Basic and computation of rebased Gross Domestic Product (GDP) Nigeria's experience

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1.0 INTRODUCTION

The gross domestic product (GDP) is one of the primary macroeconomic indicators used to gauge the health of a country's economy. It is a good measure of the level of economic activities carried out in a nation at any given period in time. It represents the total market value (measured in monetary terms) of all goods and services produced within a specific period. It is an important indicator of the national accounts.

Historically, NBS (2014) had explained that "earliest known work on national income for Nigeria was carried out by John Mars, Margery Perham and A. J. Brown in the 1930s". Several other interventions were made which include: A.R. Prest and I.G. Stewart (1950), visiting World Bank Mission (1954), E. F. Jackson and P.N.C. Okigbo in late 1950s to early 1960s, Federal Office of Statistics (FOS) 1963. Professor O. Aboyade (report in 1981), Professor Adamu (1985) revised Nigeria's SNA from 1977/78 to 1986, World Bank consultants (Majumdar and Hodgekinson) reviewed GDP for the period 1981 to 1986.

Other interventions include: The

United Kingdom Department for International Development (DFID) 2001-2005, period within which the GDP base year was changed from 1984 to 1990 and the emergence of the thirty-three economic activity classification for the Nigerian economy, the Central Bank of Nigeria (2005 and 2008) collaborating with NBS to produce the first quarterly national accounts and establish a process that guarantees the quality, frequency and timeliness of the estimates.

Currently, the System of National Accounts, (2008 SNA) is the statistical standard that supports the compilation of the GDP. The SNA is a statistical framework that provides a comprehensive, consistent and flexible set of macroeconomic accounts for policymaking, analysis and research purposes.

Statutorily, the National Bureau of Statistics (NBS), by the Statistics

Act, 2007 is mandated to compile the GDP. In recognition and subsequent response to the changing structures of production, consumption and finance in many economies, countries traditionally engage in the review of the methodology for compiling the GDP and the base year in an attempt to capture the current economic realities. It is in this regard, that the NBS decided to embark on the rebasing exercise. The objective of this paper therefore is to look at the basic concepts in GDP compilation and the computational processes for the rebased GDP.

This paper is structured into four sections. The first section deals with the introduction while section two explains some basic concepts and mathematics for GDP compilation. Section three takes a look at the GDP Rebasing while section four deals with the Recent Development from the Rebasing exercise.
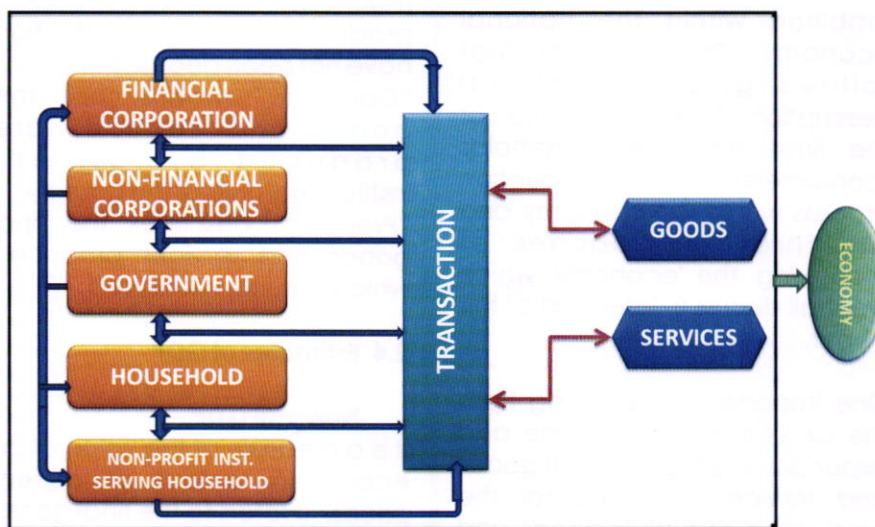
2.0 BASIC CONCEPTS

2.1 The Economy

The System of National Accounts (2008 SNA) defined the total economy as the entire set of resident institutional units. An institutional unit is an economic entity that is capable, in its own right, of owning assets, incurring liabilities and engaging in economic activities and in transactions with other entities. The SNA therefore have classified these institutional units into five mutually exclusive institutional sectors.

The diagram below shows the five institutional sectors, how they interact, and the outcome of the interactions (goods and services)

Compiling the GDP therefore involves accounting for activities of the institutional units within the institutional sectors and determining the monetary values of goods and services produced by them under the framework of the SNA.

2.2 The Circular Flow of Income and Expenditure

The circular flow of income and expenditure further portrays how the economic agents fulfil their ambition within the national economy. The diagram that follows gives a pictorial description of the participation of the firms and the households (consumers) in the production process within the economy and the three approaches of measuring the economy which we shall discuss in later part of this paper.

One important issue arising from this circular flow of income and expenditure is that inputs of goods and services are used for the production of further goods and services which when measured produces the gross domestic product (GDP).

The Circular Flow of Income & Expenditure
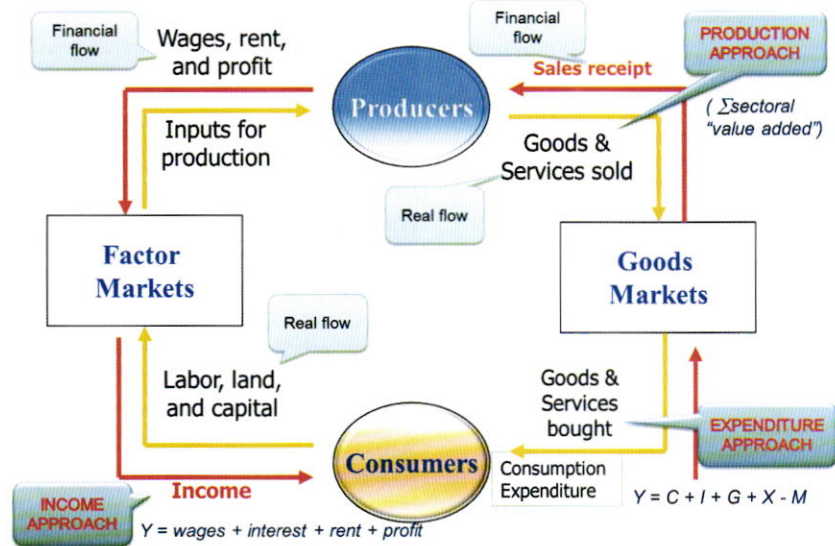
2.3 What is GDP

Gross Domestic Product (GDP) is the standard measure of the value of final goods and services produced by a country within a specified period of time. It combines in a single figure and without double counting, all the output (production) carried out by all the firms, government, non-profit institutions and households within the country's economic territory.

"Gross", implying that consumption of fixed capital of machinery and other capital products used in production have not been deducted.
"Domestic" means that the goods and services are produced by resident institutional units of the country.
"Products" describes the final goods and services produced which is usually measured.

2.4 Estimates of GDP

- **Nominal GDP**
It is a measure of the value of an economy's output at current prices. It refers to the final goods and services produced in a given year valued at the prices of that year.

- **Real GDP**
This is inflation-adjusted GDP. It refers to the same quantities of final goods and services, but valued at unchanged prices of a reference year. The Real GDP can either be a fixed base, previous year, or a chain base. When it is a fixed base, it is described as GDP at constant prices and the base year corresponds to the year for which the price index is equal to 100.

- **Implicit Deflator**
This is an index that measures the average price level of an economy's output relative to the base year. The GDP deflator can be viewed as a conversion factor that transforms real GDP into nominal GDP or vice versa. Note that in the base year, real GDP is by definition equal to nominal GDP so that the GDP deflator in the base year is always equal to 100. Thus, the percentage change in the GDP deflator measures the rate of price increases for all goods and services in the economy.

$$GDP\ deflator = \frac{Nominal\ GDP}{Real\ GDP} \times 100$$

2.5 Approaches to GDP Compilation

• Production or Value-Added approach

GDP by production approach = sum of gross value added during a period plus taxes less subsidies on product.

Output is the market value of goods and services receivable by producers of these goods and services.

Intermediate Consumption is the cost of all goods and services used up in the process of producing the output within the accounting period. It is usually measured in purchasers' value. Therefore

$$GDP = \sum Output - \sum Intermediate\ consumption$$

$$GDP = \sum Gross\ value\ added$$

The Mathematics of Compiling GDP by Production Approach:
If the gross output (ø) for a sector is given as

$$\theta = q * p \qquad (1)$$

where

q = quantity of goods or services produced in the sector for a given period
p = market price for the goods or services produced and
w = intermediate consumption (IC) for that sector

Then, gross value added for the sector will be given as

$$y = \theta - \omega \qquad (2)$$

In practice, GDP is compiled either at the product or industry level and can easily be summarised at the sector level hence total value added for the sector is given as:

$$y_j = \sum_{i=1}^{m} \theta_i - \omega_i \qquad (3)$$

where
y_j = value added for jth sector
j = sector in the economy
$\emptyset_i$ = gross output of the ith product in the sector
w_i = intermediate inputs used for the ith product in the sector
m = number of products in each sector

Thus, the total GDP for the economy would be given as

$$Y = \sum_{j=1}^{n} y_j \qquad (4)$$

Where
 n = number of sectors in the economy

In Nigeria, the total GDP is currently measured for forty-six economic activities (sectors) using data from the thirty-six states of the Federation and the Federal Capital Territory (FCT) as represented in the matrix below:.

Therefore the total GDP for Nigeria is mathematically given as:

$$Y = \sum_{i=1}^{37} \sum_{j=1}^{46} y_{i,j}$$

where
Y = total GDP
$y_{i,j}$ = value added for sector j from state i

From the above matrix $\sum_{i=1}^{37} y_{i1}$ gives the total value added of crop production for all the states, while y_{11} and $y_{37,46}$ represents value added of Crop Production in Abia State and value added of Other Services in the FCT, respectively.

• Expenditure approach

Measures GDP as the sum of its final uses
= sum of final consumption (private or public (government)),

Matrix of Value added of each economic activity by State

State	Crop Production	Livestock	......	Crude Petroleum & Natural Gas	......	Other Manufacturing	......	Other Services
Abia	y_{11}	y_{12}	......	y_{15}	......	$y_{1,21}$	......	$y_{1,46}$
Adamawa	y_{21}	y_{22}	......	y_{25}	......	$y_{2,21}$	......	$y_{2,46}$
Akwa Ibom	y_{31}	y_{32}	......	y_{35}	......	$y_{3,21}$	......	$y_{3,46}$
.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.
FCT	$y_{37,1}$	$y_{37,2}$	......	$y_{37,5}$	......	$y_{37,21}$	......	$y_{37,46}$
Total	37	37	......	37		37		37
	...	...	......	...		...		...

Gross Fixed Capital Formation (Investment),
     Net export
     Mathematically expressed as:

$$Y = C + G + I + X - M$$

where

Y = total expenditure on GDP
C = private final consumption expenditure
G = government final consumption expenditure
I = investment or Gross Fixed Capital Formation
X = export of goods and services
M = import of goods and services

· **Income approach**

This is income earned by the various factors of production
= sum of employee compensation (wages, salaries in cash or kind)
    gross operating surplus (or profit) and mixed income

Mixed income is the surplus or deficit accruing from production by unincorporated enterprises owned by the households; it implicitly contains an element of remuneration for work done by the owner, or other members of the household.

2.6 Standards for Compiling Economic Statistics

Three of these standards are of interest here namely:-
· System of National Accounts (SNA)
· International Standard Industrial Classification (ISIC)
· Central Product Classification (CPC)

These standards guided both the data collection for the rebasing and the actual compilation of the rebased GDP. The details of provisions in each of the manual are as follows.

a) System of National Accounts

The System of National Accounts, (SNA 2008) is a statistical framework that provides a comprehensive, consistent and flexible set of macroeconomic

accounts for policymaking, analysis and research purposes. The SNA was produced under the joint responsibility of five organizations namely; United Nations, the European Commission, the Organization for Economic Co-operation and Development, the International Monetary Fund and the World Bank Group. The SNA had witnessed series of update; the most recent being from the 1993 to the 2008 SNA which like earlier editions, reflects the evolving needs of its users, new developments in the economic environment and advances in methodological research.

The 2008 SNA is intended for use by all countries, having been designed to accommodate the needs of countries at different stages of economic development.

The Statistical Commission unanimously adopted the 2008 SNA as the international statistical standard for national accounts. The SNA is the standard for the compilation of

the GDP. The NBS migrated from 1993 SNA to 2008 SNA in 2013.

b) International Standard Industrial Classification (ISIC)

The onus of the task of the national accountant includes compilation of the GDP and producing the national classification of the economy which will be used for reporting the national GDP in accordance with international standards. Further to this, the classification should be able to capture the emerged economy and address morbidity of the activities in the economy where necessary. One such document which contains the activities classified according to their industrial lining is the ISIC.
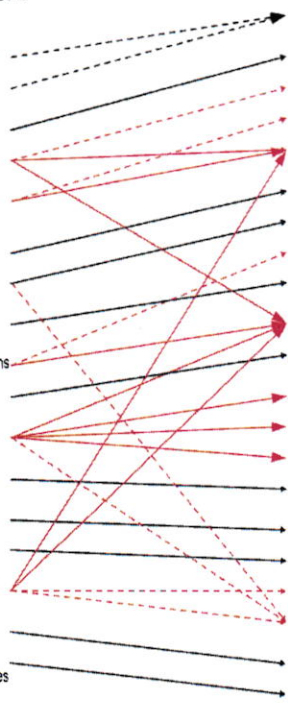
The ISIC is the classification structure that represents a standard format to organize detailed information about the state of an economy according to economic principles. It provides the basis for the construction of the survey framework, namely the Statistical business register (SBR). In addition

ISIC Rev.3.1

A Agriculture, hunting and forestry
B Fishing
C Mining and quarrying
D Manufacturing
E Electricity, gas and water supply
F Construction
G Wholesale and retail trade; ...
H Hotels and restaurants
I Transport, storage and communications
J Financial intermediation
K Real estate, renting and business ...
L Public administration ...
M Education
N Health and social work
O Other community, social, personal ...
P Activities of private households
Q Extraterritorial organizations and bodies

ISIC Rev.4

griculture, forestry and fishing
ining and quarrying
anufacturing
lectricity, gas, steam ...
/ater supply; sewerage, waste ...
onstruction
/holesale and retail trade; ...
ransportation and storage
ccommodation and food service activities
formation and communication
inancial and insurance activities
eal estate activities
rofessional, scientific and technical activities
dministrative and support service activities
ublic administration ...
ducation
uman health and social work activities
rts, entertainment and recreation
ther service activities
ctivities of households ...
ctivities of extraterritorial organizations ...

to the SBR, the structure/classification of the Nigerian economy for reporting the GDP numbers emerged from the ISIC. During the rebasing exercise, the NBS migrated from ISIC revision 3.1 to ISIC revision 4.0 The diagram below shows the linkage of the ISIC rev 3.1 to ISIC rev 4.0. It shows the emergence of new industries or how industries have expanded. The major fallout of this is the expansion and proper re-classification of the economic activities.

c) Central Product Classification (CPC)

The CPC is a classification based on the physical characteristics of goods or on the nature of services rendered. Each type of goods or services distinguished in the CPC is usually produced by only one activity as defined by the ISIC. The NBS migrated from CPC version 1.1 to CPC version 2.0

The CPC covers products that are output of economic activities. These products which constitute goods and services are what are valued at either current or constant prices to produce the Nominal or the Real GDP. It also provides the bases for the construction of the Supply and Use Table (SUT) at product level.

3.0 GDP Rebasing

We had earlier described the real GDP as inflation-adjusted GDP. When it is a fixed base year i.e. goods and services valued at unchanged prices of a particular year, it is also described as GDP at constant prices. In the course of time, the pattern of relative prices (unchanged prices of this particular year) becomes progressively less relevant to the economic situations of later periods. It becomes inappropriate to continue using them to measure volume measures from one period to the next. It therefore becomes necessary to update the base period, (replacing the old base year with a more recent one). This process therefore is

referred to as "rebasing"

3.1 Why Rebasing the GDP?

There are two dimensions to this question:

i.   What is the relevance of the GDP or the uses of the GDP as an economic indicator
ii. What must be done to enhance the strength of the GDP as an economic indicator

Uses and Relevance of the GDP

1.   The GDP estimate is used for research, policy formulation and decision making. Such decisions may include how output is divided between consumption and investment, dependency of the national economy on foreign trade, and how the structure of output changed over the years.

2.   It allows for comparability across states or nations. Such data can serve as tools for attracting or designing programmes to improve the welfare of the citizens.

3.   One fundamental economic problem is the issue of resources and their allocation. The GDP could be used as a guide in resource allocation, avail government, and investors understanding of the structure of the economy for effective channelling of resources to grow the economy, create jobs, improve infrastructure, and reduce poverty

4.   The GDP also provides a tool for monitoring the development of the national economy over time. The time perspective is particularly interesting in analysing the rate of GDP growth. It also aids in understanding the patterns of government and household consumption as well as the productivity trends.

5. It aids the International agencies in determining country's eligibility for concessional assistance, calculating quotas for IMF

member countries, and measuring the relative economic power of countries.

Strengthening the GDP

•   Most often the issue of Exhaustiveness of basic economic data for GDP compilation confronts the national account. This is more pronounced when compiling quarterly accounts because these estimates suffer from incomplete record. As a result, partial data or indicators as the case may be are used in their compilation. This poses a source of weakness. Strengthening the GDP involves correcting this inadequacy through the use of the full set of accounts on production; income and expenditure which usually occur during rebasing.

•   The birth and death of industries determine the extent of the Evolution of the economy. When such situation arises, it changes the structure of the productive economy. High premium therefore is placed in capturing the emerged economic activities and probably make less prominent the economic activities that are morbid. This leads to the compilation of a better business register or what we popularly called the frame. Data collected on the basis of this updated business register, helps to strengthen the power of the GDP.

•   Re-aligning the price configuration needed to obtain a base year structure which is more representative for the current period. Nigeria applies the fixed base method for deriving the constant price GDP. As a result, the further away the base year is from the current year, the higher the trade off with respect to accuracy and robustness of the GDP estimates. The Real GDP for Nigeria compiled by the National Bureau of Statistics was based on 1990 basic prices with a nineteen-year

lag considering 2010 as new base year. This lag poses a great challenge in recording accurately the true economic realities over time. Rebasing therefore provides the opportunity to resolve this constraint.

The question therefore "WHY REBASING THE GDP" takes its queue from how important the GDP is as an economic indicator and the periodic interventions in strengthening it. Therefore the entire process of rebasing the GDP summarily involves enhancing the POTENCY of the GDP as an economic arsenal:

• To obtain a more accurate estimate of the size and structure of the economy.

4.0 RECENT DEVELOPMENTS FROM THE REBASING EXERCISE

4.1 Recent Developments

The principles and computational procedures adopted during the rebasing exercise complied and were in accordance with international recommendations. What follows below are issues that were significant and impacted positively to the GDP during the rebasing exercise.

a) Methodology
Migration - Standards:
• Migration from the 1993 SNA to 2008 SNA
• Adoption of ISIC revision 4.0 from ISIC rev 3.1
• Adoption of CPC version 2.0 from version 1.1
• Development of SUT for Nigeria, which is still on-going

b) Reclassification of the economy
The Nigerian economy has been classified severally considering the potential use of the classification and adoption of various standards for compiling economic statistics and national accounts. The ISIC plays an important role in this circumstance in determining the formal publication of the GDP. Nigeria over the years had reported its GDP at both current and constant prices in a differing number of economic activities under different base years. What follows below is the presentation of the various classifications of the Nigeria economy used to report the GDP. The recent is the classification of the economy into forty-six economic activities using ISIC rev 4 and the adoption of 2008 SNA as standard for the GDP compilation (Appendix 1).

c) Frame update
Economic production is an activity, carried out under the responsibility, control and management of an institutional unit that uses inputs of labour, capital, and goods and services to produce output of goods and services. When a list of the institutional units involved in this economic production is compiled, a Business register or a Frame as commonly referred is produced.

It is an important instrument in any statistical enquiry or investigation. It plays a prominent role in ascertaining the size and structure of any economy and form the basis for deriving the various probabilities of computing national aggregate. This also suggests why the standards (Manuals) for compiling statistics are being updated from time to time to re-align the economy with respect to these changes.

d) Data Sources
The NBS which is statutorily mandated by the Statistics Act, 2007 to compile the GDP and other allied macroeconomic aggregates collects data through three major survey modules or infrastructures namely:-
· National Integrated Survey of Households (NISH)
· National Integrated Survey of Establishments (NISE)
· System of Administrative Statistics (SAS)

The NISH module provides a platform for household data to be collected while the NISE patterns to Industries or establishments. The SAS module covers all data that are product of administrative routine.

The NBS conducted multiple surveys which were

NBS HARMOMIZED FRAME		
SECTORS	NBS NEW FRAME	NBS OLD FRAME
1 AGRICULTURE, FORESTRY AND FISHING	1,116.00	671.00
2 MINING AND QUARRYING	971.00	261.00
3 MANUFACTURING	76,656.00	16,248.00
4 CONSTRUCTION	53,507.00	551.00
5 WHOLESALE AND RETAIL TRADE, REPAIR OF MOTOR VEHICLES AND MOTORCYCLES	502,085.00	16,583.00
6 TRANSPORTATION AND STORAGE	5,902.00	1,418.00
7 ACCOMODATION AND FOOD SERVICE ACTIVITIES	13,109.00	5,774.00
8 INFORMATION AND COMMUNICATION	1,719.00	2,183.00
9 PROFESSIONAL, SCIENTIFIC AND TECHNICAL ACTIVITIES	125,482.00	4,593.00
10 ADMINISTRATIVE AND SUPPORT SERVICE ACTIVITIES	2,048.00	1,096.00
11 EDUCATION	34,974.00	24,713.00
12 HUMAN HEALTH AND SOCIAL WORK ACTIVITIES	13,083.00	6,749.00
13 ARTS, ENTERTAINMENT AND RECREATION	805.00	281.00
14 OTHER SERVICE ACTIVITIES	8,450.00	2,002.00
15 REAL ESTATE	11,721.00	610.00
Total	851,628.00	83,733.00

complemented by the use of existing administrative or other survey data in the country. List of surveys conducted for the purpose of the GDP rebasing under the NISE Infrastructure are listed below:

i. Mining and Quarrying
ii. Manufacturing
iii. Construction
iv. Wholesale & Retail Trade, Repair of motor vehicles & motor cycles
v. Transportation & Storage
vi. Accommodation & Food service activities
vii. Information & Communication
viii. Real Estate activities
ix. Professional ,Scientific & Technical activities
x. Administrative & Support Service activities
xi. Education
xii. Human Health and Social Work activities
xiii. Arts & Entertainment
xiv. Other Service activities

Additional data gathering from the FIRS and other MDAs on: Electricity, Gas, Steam & Air conditioning Supply, Water Supply, Sewage, Waste Management and remediation activities and Oil marketing activities were conducted.

The surveys or censuses listed below are on-going and are intended to be incorporated into the GDP Framework either currently or in the future. They have a five or ten year frequency.

- National Census of Commercial and Industrial Businesses (NCCIB)
- National Agricultural Sample Census (NASC)
- Household Survey (Harmonized Nigeria Living Standard Survey – HNLSS)

These surveys or census are very relevant and provide substantial data for the compilation of the GDP.

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