NOTES AND COMMUNICATIONS

A TENTATIVE PROJECTION OF THE STRUCTURE OF THE NIGERIAN ECONOMY IN 1975: A NOTE

by

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IN the March 1970 issue of the *NJESS*, a tentative projection of Nigeria's economy to 1975 was attempted.[1] The authors frankly admit the limited ambition of the exercise, viz., to provide a "mathematical type" of projection rather than a "planning type" projection, with the expectation that the former might provide a meaningful picture of the structure of the economy, whereas the latter, whilst more desirable in itself was considered impractical on various grounds.

In deriving the projections, six sectors of the economy are isolated for consideration: Agriculture; Mining (excluding oil); Manufacturing; Electricity and Water; Building; and Transport and Communication. Each sector is projected separately so that an overall projection is the sum of the separate projections, thus ignoring interdependencies between sectors. Three reasons are adduced for this procedure, which involves the assumption, as the authors point out, that each sector has its own internal dynamic.

(*i*) *The past performance of each sector apparently includes this form of interrelationship*

It is necessary to be quite clear as to what this means. What the authors are saying is that even if linkages exist they are already taken care of. At the very least this is dubious. Let us take the case of agriculture. We can consider agricultural output to be made up of subsistence production, production for the domestic market and production for export. Now these sub-sectors are not mutually exclusive—depending on the crop there can be significant differences between end uses; depending on price there can both be substitution between type of production and differences in end use. Thus we could

[1] L. E. Lukacs & E. Vielrose. A Tentative Projection of the Structure of the Nigerian Economy in 1975 (*NJESS*, **Vol. 12, No. 1** March 1970).

have an increase in total agricultural production but a fall in export cash crop volume. The sector, transport and communications, which is heavily dependent on export volume would record a decline in activity. In other words the interdependence between sectors can be effectively masked by the procedure adopted by the authors. Ignoring interdependencies must inevitably lead to distortions.

Assuming that the above objection could be overcome, the situation is still complicated. It is not altogether clear that even if we accept that past performance of a sector alone includes inter-relationships, that this is very useful for projection purposes, even when the same technique of projection is adopted. Can we have a legitimate expectation that projected figures will also include such interrelationship.

On slightly different grounds (i) can be criticized as involving a confusion between gross and net output of a sector, From the point of view of linkages gross output is a more meaningful concept. The contribution of G.D.P. of a sector in National Accounts terms is simply its value added, which abstracts from linkages between sectors.

Of course (i) makes nonsense of the assumption which supposedly depends on it "that each main sector of the economy has its own specific tendency".

(*ii*) *There is historical evidence to the fact that in a developing economy sectors may for a long time grow relatively separated from the rest of the economy*

There would also seem to be considerable evidence to the contrary. It could be more realistically argued that as development occurs a network of interlocking relationship is established which becomes more complex and broadens in scope with development. Perhaps it might be more meaningful to look at each country separately rather than making sweeping historical generalisations. Let us look at Nigeria. The basic data for the projections is drawn from the period 1958/59–1966/67, the projected year is 1975/76. The data base straddles the pre-and post-independence period. Whatever can be said about the success or otherwise of the First National Development Plan, its launching did herald the beginning of a new era in investment the effects of which were beginning to be felt before the war. The seeds of structural change were sown in the latter half of the data period, the war interrupted and then accelerated this change and it is current policy that this should be further accelerated. Qualitatively, there is little disagreement about this, though the precise figures are, as always, hard to come by. The country has gone through a war—it is idle to pretend that this has not affected the structure of the economy.

Manufacturing production by 1969 was 30% above the 1966 level after a slowing down in its growth in 1967 and 1968. Estimates for 1970 indicate that it will be 14% above the 1969 level. There is some evidence that Nigeria is beginning to supply directly from domestic sources the raw material of industry. Let us go a step further and look at some figures at the micro-level.

In a paper[1] presented to an International Conference on the Marketing Board System, figures shown below were given to show the amount of cotton lint and groundnuts taken by textile mills and oil mills.

TABLE 1

Season	*Cotton (000) Bales* *Total Prod.*	*Textile Mills Off-take*	*Groundnuts (000 tons)* *Total Prod.*	*Oil Mills Off-take*
1965/66	250	90	968	285
1966/67	288	125	1,053	303
1967/68	152	124	705	310
1968/69	309	140	764	340
1969/70	496	189	615	365

The figures, I think, do not require any further comment.

The Central Bank Annual Report provides further evidence, drawing attention to the rise in exports of semi-manufactured agricultural products Cocoa is a case in point, cocoa products exports rising from £0.4m. in 1967 to £6.1m. and £8.5m. in 1968 and 1969 respectively. Although the amount is small it is indicative of the sort of structural change that is taking place.

Finally, the Annual Report for 1969 of the Federal Ministry of Industries, though short and incomplete, provides the sort of qualitative information that must be used by the economist in discerning structural change when faced with weak data.

Now it may be argued that this criticism is unfair, as the real complaint is centred on a time period outside the data period—a time period for which the authors cannot be held responsible! This raises two further points (*a*) the validity of using mechanical methods of projection which will be returned to later and (*b*) discounting all the argument given above would it still be true that "sectors may for a long time grow relatively separated from the rest of the economy". This latter point I think does not stand up under examination. Can it seriously be argued that cocoa production is separated from the rest of the economy. Without getting carried away with the subject, the size and price (both producer and international) of the cocoa crop has implications for: road transport; post facilities; farmers' income; tax revenue; Marketing Board's surplus; and each of these in turn has obvious implications. One could go much further; up to quite recently, but now of diminishing importance, the cocoa crop's importance to the balance of payments was out of all proportion to its contribution to GDP—would anyone argue that the state of the Balance of Payments is a matter of slight consequence to the *whole* economy.

[1] M. O. Titiloye and A. A. Ismail, "A Survey of the trends and problems in the domestic arrangement for the marketing of groundnuts and cotton.

(*iii*) *The inclusion of intersectoral growth effects would have made our mathematical formulae much too complex to be handled without resorting to a computer, that is to say, without undue delay*

But would it. In (ii) the authors argue that intersectoral effects are small if not negligible. If for one moment we accept the principle involved in (ii) then it would be relatively easy to incorporate such effects. Accepting the case I have made for greater complexity than the authors are prepared to admit it would still be relatively easy. The relationships are not negligible, but they are simple. Seers[1] has argued that the relative simplicity of a developing economy has made it that much easier to discover and connect meaningful linkages.

> It may seem strange that it should be possible to attempt in an underdeveloped economy the sort of technique which is only just being introduced in the most highly developed economies. The explanation lies, firstly, in the high proportion of economic transactions which are international (and, therefore, recorded in the trade statistics), and secondly, in the possibility that the accounts of one or two large mineral companies or agricultural marketing boards cover another substantial fraction of all economic transactions. A set of accounts for sectors of the economy is, in fact, feasible, either (a) if the economy is highly developed, which generally implies a comprehensive documentation by censuses of production, tax statistics, budget studies, etc., or (b) if the economy is hardly developed at all. A comprehensive matrix of transactions would probably not be even a possibility for economies which have developed sufficiently to supply many of their own needs from local industries, but have not a comprehensive system of economic statistics.

To recap: conflicting arguments are proposed to cover the assumption that each sector has its own momentum and that there are no interdependencies —if there are interdependencies they are already taken care of, anyway in developing economies separate development at the sectoral level occurs so there are no interdependencies, and in any case if interdependencies do exist, they would complicate the mathematics! The authors would have their cake and eat it.

While all this may seem to be negative it is not intended as such. It would be much better for the authors to clearly recognize the limitations of their assumption than to attempt to give it respectability, dubiously. We are all still feeling in the dark as far as projections are concerned and first approaches must necessarily be simple.

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[1] Dudley Seers, "The Role of National Income Estimates in the Statistical policy of an underdeveloped area (Review of Economic Studies, **Vol. 20 (3) No. 53** (1952–53).

The "Model"

Earlier, doubts were raised as to the validity of mechanical methods of projection. It is now necessary to turn to the actual model used for projection purposes. The assumption in the previous section has imposed severe limitations on the form of the model. For the authors, each sector's value added is explained in terms of the value added of the previous year. The functional form is as follows

$$X_{t+1} = a + b\,X_t$$

where X_{t+1} is value added in year $t+1$ and X_t value added in year t. It should be noted that while the data period is nine years the use of this form provides only eight observation. For each sector least squares is used to calculate linear regression equations which are transformed into difference equations of the fam $X_t = c.b^t + d$ with $t=0$ in 1962/63. The original and the transformed equations presented are given below.

TABLE II

	Original Equation	*Transformed Equation*
Agriculture	$X_{t+1} = 0.853\,X_t + 141.60$	$X_t = -146.2 \times 0.853^t + 963$
Mining	$X_{t+1} = 1.042\,X_t + 0.09$	$X_t = 13.84 \times 1.042^t - 2.14$
Manufacturing	$X_{t+1} = 0.871\,X_t + 14.60$	$X_t = -40.1 \times 0.871^t + 113.2$
Electricity and Water	$X_{t+1} = 1.108\,X_t + 0.38$	$X_t = 9.52 \times 1.108^t - 3.52$
Building	$X_{t+1} = 1.027\,X_t + 4.16$	$X_t = 215.2 \times 1.027^t - 154.1$
Transport and Communication	$X_{t+1} = 0.709\,X_t + 1.498$	$X_t = -6.3 \times 0.709^t + 66.9$

Several points emerge from the above Table

(*i*) It is not possible to evaluate the statistical relevance of the equations. No R^2s are given and no tests of significance on the coefficients. The illustrative graphs given are no help—straight lines would appear to fit as well. It could very well be that the authors felt this unnecessary as the functional form was predetermined irrespective of its explanatory powers. If this is the case then the usefulness of this mechanical projection method is zero.

(*ii*) Looking at three of the original equations, viz., those for agriculture, manufacturing, and transport and communication it is apparent that the sectors represented by these equations cannot grow unless X_t is above a certain level (which is easy to calculate). When we come to the transformed equations the consequences are seen even more clearly. Agriculture, Manufacturing, and transport and communications can *never* rise above the level of £963 m., £113.2 m., and £66.9 m. respectively. This of course is a direct consequence of the coefficients estimated in the original

equations. As long as they are less than unity we can expect no better. In fairness to the authors, it should be said that having projected the sectors to 1975 and calculated growth rates they recognized that manufacturing would fall from 6.5% of GDP in 1966/7 to 5.6% of GDP in 1975 and found this unacceptable. As an alternative they project manufacturing at the annual rate of growth achieved between 1958 and 1966. They do not appear to have fully recognized the inevitability of this given the coefficient, and the inevitability of a declining growth rate in the other two sectors. Recognition of this would lead to rejecting the functional form chosen out of hand.

One can only be uneasy about the basic model used. If each sector does in fact have its own internal dynamic then more sophisticated mathematical techniques are required to find it. But I do not believe that the situation is so easy. The case for the use of mechanical projection methods has not been made. Perhaps the authors overestimate the difficulties of a planning type projection. Paul G. Clark, in his development Planning in East Africa (EAPH), attempts a simple projection model for the three East African economies. It can best be described in his own words:

> First, it is a sector model distinguishing six producing sectors of the economy, seven kinds of imports, two classes of exports, four forms of capital formation, four kinds of government taxes and certain other variables. Thus, it embodies substantially more specific information than a purely aggregative model but still much less detail than is involved in planning development actions within ministries. Second, it portrays an economy in which everything depends, by way of the structural relationships among its parts, upon five autonomous variables: the quantity of agricultural exports, the prices of those exports, the value of manufactured exports, import substitution in manufactured products and central government current expenditures. In particular, it specifies that required capital formation is derived within the model from implied increases in domestic production. Third, the parameters describing the structural relationships among parts of economy must each be projected into the future. Some are assumed to remain unchanged or to follow a time-trend, while others are assumed to be adjustable by government policy. Fourth, it is a linear model; capital formation, though in principle non-linear, is represented by a linear approximation depending on a tentative initial estimate of rate of growth. Thus, though the algebra is somewhat laborious, it is mathematically simple. Finally, the model is designed to emphasize three potential constraints on development expenditures and policies; the balance of trade, which depends mainly on the various import parameters; the government budget surplus or deficit, which depends mainly on the tax revenue parameters; and the required saving, which depends mainly on the capital formation parameters.

The model consists of 11 accounting identities five autonomous variables and 21 functional equations. It would be naive to apply this model wholesale to Nigeria, but it does indicate methodology and shows what can be attempted. It has the distinct advantage of embodying many variables in addition to G.D.P. figures. There is a considerable amount of data available in Nigeria—the problem is to tie it together. Any model, however, would need to take account of foreign trade and the importance of government. Of necessity, the model builder must come to grips with the staggering amount of oil revenue accruing to the Federal and State governments, where the constraints of the future are likely to be manpower and executive capacity. All this requires a considerable amount of data collection and experimentation on the part of the researcher. To end on a lighter note and falling into the researchers common error—with a bit of luck and two years a workable model might appear.