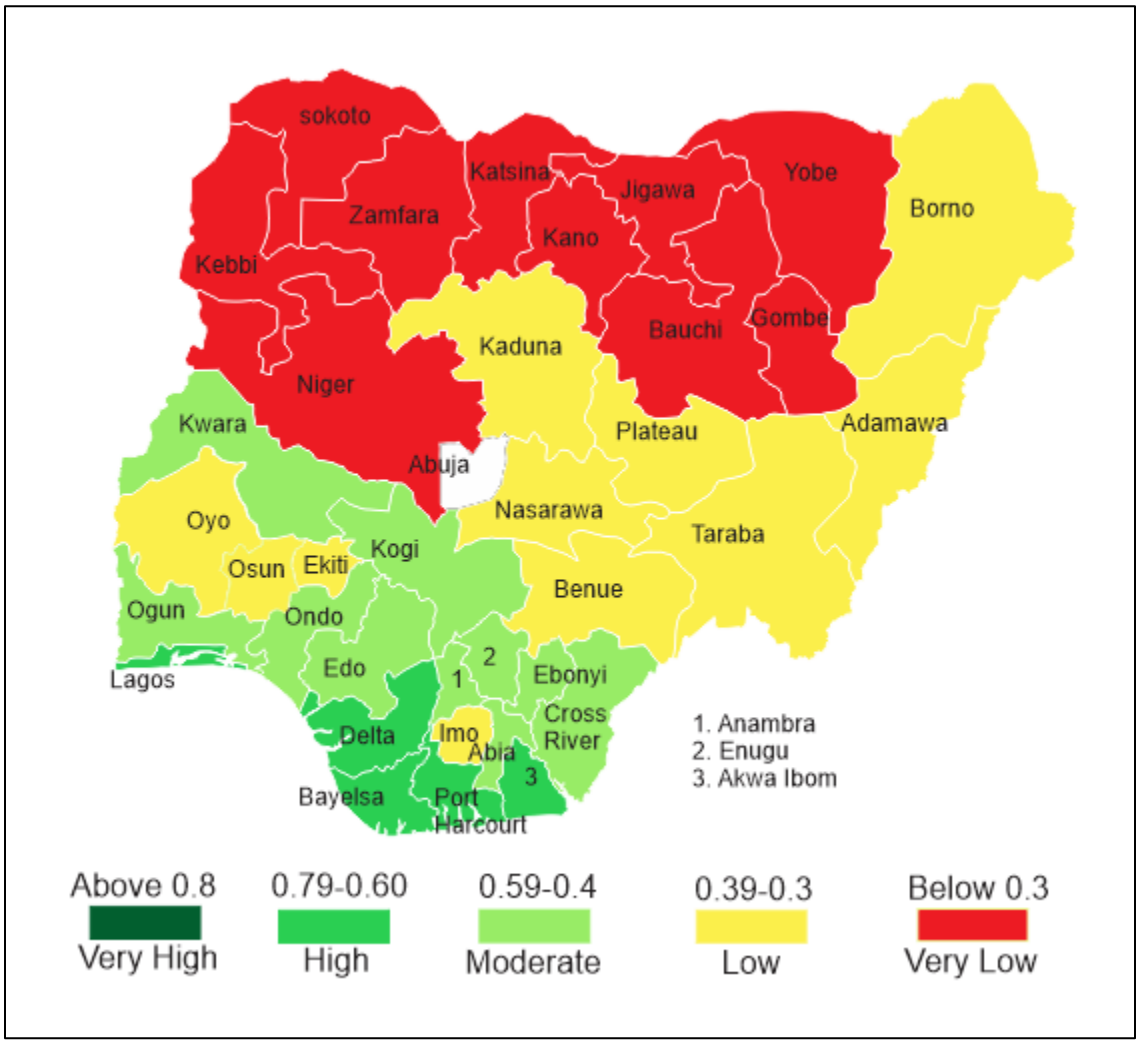
Beyond Country-level Averages: Construction of Sub-National Human Development Index for the Nigerian States



Abstract

This study develops a comparable Human Development Index for subnational government in Nigeria. While built on the UNDP approach, we extend the generic framework to address challenges at the subnational level such as comparable indicator, data unavailability and estimation technique. The result shows wide disparity across states in their human development, with states within the southern region recording more impressive performance. We further examine the key economic and political drivers of the observed variations across state and found fiscal sustainability and geopolitical zoning as the key determinants.

1. Introduction

Human Development Index (HDI) was developed in 1990 by the United Nations Development Programme (UNDP) as an attempt to capture the multidimensional and capacity approach to economic development. By multidimensional approach, HDI entails broader aspects to development, including health, knowledge and material wellbeing. This corrects the dominant economic-centric narrative which equates development to economic growth or per capita income. Also, the capacity approach to development as postulated by Sen (1985) is explicitly captured in HDI, as it measured functional capacities within the society. Hence, it reflects the society's command over resources (health, education and income) to improve welfare and achieve human development.

HDI has proven to be useful for diverse stakeholders and purposes within the policy space. It is widely used as a frame of reference to compare social and economic performance across countries. Reform minded government can therefore identify weakness areas for policy fine-tuning. For example, governments in India, Hondurans, Argentina, Mexico and Brazil among several other countries have adapted HDI for planning and resource allocation purposes in recent years (see Dervi & Klugman, 2011). In similar respect, public and non-state actors have utilized the statistics as a tool in pushing reform in public sector service delivery[1]. For developing countries, donors and private philanthropist rely in part on HDI as an entry point for development assistance.

Despite its relevance, a major weakness of HDI is the lack of coverage for sub-national governments[2]. Basically, the indicators are aggregated and reported at the national level. This shortcoming could be significant for a country like Nigeria, with a federal system of government. For example, less than one percent of the population are directly under the purview of the national government. More importantly, more than 60 percent of resources are controlled by the sub-national governments. This suggests a strong need for a tool such as HDI at sub-national government to measure government performance and assist in identifying crucial reform areas.

This study fills this gap by developing an HDI for the 36 sub-national government in Nigeria. We call the new index State Human Development Index (SHDI). The report is structured into three

[1] http://indianexpress.com/article/india/primary-health-care-in-maharashtra-implementation-issues-funding-crunch-hold-back-manav-vikas-scheme-5095577/

[2] There are few instances of HDI for sub-national government such as in Honduras and India

sections. Section 2 details the methodological approach for constructing the SHDI. While the multidimensional approach of the UNDP's HDI serves as bedrock, we modify their approach to address the data challenges at the sub-national level. Sector 3 presents the report of the state HDI. In addition, we empirically investigate the key socio-economic factors that could explain the observed difference across the states. We conclude with a summary and discussion of the policy implication of the findings.

2. Methodology

The construction of SHDI follows three steps: (1) selection of dimension and indicators: This involves choice of human development dimension to draw among various desirable functional capacities and selecting the best indicator that captures the dimension; (2) Normalization of indicators: This is to ensure that all indicators are on the same scale; (3) Aggregating the indicators: At this stage, the composite indicators are aggregated to derive a single index.

2.1 Selection of dimension and indicators

Following the UNDP approach, we focus on human capacity along three dimensions, each of which is detailed below:

2.1.1 Health

This dimension measures value of access to healthy, long and quality life among the population. This is proxied by life expectancy at birth, generated from national life table system. In the case of Nigeria, there is no life table system at the sub-national level. We therefore use **infant mortality rate+** as a proxy for the health dimension. The infant mortality rate is widely used as a measure of health performance in global development agenda such as MDGs, SDGs among others. It also has a strong link to life expectancy, as both are determined by the viability and effectiveness of the national health system. In fact, prior to 2010, the health dimension of HDI is measured as a composite index of life expectancy and IMR (see Table 1).

The infant mortality rate is calculated as the number of deaths of infants under one-year-old per 1,000 live births. It is an important marker of basic health facilities and practices and therefore quality of health within the state. It also indicates the level of condition such as sanitation, nutrition and family health awareness. Hence, it serves as an ideal proxy for health dimension.

2.1.2 Education

The UNDP HDI combined mean year of schooling and expected years of schooling to measure the education component. Again, these indicators are not available at sub-national level in Nigeria. Therefore, we use the **youth literacy rate**. The youth literacy rate is calculated as the percentage share of all literates in a state over the total population of people between 15-24years of age. The youth literacy rate explicitly captures the state of human capital endowment and knowledge within a state. A highly literate population ensures easy technological adoption which is needed to tap into the global value chain. Also, highly educated workforce translates to improved productivity and capacity for innovation and economic development.

2.1.3 Income

This retains the economic dimension in terms of standard of living and is simply measured by Gross National Income (GNI) per capita. Generating similar measure at state level comes with a number of challenges. The GDP estimates are only provided nationally. The alternative approach is to use income/expenditure per capita from the house-level survey. However, this excludes income of firms and the overarching objective of the survey is to estimate poverty and not income level within a state. The closet proxy we came up with to the GNI per capita is the state capacity per capita. We define state capacity proportion of the total revenue that relates economic activities within a state. This exclude revenue items such as gross allocation with represents vertical transfer from federal to the state government. In this regard, the state capacity is derived by adding up the Internally Generated Revenue (IGR), Value Added Tax (VAT) and 13 percent derivation from oil exploration. The IGR is based on the tax on income of workers in private and public sectors within the state, while the VAT reflects absorption component of the GDP based on economic transactions. The derivation is royalty from natural endowment– shared to only oil producing state. This means that the GNI per capita of a state will be directly proportional to the state capacity per capita at any given point in time and therefore serves as an ideal proxy.

Table 1: Components of the State Human Development Index

	HDI		**SHDI**
	Old method (pre-2010)	*New Method (2010 onward)*	
Health	Life expectancy at birth + Infant Mortality Rate per 1000 live births	Life Expectancy at Birth	Infant Mortality Rate per 1000 live births
Education	Adult literacy rate (%) + gross enrolment rate	Mean Years of Schooling + Expected years of Schooling	Youth Literacy (%)
Income	Gross Domestic Product (GDP) per capita	Gross National Income (GNI) per capita	State Capacity per capita

Source: Authors compilation

2.2 Normalization of the Indicators

In order to aggregate the indicators, it is important to construct a unit-free index, with uniform scale and ordering. For example, the higher levels for the literacy rate and state capacity per capita means better performance, while for infant mortality rate it is diametrically opposite. To generate this, we apply the normalization formula:

$$= \underbrace{\frac{Actual\ value - Minimum\ value}{Maximum\ value - Minimum\ value}}_{\text{If indicator in ascending order}} \quad \text{or} \quad = \underbrace{\frac{Maximum\ value - Actual\ value}{Maximum\ value - Minimum\ value}}_{\text{If the indicator is in descending order}}$$

where the "actual value" is the value of the indicator for a given state, "minimum value" is the lowest value of the indicator across the 36 states; "maximum value" is the highest value of the indicator across the 36 states. The education (e) and income (y) indicators are in ascending order, while health (h) indicator is in descending order. After normalization, all the indicators range between 0 and 1.

2.3 Aggregating the indicators

The final step in the computation of SHDI is to generate a composite index based on the three indicators. In aggregating the indicators, we depart from the UNDP approach by employing the

Displaced Ideal (DI) method. Displace ideal method aggregates the indicators based on their distance to their ideal point (which is 1 for all indicators). Displaced ideal is calculated as:

$$SHDI = 1 - \frac{\sqrt{(1-h)^2 + (1-e)^2 + (1-y)^2}}{\sqrt{3}}$$

This provides a score that lies between 0 and 1. DI has several advantages over the geometric mean that is presently used by the UNDP or the arithmetic mean which was previously employed. According to Mishra and Nathan (2014), there are 6 intuitive axioms that HDI should satisfy: monotonicity, anonymity, normalization, uniformity, shortfall sensitivity and Hiatus sensitivity to level. Table 2 compares the three methods of constructing HDI along these axioms. Overall, DI satisfies the 6 axioms, while geometric and arithmetic means satisfy only three.

Table 2: Axioms of Human Development Index (HDI)

	Linear Averaging	**Geometric Mean**	**Displaced Ideal**
Monotonicity	✓	X	✓
Anonymity	✓	✓	✓
Normalization	✓	✓	✓
Uniformity	X	✓	✓
Shortfall Sensitivity	X	X	✓
Hiatus Sensitivity to level	X	X	✓

2.3 Data sources

The data for infant mortality rate and total and youth literacy rate are sourced from Multiple Indicator Cluster Survey (2017) produced by the National Bureau of Statistics (NBS) United Nations Educational, Scientific and Cultural Organization (UNESCO). The state revenue is taken from NBS Internally Generated Revenue report (2017), while the state population is based on the projection of 2006 Census using individual growth rate for each state.

3. Results

3.1 State Human Development Index in 2017

The results of SHDI are presented in Figure 1 for the 36 states. Lagos State is ranked the highest in the human development with a score of 0.741, followed by Bayelsa (0.729), Rivers (0.679) and Delta (0.673). States in the South-South region have the best performance, followed by the South-East and South-West. Generally, the Northern region performed dismally. In fact, Kwara – the highest ranked Northern state – featured outside the top ten. This is hardly surprising given the high incidence of poverty, poor resource endowment and recent Boko Haram violent conflict in the region.

However, violent conflict and resource endowment alone could not explain the result, as North Eastern states, the hotbed of the insurgency, perform better than North Western state. This points to structural challenges that affect other component of human development. For example, North West has the lowest performance on literacy rate, especially for girl child, when the indicators are disaggregated. Similarly, infant mortality rate is highest in the region. While the index can be situated for a year, the actual performance reflects long-term and persistent systemic and structural issues. Education performance, for instance, could reflect a vicious cycle of inter-generational deprivation.

Figure 3 disaggregates the relative performance of each state across the three dimensions. This is to show the dimension where each state is doing best. The high performing states in the top 5 have fairly balance score across the three dimensions. However, down the line, scores are skewed towards one or two of the dimensions. This underscores the importance of multidimensional approach to human development. Taken individually, each dimension gives a different outcome, but when combined it reflects the different intersections and overall human capacity within a state. This is more crucial and has relevance for economic planning and resource allocation.

Figure 1: Human Development Index (HDI) Across All Nigerian States

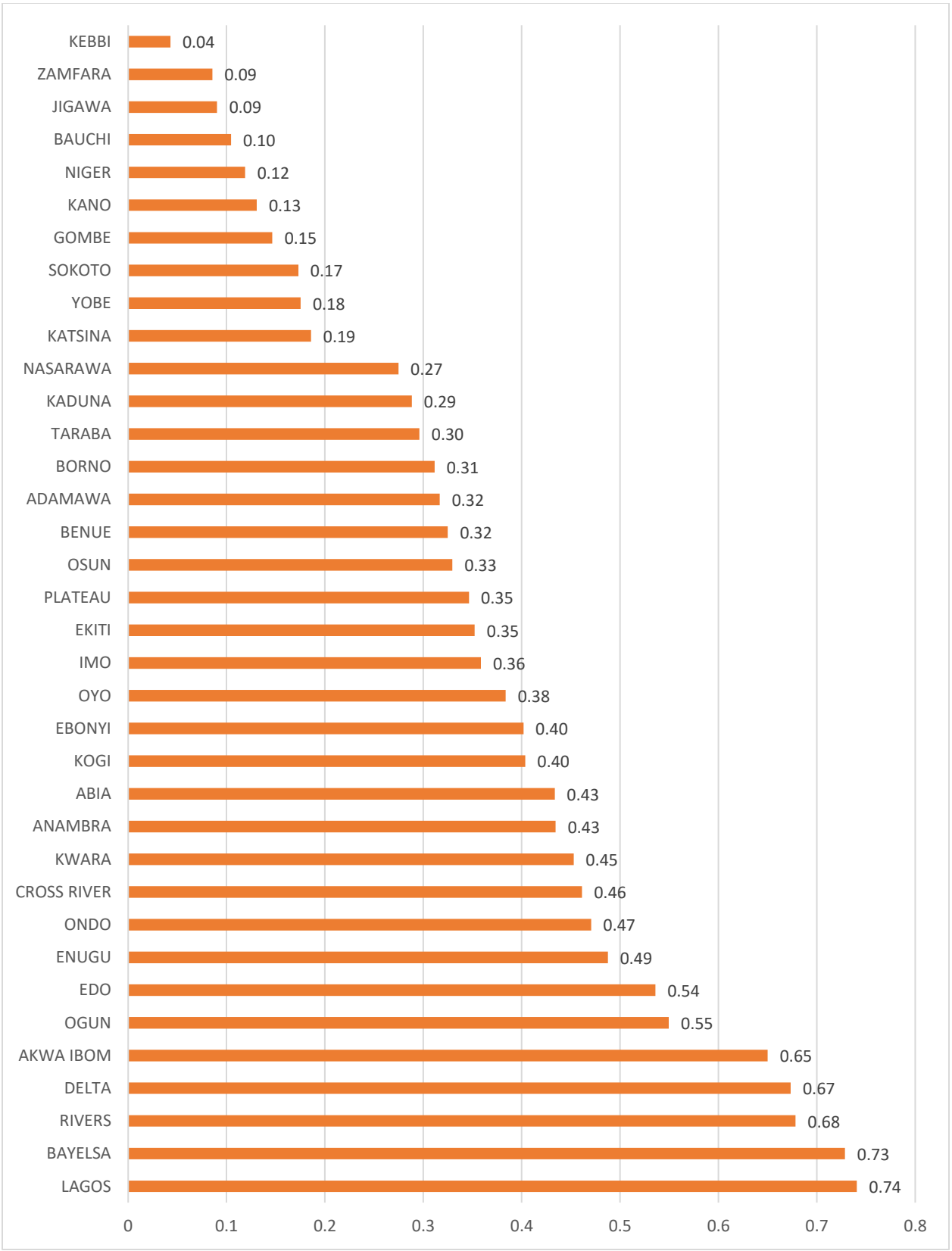
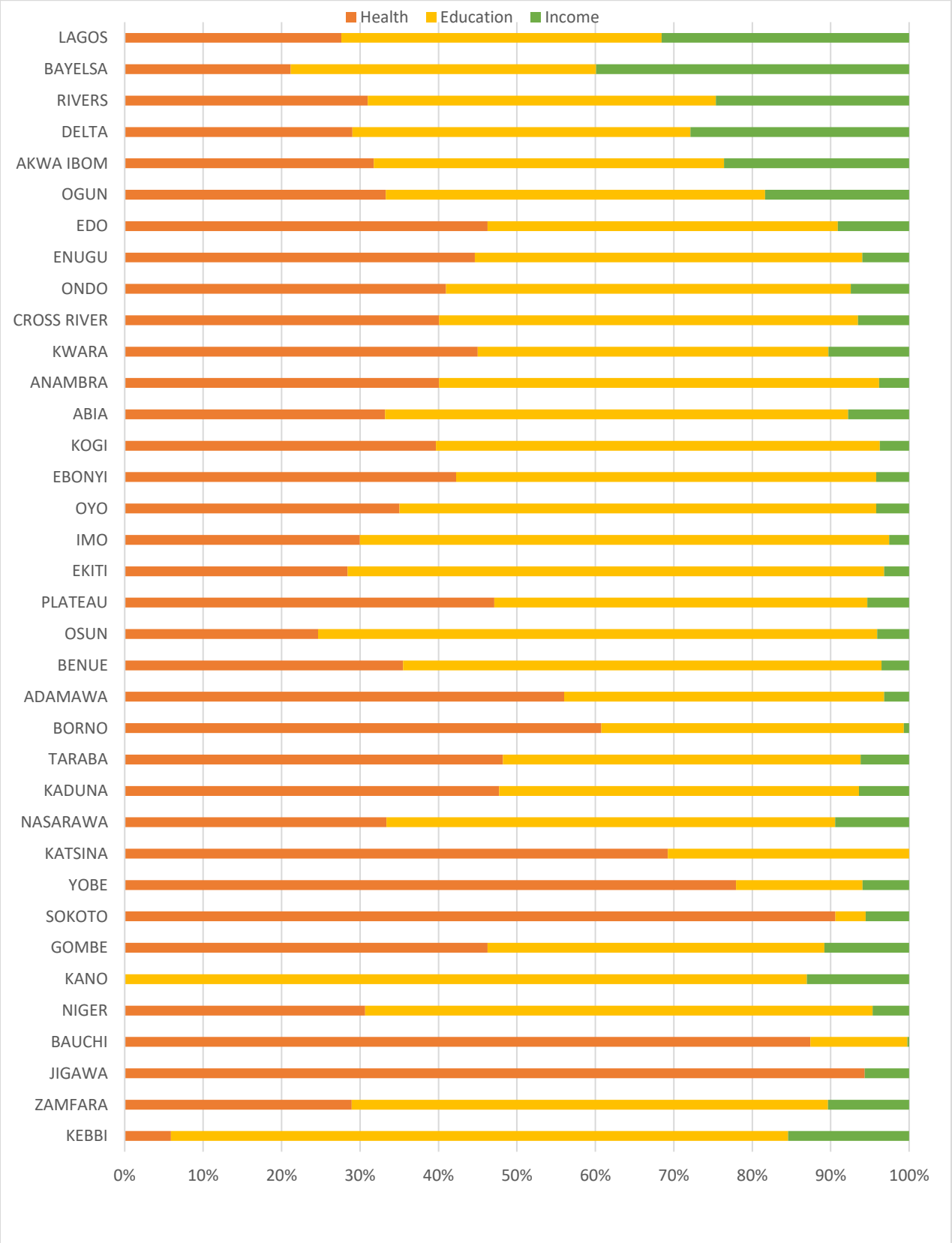

KEBBI 0.04
ZAMFARA 0.09
JIGAWA 0.09
BAUCHI 0.10
NIGER 0.12
KANO 0.13
GOMBE 0.15
SOKOTO 0.17
YOBE 0.18
KATSINA 0.19
NASARAWA 0.27
KADUNA 0.29
TARABA 0.30
BORNO 0.31
ADAMAWA 0.32
BENUE 0.32
OSUN 0.33
PLATEAU 0.35
EKITI 0.35
IMO 0.36
OYO 0.38
EBONYI 0.40
KOGI 0.40
ABIA 0.43
ANAMBRA 0.43
KWARA 0.45
CROSS RIVER 0.46
ONDO 0.47
ENUGU 0.49
EDO 0.54
OGUN 0.55
AKWA IBOM 0.65
DELTA 0.67
RIVERS 0.68
BAYELSA 0.73
LAGOS 0.74
0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8

Figure 2: Distribution of Various Components of Human Development Index (HDI) Across States



3.2 Key determinant of SHID

The first important step is to estimate the SHDI, but equally crucial is to have a sense of drivers of the mixed performance on the SHDI. We estimate a linear cross-sectional regression controlling for economic and political factors that could account for the mixed performance. The linear model is specified as:

$$SHDI = \alpha + \beta_1 FISC + \beta_2 Pol + \beta_3 Dum\_zone + \beta_4 Dumm\_res + \mu \quad \ldots\ldots\ldots\ldots\ldots\ldots (1)$$

The first control variable, *FISC*, stands for fiscal capacity and captures the level of fiscal stance and space within a state. We use the state fiscal sustainability index developed by BudgIT (2017). The index is non-negative, with zero as the peak and the farther away for it translates to poor fiscal capacity[3]. It captures the ability of state to finance its annual budget as well as meet its debt obligations. Essentially, the capacity for a country to deliver effective public service depends on fiscal space. For ease of interpretation, we use the inverse of the fiscal sustainability index. The second control variable, *Pol*, represents political competition and this is to measure the level of institutional development across the states. It is measured by the average of the runner-up index (ratio of total vote of runner-up to the winner) for the past three elections in a state. The runner-up index suggests that the closer the vote share between the runner-up and winner, the higher the level of political competition. However, a single election might not be reflective of this, as such we combine three election cycles. Election outcomes are taken from INEC election database. We also control for spatial disparity in human development with variable, *Dumm_zone*, which is 1 if a state is within the southern region and zero otherwise. Lastly, we control for resource endowment of a state, with a dummy variable *Dumm_res* which 1 for oil producing state and zero otherwise.

3.2.1. Empirical Result

The regression result based on Equation (1) is shown in Table 3. Among the control variables, fiscal capacity and geo-political zones are significant. Specifically, states in the Southern region have 0.213 higher score than Northern region. The fiscal capacity also shows that states with higher score in fiscal sustainability index performs better in human development.

[3] $\text{Fiscal sustainability index} = (Index\,A \times 0.35) + (Index\,B \times 0.5) + (Index\,C \times 0.15)$; where Index A=Recurrent expenditure/ (IGR+13% Derivation); Index B=monthly recurrent expenditure/estimated total revenue; Index C=Total debt stock/total revenue

We found no significant effect for political competition and resource endowment. The result for resource endowment is particularly interesting, as the significant level remains the same even if we drop fiscal capacity from the specification. One way to interpret this is that the degree of effective utilization of resources is more important than actual endowment of the resource. Fiscal capacity captures use of resources; therefore, it reflects how well states are doing with their endowment. The explanation for insignificant effect of political competition variable could reflect that weak governance across the states. Therefore, if institutional differences matter in any way, it will have to reflect those that are structural, which were formed at a 'critical juncture[4]' in the past. One instance could be the introduction of free education policy in 1954 in the present South West region and subsequently in the South South and South East in 1955.

Table 3: Cross-sectional Regression on the Determinants of SHDI

Variable	Coefficient
Political competition (*Pol*)	-0.050
	(0.13)
Fiscal capacity (*FISC*)	0.276***
	(0.100)
Geo-political zone (*Dummy_zone*)	0.233
	(0.0496)
Resource endowment (*Dummy_res*)	0.0797
	(0.0566)
Constant	0.132
	(0.090)
F-test	16.79
Adj-R-squared	0.64

Standard errors in parentheses; * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Conclusion

Sub-national governments play many vital social and economic roles. It is therefore important to gauge their contribution to human development within their sphere. The main motivation of this study is to create comparable index to evaluate human development among states in Nigeria. This can serve as both assessment and diagnostic tools. It shows the position of a state relative to others, which could galvanize healthy rivalry. Another important use will be to enable state actors identify deficient areas in human development in order to design appropriate policy intervention. For

[4] Critical juncture refers to situations of uncertainty in which decisions of important actors are causally decisive for the selection of one path of institutional development over other possible paths (Capoccia, 2016).

example, sub-national government in Honduras have successfully utilized the index for economic planning and priority setting.

A crucial finding from the study is the critical contribution of fiscal capacity to human development. Improved fiscal space implies more resources for public service provision. At present, majority of states in Nigeria rely on federal allocation, which in recent times has significantly declined due to oil price collapse. It is therefore important for states to develop complementary revenue stream that can improve fiscal space, such as local taxes. More importantly, effect of fiscal capacity on human development is not unidirectional, especially in the long-run. Human development translates to long-run economic growth, which enhances fiscal capacity of the state. In this regard, removing structural bottleneck to education and health access will be fundamental.

The study also finds significant regional variation in human development, but political competition does not play a role. Given that in the past, each region experienced different institutional structure, we hypothesized that a possible critical juncture could explain this regional drift in development. While this suggests a sustained policy intervention will be required, there are areas for quick wins. For example, the wide disparity in education and health attainment in North West and East regions indicates substantial gains are possible with considerable attention to girl-child education and maternal health, both pre and post-delivery.

Appendix

Table 1A: Summary of data

	IMR	Weighted Literacy Rate	State Per Capita Revenue	SHDI	Political Competition	Fiscal Sustainability
***Lagos**	44.97	94.76	32,249.20	0.741	0.494	0.99
***#Bayelsa**	56.64	96.63	43,118.63	0.729	0.257	2.14
***#Rivers**	40.72	96.87	24,459.19	0.678	0.090	0.86
***#Delta**	47.63	92.43	26,496.72	0.673	0.604	1.59
***#Akwa Ibom**	42.26	94.05	22,580.29	0.650	0.343	1.46
***Ogun**	48.51	90.10	16,006.88	0.550	0.491	1.15
***#Edo**	7.47	95.93	10,347.57	0.536	0.254	1.9
***Enugu**	18.79	97.54	7,182.43	0.488	0.464	1.74
***Ondo**	36.61	91.99	7,659.77	0.471	0.638	2.6
***#Cross River**	37.97	94.50	7,017.42	0.461	0.081	3.05
Kwara	39.54	76.27	8,787.71	0.453	0.366	1.84
***Anambra**	38.67	97.24	5,052.76	0.434	0.093	1.46
***Abia**	54.65	96.86	7,574.57	0.434	0.425	1.81
Kogi	49.13	88.38	4,643.98	0.404	0.594	2.25
***Ebonyi**	47.43	83.02	4,817.31	0.402	0.365	2.63
***Oyo**	59.07	89.89	4,792.22	0.384	0.610	3.01
***#Imo**	65.68	98.42	3,866.77	0.359	0.681	2.42
***Ekiti**	69.30	97.46	4,192.65	0.352	0.568	4.04
Plateau	54.70	66.66	4,848.36	0.346	0.700	3.11
***Osun**	77.88	94.73	4,538.48	0.329	0.595	5.65
Benue	69.80	76.78	3,959.82	0.325	0.506	2.44
Adamawa	48.82	58.55	3,724.18	0.317	0.426	2.92
Borno	41.87	57.48	2,621.23	0.311	0.449	3.15
Taraba	63.62	58.41	4,745.33	0.296	0.489	2.42
Kaduna	65.58	57.60	4,757.48	0.288	0.548	2.14
Nasarawa	81.22	63.29	5,732.73	0.275	0.694	2.48
Katisina	67.66	40.56	2,321.68	0.186	0.410	1.93
Yobe	63.95	33.88	3,757.50	0.175	0.624	2.36
Sokoto	50.87	28.87	3,781.00	0.173	0.475	2.97
Gombe	90.47	40.83	4,298.76	0.147	0.304	3.07
Kano	112.22	54.49	4,671.27	0.131	0.738	1.26
Niger	100.30	44.21	3,026.25	0.119	0.443	2.09
Bauchi	80.80	30.12	2,349.97	0.105	0.534	2.37
Jigawa	82.70	27.09	3,013.85	0.090	0.581	2.96
Zamfara	104.29	38.42	3,426.02	0.086	0.490	2.37
Kebbi	111.41	34.48	3,150.56	0.043	0.495	2.25

Reference

Capoccia, G. (2016). Critical junctures. *The Oxford Handbook of Historical Institutionalism, Oxford*, 89.

Dervis, K., & Klugman, J. (2011). Measuring human progress: the contribution of the Human Development Index and related indices. *Revue d'économie politique*, *121*(1), 73-92.

National Bureau of Statistics (2017). Multiple Indicator Cluster Survey 2016-17.

National Bureau of Statistics (2017). Internally Generated Revenue at State Level.

Sen, A. (1985). The concept of development. *Handbook of development economics*, *1*, 9-26.

Srijit, M., & Nathan, H. S. K. (2014). Measuring HDI–The Old, the New and the Elegant: Implications for multidimensional development and social inclusiveness. Asia Research Center Working Paper no. 63, 1-36.

YourBudgit (2017). State of States: The 2017 Edition. http://yourbudgit.com/wp-content/uploads/2017/10/State-of-state-2017-report.pdf