortion and economic growth in the key background paper (Agarwala, 1983) that one third of the variation in growth performance of 31 developing countries can be explained by a composite index of price distortion. In some cases, export taxes deterred foreign investors and diverted domestic capital into unproductive activities. As summarized by Balassa (1982), studies for Brazil, Chile, Pakistan, the Philippines, and Turkey relating to the 1960s estimated that the costs of distorted prices due to trade restrictions alone could have amounted from 4% to 10% of their GNP. Also, Marsden (1983) found a significant negative relationship between taxes and GDP growth and critical growth determinants. And that a 1% point increase in the total tax/GDP ratio will decrease the rate of economic growth by 0.36% points. Bautista (1985) argued that agricultural products are often implicitly or explicitly subject to export tax, reducing their domestic price relative to the world price. Hence, this agricultural export taxation leads to a

great distortion of incentives biased against agriculture. Also, Krueger et al., (1988, 1991) analyzed the distorting effects of agricultural policies across the world. They argued that agriculture in most developing countries was effectively taxed, directly and indirectly, through government policies, thereby diminishing the incentives to invest with the result that the growth potential of agriculture was negatively affected.

The governments of poorer countries are typically observed to impose taxes on farm production, while government in richer countries typically subsidized it. The modern literature documenting this tendency begins with Bale and Lutz (1981), and includes notable contributions from Anderson and Hayamis (1986), Lindert (1991), Krueger at al., (1988, 1991) among others. They argued that agriculture in most developing countries was effectively taxed, directly and indirectly, through government policies, thereby diminishing the incentives to invest with the result that the growth potential of agriculture was negatively affected. And this was also referred to as the 'plundering' of agriculture (Schiff and Valdes, 1992). Also, Bale and Lutz (1985) discussed government intervention in agricultural price determination, drawing on welfare theory to quantify the economic impacts on output, income distribution, efficiency, and employment. The results of the paper are derived from using standard partial equilibrium analysis in the Marshallian economic surplus framework. Also, the real and pecuniary effects of agricultural price distortions in the case of a small country are analyzed, using nominal protection coefficients to measure the disparity between domestic prices and border prices. It was concluded that the levels of agricultural production in less developed countries are significantly smaller than what they would be in the absence of distortions. It was also discovered that exports of developing countries are reduced due to price distortions. Finally, it was found that the economies of the countries analyzed incur large annual welfare losses due to a misallocation of resources from the existing agricultural pricing policies. Most of the earlier studies which measured the costs of protection have been conducted using "partial equilibrium" framework under ceteris paribus assumptions with the help of effective rates of protection (ERP), as well as the concepts of producers' and consumers' surplus. Some analysts have attempted to estimate the costs of protection in models using general equilibrium methods to examine the general effects of trade liberalization. For example, De Melo (1978), in his study, divided the loss of real income due to protection into two elements: (a) the consumption costs resulting from the distorted prices facing consumers as domestic prices differ from world prices, and (b) the production costs resulting from distortions of prices facing producers. Therefore, the total cost of protection is measured by the total reduction in utility from the above effects. However, a general equilibrium approach was used which is not restricted to small departures from free trade. The analysis is based on a walrasian approach, which emphasizes the importance of substitution effects in both product and factor markets on the grounds that a removal of trade barriers entails a large change in relative prices that is likely to affect both producer's and consumer's choices. Therefore, protection has a joint effect of being a consumption tax and a production subsidy, and it reduces the utility enjoyed by the community both by reducing real output below the maximum attainable from the expenditure of the real output below the potential maximum. It was noted that removing quota alone in Turkey in 1978 would have increased its GDP by as much as 5.4% (Grais, De Melo, &Urata, 1986). Also, Ubogu (1988) concluded that a liberal trade regime with low tariffs and without quotas up to 1973 led to export-led growth in the world economy and relative stability in Nigeria's export earnings and inflow of foreign capital. It was evident that when economic reform began in the late 1970s in China, market-oriented reforms involved efforts in creating autonomous incentives at the micro level, such as adoption of various systems in agriculture and urban industries (Lin, 1992; Huang, 1998, 2001); and removing restrictions over free markets by trade

liberalization (Drysdale & Song, 2000; Lardy, 2002); and building institutional infrastructure necessary for the market economy, such as the development of large modern financial industry (Huang, 2001). This set of reform policies resulted in what can be described as the "China puzzle" (Huang, 2010).

THEORETICAL FRAMEWORK

The main focus of the theoretical framework is to determine the impact of agricultural price distortions (TA) on agricultural output (YA). And explore the theoretical linkages between agricultural price distortions and some growth components, such as exports and productivity.

What accounts for the poor performance of the Nigerian agricultural output? The level of agricultural price distortion is clearly not the only factor. Development is complex, and its pattern can be influenced by many variables, endogenous and exogenous. Growth has been retarded in some developing countries by deterioration in their terms of trade, inflation, and high interest rates which have made progress very difficult. But the links between agricultural price distortions and growth are there, operating mostly indirectly through resources mobilization and efficient use of resources. Price and quantity controls create distortions in the sense that goods and services are not valued at their opportunity cost. These distortions in turn affect the efficiency of resources allocation and, as a result, have macroeconomic consequences.

Exports play a key role on both the supply and the demand side of the economy. On the supply side, they provide the basis to acquire through foreign exchange the imported capital goods and technology which are necessary towards a rapid economic growth. On the demand side, they serve to prop up the aggregate demand. Indeed, the whole efficiency of resource allocation is, to a large extent, mirrored in terms of export performance. Since agricultural price distortion affects the efficiency of resource allocation, it reduces the volume of agricultural exports, thereby reducing the volume of imported capital and the other intermediate goods which could have been made available through the agricultural export proceeds. Agricultural price distortions through faulty price signals generate inefficiencies in resource allocation which eventually will reduce the amount available for investment, since Nigeria greatly depended on the availability of its imported capital and machineries for an efficient operation of its productive processes. As a result, agricultural output will increase with a decrease in agricultural price distortion over a time period. However, agricultural output will be constrained if there are high levels of agricultural price distortion.

The Production Function

The Nigerian economy is assumed to consist of a large number of firms, each producing the same product and subject to the same production function. Thus, different from the usual production function that includes only capital and labour; this model analyzes the role of agricultural exports in economic growth in the framework of a straight-forward production function that treats agricultural exports as similar to a production input. Agricultural products are often implicitly or explicitly subject to export tax, reducing their domestic price relative to their world price. Low food prices keep real wages low which in the classical growth model facilitates the transfer of workers from agriculture to the industrial sector. At the sectoral level, price intervention policies concerning agricultural exports are likely to create biases in the structure of incentives within agriculture. Each of these policies creates a disincentive to agricultural production. Subsidies are typically a significant drain on

government savings and, hence, on resources available to finance investment. Substantial savings may also be lost through income transfers from agriculture to the rest of the economy through price distortions, since marginal saving rates are higher in rural than urban areas and are almost as high for small farmers as for large. Also, over a time period, the effects of price distortions in the agricultural sector will cause inefficiency in resources allocation, thereby, inhibiting agricultural productivity.

Producer behavior is represented in the model by the following agricultural export equation:

XA = f(Pdxa, Z)
(3.1.1)
Where,
XA = agricultural exports;
Pdxa = the domestic price of agricultural exports;
Z = a vector of quantities of fixed inputs and other supply shifters such as technology and weather.

In a small open economy like Nigeria; it is usually the case that agricultural export prices are determined in the domestic market as follows:

Pdxa = Pfxa.e (1 + TA)
(3.1.2)
Where,
Pfxa = foreign price of agricultural exports;
e = the real exchange rate;
TA = agricultural price distortion level

The domestic price of agricultural exports (Pdxa) is determined by the foreign price of agricultural exports (Pfxa), the real exchange rate (e), and the agricultural price distortion level (TA). But where the state marketing boards have effective control over export trade; the agricultural price distortion level (TA) would represent an implicit agricultural export tax underlying the disparity between the foreign price of agricultural exports and the government determined price. Unless otherwise indicated, the analysis will assume that the agricultural export tax is the policy instrument being used rather than the direct price intervention policy of the state marketing boards. Trade policy for agricultural exports limits the quantity exported through the imposition of either a per unit agricultural export tax or an agricultural export quota, and the result is to cause the domestic price of agricultural export to be lower than the world price of agricultural exports. Therefore, the immediate impact of the agricultural price distortion level (TA) is on the domestic price of agricultural exports. The most general price effect of this distortion is to create a differential in the international price of the affected export commodities. Another effect of this distortion is to reduce the volume of international trade. By reducing the volume of trade, the country's real income is reduced. Also, there will be a distortion of optimum resource use and a breakdown of the price mechanism as a guide in the international allocation of resources.

In regards to the above considerations, Nigeria's agricultural export supply function for the merchandise goods can be specified as follows:

XA = f(TA)
(3.1.3)
$dXA/dTA < 0$

From the above formulations, a simple linear reduced form model was used to estimate agricultural output in Nigeria. The model chosen, which reflects the issues and constraints in the sector, is derived from the conventional supply behavior based on the theory of profit maximization. Therefore, structurally, agricultural output can be expressed as a function of agricultural output prices, input prices, and other exogenous shifters in a reduced form. Both price and non-price factors have over the years influenced agricultural productivity, thereby inhibiting agricultural growth. The inclusion of non-price factors in the model meant that elasticities obtained are long-run elasticities. Farmers can only respond to a pure price adjustment in the short-run. Long-run response, which involves shifts in the supply curve, can only come about through improvements in technology and other exogenous supply shifters. Farmer's decision on what to produce and in what quantity is based on their assessment of domestic price. This is particularly very important for Nigeria where bulk of agricultural output is food. In Nigeria, labour played a crucial role in the agricultural sector. It was estimated that about 60% of the adult labour force is engaged in agriculture. Thus, labour becomes a crucial factor in agricultural output supply function.

From the above formulations, a simple linear reduced form model can be derived from the conventional supply behavior based on the theory of profit maximization as follows:

$$YA = f(LA, Pda, TA) \quad (3.1.4)$$

$$dYA/dLA > 0;\ dYA/dPda > 0;\ dYA/dTA < 0$$

where,

YA = agricultural output;
LA = labour input in agriculture;
Pda = domestic price of agricultural goods.

Therefore, structurally, agricultural output can be expressed as a function of input prices, output prices and other exogenous shifters in a collapsed reduced form.

The study period covers the oil-boom era when oil basically earned most of the foreign exchange for the country. At this point, the influence of oil-boom overshadowed other influences in the economy and dictated the movements of all the key macroeconomic variables and policy decisions. Therefore, oil-boom is represented in the following equation by a dummy variable to capture its influences on the agricultural output in the economy. The introduction of a dummy variable to represent the influence of the oil-boom is relevant in this model in the sense that there was a movement of labour from agriculture during the oil-boom period to the other sectors. In the absence of technological progress in this sector, agricultural output fell due to this outward migration. Thus, from the above formulations, outputs in the agricultural sector were influenced as follows:

$$YA = f(LA, Pda, TA, D1) \quad (3.1.5)$$

Where,

D1 = oil-boom influence.

Comparative Static Analysis of the Agricultural Model

The following equations specify a modified Neo-classical production function in the Nigerian agricultural sector while assuming profit maximization for the firms in the economy:

YA = f(LA, Pda, XA)
(3.2.1)
dYA/dLA > 0; dYA/dPda > 0; dYA/dXA > 0
XA = f(TA)
(3.2.2)
dXA/dTA < 0;
By substituting (3.2.2) in (3.2.1), we have:
YA = f[LA,Pda, XA(TA)]
(3.2.3)

From equation (3.2.3), we can analyze the overall impact of agricultural price distortion on agricultural output thus:

dYA = df/dLA . dLA + df/dPda . dPda + df/dXA . dXA/dTA
(3.2.4)

Dividing (3.2.4) across by dTA, we have:

dYA/dTA = df/dLA . dLA/dTA + df/dPda . dPda/dTA + {df/dXA . dXA/dTA}/dTA < 0

(+) (-) (+) (-) (+) (-)

From the above analysis, it is then easy to conclude that the overall effect, theoretically, of agricultural price distortions on agricultural output is very negative. Therefore, we hypothesize a negative relationship between agricultural price distortions and agricultural output in the economy over the study period.

MODEL SPECIFICATION AND METHODOLOGY

These model specifications were based on the theoretical framework already developed in the study. And they also provide the empirical basis to investigate the effects of agricultural price distortion on agricultural output.

Two functional forms were used in the specification of the models: the first specifies the influence of only the policy and non-policy variables on agricultural output without the impact of oil-boom, and the other specifies the influence of the policy and non-policy variables on agricultural output with the impact of the oil-boom. This impact of the oil-boom on agricultural output is represented by a dummy variable.

Model Specification

To develop a testable hypothesis, the export variable in the agricultural sector (XA) is replaced with the other policy variables and therefore, the behavioural equations in the model are specified as follows:

$YA = \beta o + \beta_1 LA + \beta_2 Pda + \beta_3 TA + e_1$
(4.1.1)
$YA = \beta o + \beta_1 LA + \beta_2 Pda + \beta_3 TA + \beta_4 D1 + e_2$
(4.1.2)
Where,
βo = constant term in each equation
$\beta_1, \beta_2, \beta_3, \beta_4,$ = parameter estimates of the explanatory variables in each equation
e_1, e_2 = stochastic error terms in each equation
Pda = domestic price of agricultural goods

Methodology

The models are represented by a series of algebraic equations. However; to derive consistent, unbiased, and efficient estimators of the structural equations, the hypotheses were tested using the ordinary least square (OLS) regression technique. And to test the significance of the policy variables; statistical tests, such as the F-test, t-test, and the Durbin Watson (DW) statistics were used. In order to test the relationship among the policy variables in each of the behavioural equations developed; it was necessary to assume that their coefficients are the estimators of the population parameters. It was also important to ensure that the explanatory variables in the models were independent; meaning that they are not correlated among themselves and they do not influence each other. Without these assumptions, the population estimates may be biased; therefore statistically insignificant.

ESTIMATION RESULTS AND ANALYSIS OF THE MODEL

To appreciate the empirical relevance of the theoretical framework already developed, equations have been fitted to Nigeria's annual data in constant 1980 prices for the period 1967 – 2010, using ordinary least squares (OLS). All the equations were estimated in log form, and therefore, their coefficients are elasticities. These elasticities indicated the direction and magnitude of the impact of these exogenous variables on economic performance. The estimation results were given below with the t-values stated in parenthesis and corresponding to the coefficients of the exogenous variables of each equation. This t-value is defined as the estimated coefficient of the explanatory variable divided by its standard error, which is used to obtain the statistical significance of each of the individual results. Coefficient of determination R^2, F-Ratio, and the DW statistics are summarized below each equation. The R^2 determines the explanatory power of each equation by measuring the proportion of variations of the dependent variable that are mathematically accounted for by the independent variable taken together. On the other hand, the statistical significance of all the explanatory variables for the whole equation was tested by using the F-Ratio, which was defined as the ratio between the sum-of-squares of the residuals. Finally, the DW statistics was used to test for the first order autocorrelation in each equation.

The results of the estimates are as follows:

$$YA = -2.8 + 4.6LA + 0.57Pda - 0.03TA \quad (5.1)$$
$$(-1.2)\ (2.8)\quad (2.5)\quad (-1.6)$$
$$R^2 = 0.80;\ F = 4.0;\ DW = 0.87$$

In the above model (5.1), all the variables have correct signs including the agricultural price distortion level, TA, but it is not significantly different from zero. From equation (5.1), it can be seen that in the agricultural sector during the study period; that output elasticities of labour, domestic price in agriculture, and agricultural price distortion level were 4.6, 0.57, and 0.03 respectively. In other words, over the study period, holding labour and agricultural domestic price constant, a 1 percent increase in agricultural price distortion level (TA) will lead on average to about 0.03 percentage decrease in agricultural output. AS a result, agricultural output is decreased due to an increase in the distortion level. The model also showed increasing returns to scale with the sum of the coefficients summing up to 5.2; doubling the inputs will more than double the output. The statistical significant of the agricultural output (YA) at the 5 percent level means that the hypothesis that agricultural price distortion level is negatively related to agricultural output cannot be rejected. However, since oil was the engine of growth during the greater part of the study period, it becomes

necessary to test whether oil-boom has any significant influence on agricultural output during this period. Thus, the estimated results are as follows:

YA = -2.2 + 4.3LA + 0.62Pda – 0.02TA – 0.06D1
(5.2)
(-1.0) (2.7) (2.8) (-0.48) (-2.1)
R^2 = 0.90; F = 8.0; DW = 1.1

Model (5.2) also exhibits correct signs in terms of the explanatory variables. However, the explanatory variables are all significant except the price distortion variable. This suggests that in the agricultural sector, the effects of the oil-boom overshadowed the effects of price distortion during the study period. Nonetheless, price distortion in agricultural sector has a negative influence on agricultural output during the study period, though not significant.

Summary Results of the Estimations in the Sub-Periods

Pre-oil Boom Period:
YA = 4.8 + 0.38LA + 0.67Pda – 0.06TA
(6.6) (2.0) (2.1) (-2.4)
(5.1.1)
R^2 = 0.92; F = 15.9; DW = 2.8
Oil-Boom Period:
YA = -0.95 + 3.0LA + 0.86Pda + 0.06TA
(5.1.2)
(-1.3) (7.2) (2.8) (1.6)
R^2 = 0.96; F = 25.4; DW = 1.6
Post-oil Boom Period:
YA = -4.7 + 5.1LA + 0.2Pda – 0.08TA
(5.1.3)
(0.48) (2.0) (1.5) (-0.5)
R^2 = 0.76; F = 2.2.

An analysis of the pre-oil boom period in model (5.1.1) indicated that agricultural price distortion has a significant negative impact on agricultural output, while the effects during the oil-boom is positive, and mildly negative during the post-oil-boom period; suggesting again that oil-boom effects still persist after the boom period. This negative influence of agricultural price distortion might be as a result of several discriminatory practices of the marketing boards during the study period, while the negative impact of the oil-boom might be due to the obvious neglect of the agricultural sector at this period. From all indications, it can be concluded that if not for the influence of oil-boom, the negative relationship between agricultural price distortion and agricultural output as hypothesized in this study period could have been very certain in this study. Also, the high elasticity of labour to agricultural output confirms that labour is a constraining factor and that agricultural output depends on the labour involved in agriculture. This is explained by the fact that in agriculture, labour is the most important factor of production.

CONCLUSIONS AND POLICY RECOMMENDATIONS

The analysis of the experience during the period (1967-1910) in Nigeria confirms the view that agricultural exports are important positive determinants of agricultural output. The effect of agricultural price distortions on agricultural output is as a result of their impact on

agricultural exports. During the greater part of the study period, oil export is the engine of growth in the economy. Hence, oil-boom greatly influenced other factors that determine agricultural output. Because of that, after a reduced form equation was formulated and estimated, the results showed that the influence of agricultural price distortion on agricultural output was greatly overshadowed by the influence of oil-boom during the study period. However, when the estimation was done for the pre-oil boom period, the results showed that price distortion has a significant negative relationship with agricultural output. Hence, the hypothesis that there is negative relationship between price distortion and agricultural output was supported when the influence of oil boom was controlled for. The obvious conclusion, therefore, is that an inverse relationship exists between agricultural price distortions and agricultural output, although this negative relationship was greatly suppressed due to the influence of the oil-boom during the study period.

Nigeria has over the years been engaged in a wide range of price interventions in the agricultural sector with the sole intension of providing incentives to promote sectoral growth. However, these pricing and subsidy policies have had a distorting impact on the allocation of resources within the sector, thereby generating considerable costs in terms of economic efficiency. And agriculture appears to be highly taxed in Nigeria. There is often a tax on agricultural exports. This is often combined with fixed official prices paid to producers of agricultural export designed to stabilize the domestic price compared to the more volatile international price. These prices paid to farmers are below or above the international price depending on the movement of the international price and the efficiency of the marketing board acting as intermediary.

Since future economic growth will depend on the pace and effectiveness of policy reforms designed to eliminate the price distortions in the economy, reforms of the pricing policy should constitute a major component of any remedial program. If the Nigerian agriculture is to become modern and efficient, it must be given both the opportunity and the motivation to reduce costs. Indiscriminate reduction of the rate of protection and the reduction of the implicit taxes on exports alone are not the solution. Better physical infrastructure, better education and training, and more industrial experience can contribute to the ability to reduce costs and raise productivity. Lower protection and the reduction of the implicit taxes on exports can only increase the motivation. Improved efficiency means better utilization of productive factors and widening of domestic markets. Also, improved efficiency creates greater possibilities for augmenting the exports of the agricultural sector, which is of importance for both improving the balance of payments and maintaining a high growth rate of output.

With external indebtedness pressing on the country's debt-servicing capacity, improvements in foreign exchange earnings are necessary to provide the imports needed to maintain a high rate of economic growth. Apart from increasing import capacity, exports contribute to economic growth directly by raising incomes and providing demand for domestically produced inputs. This export-led growth can be achieved through sustained improvements in the pricing policies. Policies that would reduce price distortions and improve the efficiency of the market mechanism should be encouraged.

The changes required in the system of protection cannot come overnight. It then seems appropriate to distinguish between the short-term and the long-term policy changes. For the short-term, there is the need to provide greater competitive pressures in the agricultural sector. For the long-term, policies should be devised to reduce discrimination against exports

and improve resources allocation in the national economy. To increase the incentives to export, it would be necessary to abolish export licenses, reduce the rate of domestic protection, and remove all other forms of subsidies. Producers of agricultural goods should be allowed to sell their products in both the domestic and international markets. This will re-establish and strengthen the market mechanism, especially in the agricultural sector.

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