RE-ORIENTING NIGERIA'S HIGHER EDUCATION SECTOR FOR NATIONAL GROWTH IN GLOBAL ENTREPRENEURIAL PERFORMANCE

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Abstract
This study argues for a paradigmatic shift of the national tertiary education culture to an entrepreneurial model that is driven by research innovation rooted in strong collaboration between different elements of the national system of innovation. Evidence for the current unenviable status is illustrated by the negative trend in Nigeria's global competitiveness index over the past decade. It is, however, shown that a strong correlation between entrepreneurial growth dynamics and the number of entrepreneurial universities per capita explains the superior performance of the developed and rapidly developing economies. Significantly, we provide, for the first time, a functional mathematical relationship between economic development and per capita entrepreneurial universities, as a useful tool for performance prediction and implementation of national science & technology innovative research policy control. The explicit connectivity between tertiary educational culture, economic environment parameters and the national context descriptors is robustly demonstrated.

Introduction
Economic growth and social change have been strongly linked to the role of universities as catalyst in the modern national development process[1]. In the global knowledge-based economy, universities are increasingly seen as agents for building society's innovative capacity in addition to their traditional functions as teaching and research centres[2]. Although Nigeria has witnessed international economic visibility in the past four decades especially because of its natural resources and its position as a major oil producer[3], longitudinal analysis by Akinwale et al[4] revealed that the real gross domestic product (RGDP) has a negative dependency (exponent) on gross expenditure on research & development (GERD) innovation for data over the three-decade period, 1977-2007. However, the positive exponents for gross fixed capital formation (GFCF) and labour force (LABF) is consistent with economic growth arising principally from export of primary resources such as crude oil, solid minerals and agricultural produce as the main income earnings. These findings implicate the need for a new paradigm for R & D activities in Nigeria. Not only is single-resource (crude oil which accounts for about 80% of the national revenue) dependency unsustainable, neoclassical economic theory may not be able to account for a national performance that is a complex interplay of many factors. Research practice in Nigeria has been patterned after the colonial Anglo-Saxon model since independence and as such, the national science and technology policy of the 60s-70s simply reflected ties to the British formulary which was inimical to sustainable development. Although high quality papers were produced by Nigerian scholars, the studies may be described as exploratory, replicative or appraisal studies that did not intentionally address specific national priorities. Innovation was a missing motif. Even national research institutes such as the Nigerian Institute for Oil Palm Research, Nigerian Horticultural Research Institute, Cocoa Research Institute of Nigeria and Federal Institute of Industrial Research among others, who within this period, exhibited outstanding international productivity, had minimal linkage with research activities in the nation's universities resulting in ineffective harnessing of research output for national economic advancement.

Pointedly, European higher education models[5] namely; Anglo-Saxon, Humboldtian and the Napoleonic types offered specific and relevant benefits to the applicable African contexts for post-independence fulfillment of professional and technical needs. For instance, the Uxbridge-rooted

Anglo-Saxon tertiary education model emphasizes professionalism in order to ensure a flexible and adaptive transfer of operational management to the nationals. However, the Napoleonic education is a highly centralized, government-controlled system of institutions via professional councils or organizations (as in the engineering schools - École Nationale Supérieure d'Ingénieurs Chimique, ENSIC, at major French cities). For the attainment of high competency in engineering and technological operations in industries, these institutions are generally fixated on rote learning by students rather than via research and independent thinking. Research is conducted mostly outside the university environment (e.g. Centre National de la Recherche Scientifique, CNRS laboratories). The signature of the Humboldtian (named after the German scientist, von Humboldt) educational approach is research-like learning and academic freedom where professors and students work together to generate new knowledge. Nonetheless, these various models have been significantly transformed even in the originating countries to cater for 21st century training initiatives while many African nations are yet to emerge from the colonial mold.

However, with humanity entering the fourth industrial revolution (4IR) phase, the measure of global competitiveness of any nation will be more accurately determined by the interplay of innovation, human capital, resilience and agility rather than the traditional attributes (such as physical infrastructure, ICT, macroeconomic stability, property rights, years of schooling etc). As such the Global Competitiveness Index (GCI) score[6] represents an objective data-driven measure for future-oriented and policy-making decisions that arose from dispassionate analysis. Figure 1 plots the percentage GCI score over the last decade (2008 to 2018) for Nigeria and some other countries. It is somewhat disturbing that while there is a general positive trend in the evolution of the GCI score for other nations, Nigeria's global competitiveness index has been decreasing over the same period. Table 1 displays the slope of the data for individual country assuming a linear regression. Significantly, China exhibited the highest global GCI rate (0.6823% per year) while Malaysia – a nation with similar colonial past as Nigeria - is characterized by a GCI rate of 0.2361% per year. In contradistinction, the GCI slope for Nigeria is -0.3697% per year. The 'intercept' column contains the estimate of starting position (year 2000) for each country. The actual scores for 2000 are not available from that year's GCI Report - only the rank for different countries is provided. The rank is an indicator of how each nation has performed within the global cohort of countries considered for that year and is thus another independent marker of international economic evaluation. Figure 2 also reveals that Nigeria has not fared well when compared with other nations suggesting that not only is she retrogressing in terms of real favourable economic criteria applicable to the modern global marketplace, but other countries have actually been making changes that are more in line with the demands of knowledge-based economy over the same period. A chief contention of this paper is that the transformation of the tertiary education model of the other countries to an entrepreneurial framework is a key factor in this advantage over Nigeria since her GDP (an economic indicator reflecting traditional export revenue from natural resources such as oil, gas and minerals, rather than innovation) has in fact been rising over the same decade[7]. For that reason, the annual global performance index, GPI (within the cohort), given by:

$$GPI = \left[1 - \left(\frac{\text{Country rank}}{\text{Number of countries in the cohort}}\right)\right] \times 100\% \quad (1)$$

showed Nigeria (cf. Figure 2) as the lowest within the select group of nations and undeniably featured a negative slide (-1.219% per year) during that decade. The time-average GPI was 16.59% with a standard deviation of 7.73% - which expresses wide variability in performance and the unflattering nature of low-level innovation-driven policy in the Nigerian economic sector. By comparison, both China and Malaysia exhibited strong positive GPI rates (0.999% per year and 0.149% per year respectively) with attendant decade-average GPIs of 77.63±6.54% and 83.27±2.09% respectively.

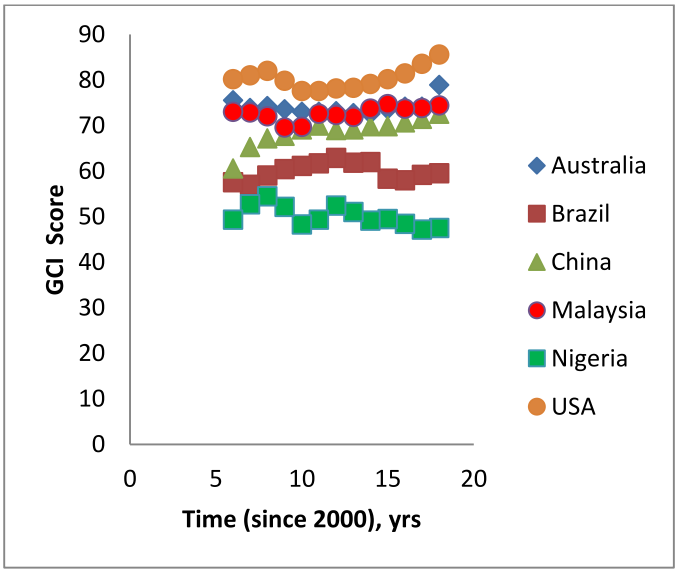

Figure 1: Trend of the Global Competitiveness Index score for 2008-2018 for Nigeria and selected countries.

Table 1: Linear Model Parameters for Global Competitiveness Index Score trend over the 2008-2018 period

Country	GCI Score trend linear model parameters	
	Slope (%per year)	Intercept (%)
Australia	0.1082	72.74
Brazil	0.0754	58.98
China	0.6823	60.46
Malaysia	0.2361	69.80
Nigeria	-0.3697	54.53
USA	0.2639	77.18

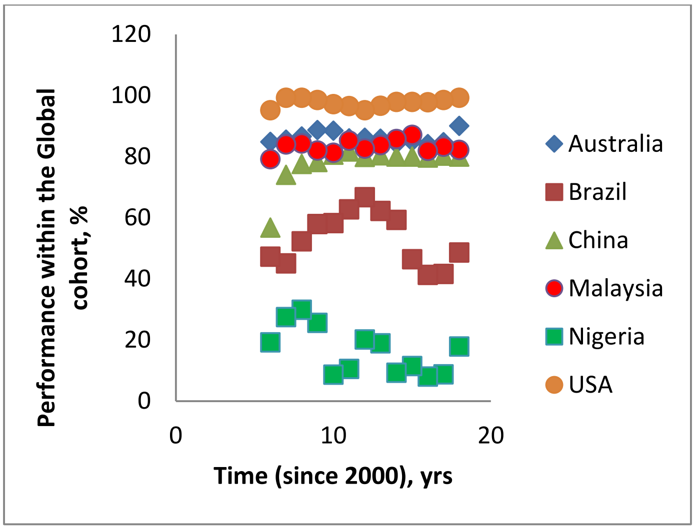

Figure 2: Trend of the annual global performance index for 2008-2018 for Nigeria and selected countries.

Critical to the sustainability of a knowledge-based economy is an entrepreneurial culture that fosters innovation within the wider society and especially in the tertiary institutions preparing the next generation for the global marketplace. It is in this respect that the extant colonial higher education practice in Nigerian universities warrants transformation to the entrepreneurial mode that was first pioneered by Stanford, MIT and the University of Wisconsin through a new approach to university-wide patent policy that promoted technology transfer to the industry via profit-oriented university-industry R&D partnerships, institutional spin-off companies, etc[8]. The success of these entrepreneurial institutions inspired the second wave of Western European (Belgium, France, Germany, Netherlands and the UK) universities starting in the early 1990s till present time. China and Malaysia are among the major Asian nations[9-10] along with Eastern European and South American countries participating in the recent, third wave of entrepreneurial university transformation in the emerging economies of the world. This historical antecedent provides further support for the motif of the present paper.

Results & Discussion

Innovation and Entrepreneurship

Research innovation in Nigeria is stymied by inadequate clarity in a robust national science technology policy rooted in a distinct set of national goals and priorities. For the most part, in spite of archipelagos of strengths in some universities, alignment with national aspirations is essentially amorphous. Data on contextually-informed need areas and individual as well as institutional research activities (as distinct from mere expression of research interests) must be collected in a well-maintained database and made available by the relevant Federal government agency in order to facilitate industry-university and government-university interactions to improve technology development and transfer for sustainable national benefits. This strategy also has the added advantage of enhancing formation of research clusters for resource and infrastructure optimization. While the Petroleum Technology Development Fund (PTDF) and the Tertiary Education Trust Fund (TETFund) represent major sources of government funding for research in tertiary institutions, a systematic analysis of the measurable outcomes (such as number of graduate students trained, personnel exchange between industry-government-university, peer-reviewed papers, patents, prototype or commercially-proven technologies, R&D expenditures, etc) arising from the various programs of these funding agencies is minimal or non-existent. As a result, the true impact of research-based innovation and ultimately the contribution of entrepreneurship to national economy is hard to come by.

From a practical standpoint, innovation may be described as the research outcome that leads to the implementation of a new or significantly improved:

i. product (goods or services),
ii. process
iii. marketing method
iv. organizational techniques in business practices, workplace relations or external alliances

In view of this working definition, every country needs to have a national system of innovation (NSI) to stimulate and promote research activities for sustainable economic growth. There is an extensive literature on the utility and benefit of the NSI approach in the OECD countries[11] where it has produced strong interactions between different sectors of the society resulting in a knowledge-based economy with substantial entrepreneurial performance. Adeoti has also reported the role of NSI in the building of a viable technological capability for the developing countries[12]. It is evident from these studies that the overarching goal of the

NSI framework is to maximise national innovative performance through the relationships of its constituent elements which interact in "the production, diffusion and use of new, and economically useful knowledge"[13]. The elements of NSI are universities, public laboratories, industrial firms, financial institutions, government regulatory bodies, professional organizations and others who interact in the course of innovation-based economic activities. Since the ultimate goal of the research system is innovation, NSI therefore sees research as part of the larger system consisting of university, government, business and its environment. As a result, it is amenable to systems treatment and appropriate for the contextualization of research innovation to specific conditions (including exogenous factors such as cultural norms and political peculiarities) of the particular knowledge-economy. Figure 3 is a simple schematic representation of the interaction between the elements, national environment and the global atmosphere that facilitates knowledge distribution and application to create innovation performance in the NSI framework.

The capitalization of innovation through technology transfer to the commercial sector (e.g. creation of spin-off companies owned by the university or faculty and researchers, collaborating or sponsoring industry) is at the core of entrepreneurial activity. As a result, entrepreneurship is a complex multidisciplinary terminology encompassing: faculty consultation, university-industry collaboration, intellectual property protection and technology transfer. It is immediately evident that entrepreneurship is innovation-driven. Arising from the working definition of innovation given above, entrepreneurship education is necessarily a university-wide attribute requiring students in engineering, science, business and the humanities to have competency in:

i. Developing new products (goods & services)
ii. Using new technologies
iii. Accessing new markets
iv. Practice management of enterprises

The development and functioning of an entrepreneurial university will therefore depend on the formulation of a national research policy for science, technology and innovation (STI) that can be used to influence the process through which scientific findings may be harnessed for the creation of products and services that meet societal demands in a knowledge-based economy. For Nigeria, this may be readily seen, for example, in the areas of energy, water, environment, health, safety, security, information, food and bio-products. A systems approach to the analysis undertakes the assessment of such innovation performance through a matrix of input factors and output indicators based on a condensation of the schematic in Figure 3 as shown in Table 1 where R & D expenditure has been used as a first approximation indicator of innovation.

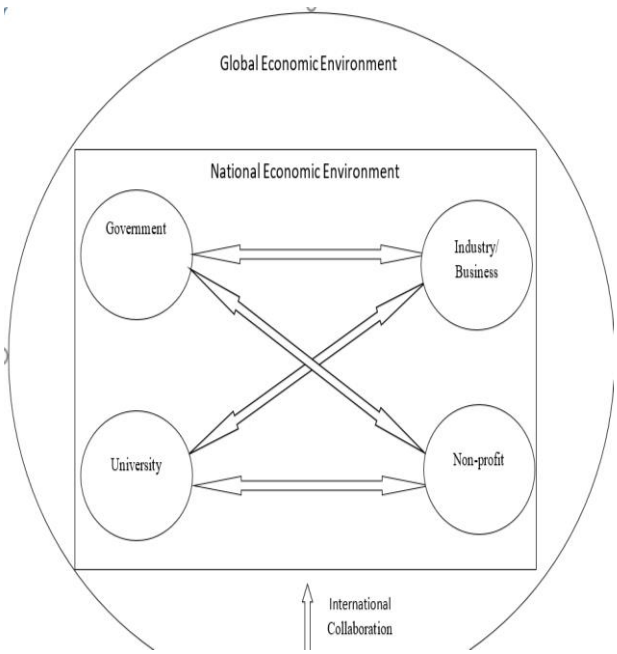

Figure 3: Schematic of the interrelationship between elements and the environments in the NSI framework (after Godin, 2009).

Table 1: Matrix of input-output variables for innovation-driven knowledge economy (R& D expenditure as an indicator of innovation performance as entries) (after Godin, 2009)

Origin of R&D funds	R&D activity contributors			
	Government	University	Business (Industry)	Non-profit
Government	a_{11}	a_{12}	..	a_{14}
University	a_{21}	a_{22}	..	a_{24}
Business (Industry)	..	..	a_{33}	..
Non-profit	..	..		..
International collaboration	a_{51}	a_{52}	..	a_{54}

where a_{ij} is the R&D fund provided by i to j in the prosecution of research for innovation-oriented economic growth. Thus, a_{11} is the fund provided by the government (federal, state and local) to government research institutes and agencies for R & D activities throughout the financial year while a_{52} is the total R&D funds from overseas partners to the nation's universities. Using 2011-2012 data from the Australian Bureau of Statistics[14], an Analysis of Variance (ANOVA) may be carried out on Table 2.

Table 2: R& D expenditure* for the NSI elements in the Australian environment for 2011-12 financial year

Origin of R&D funds	R&D activity contributors			
	Government	University	Business (Industry)	Non-profit
Government	3040	1870	290	440
University	10	5340	0	10
Business (Industry)	250	400	17720	37
Non-profit	99	150	0	390
International collaboration	150	230	210	58

* Entries are in Australian million dollars

The exercise showed that at 95% confidence level, there was not only significant variation in R &D expenditure between the funding sources but interaction effects between funds providers and R&D performers were equally important to the national innovation performance. Although with different numerical values of the F-ratio, similar inferences were deduced for the financial data for other years in the period, 2008-2017. Strong interaction between the elements of the NSI in Australia is symptomatic of effective technology transfer between university-to-industry (U-I), industry-to-government (I-G) and university-to-government (U-G). This is substantiated by the dominant culture of an entrepreneurial university system (for example, the University of New South Wales, Australian National University, University of Queensland, Monash University, etc) that has led to several high technology products (membrane-based water treatment, high efficiency solar cells, cochlear implant and sleep apnea technologies) as a result of university-industry and university-government collaborative research & development projects within the past three decades.

A similar analysis using sparse data from Nigeria's National Bureau of Statistics[15] (NBS) also indicated a rather diffused relationship between university, industry and government in terms of R&D funding source or activity contributors. Indeed, there was no significant interaction between any of these participants in the innovation process. Interestingly, while Australia (as an example of an OECD nation) spends 2.3% of the GDP on R & I activities[16] in 2005-2014, Nigeria spent 0.22% of her GDP on the same activity within that period. In comparison, the BRICS block (a group of rapidly developing economies - Brazil, Russia, India, China and South Africa) expended an average of 0.55% GDP over the same decade.

The relationship between overall economic development and innovation output is mediated by the global entrepreneurship index[17] (GEI) which is a composite measure of 14 different key drivers which span the individual and institutional components in the economic environment. These key drivers of the entrepreneurial ecosystem may be subsumed under three components of the GEI as:

a. *Attitude* - consisting of 5 pillars, namely; Opportunity perception, startup skills, risk acceptance, networking and cultural support.
b. *Ability* - encompassing the 4 pillars of: opportunity startup, technology absorption, human capital and competition.
c. *Aspiration* - including the 5 pillars, viz; product innovation, process innovation, high growth, internationalization and risk capital.

The GEI methodology has been endorsed by the United Nations Conference on Trade and Development as well as the European Commission. It is immediately evident that the nature of the university as an incubator and facilitator of innovation as well as the teaching activities play a unique role in shaping attitude, ability and aspiration of the human agents experiencing its culture and hence, the national score of the GEI. Accordingly, the operating educational model of the nation's tertiary institution system impacts on the entrepreneurial orientation of its product (trained human workforce). As a reflection of the evolutionary process involved in economic development, the general behaviour of entrepreneurship with respect to economic progression indicator(s) is a sigmoid as illustrated in Figure 4. The S-shape is a characteristic growth feature of many sustainable natural ecosystems[18,19,20] implicating different stages from birth to maturity. The entrepreneurship-versus-economic development relationship from resource factor-based (export of primary raw materials) through to efficiency-driven (value-added product manufacturing) to innovation-driven knowledge technologies is reminiscent of the three-stage process of childhood, adolescence and maturity for an organic system. GEI scores for developed economies locate them in the innovation-driven stage of the sigmoid as seen on Table 3.

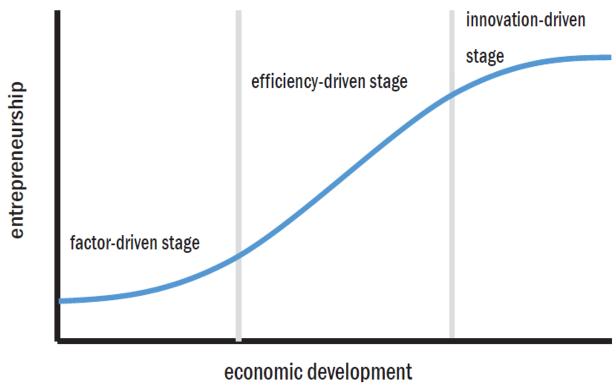

Figure 4: The relationship between entrepreneurship and economic development (after Acs et al, 2015).

Table 3: GEI Scores for representative countries in 2018[21]

Country	GEI Score (Max. 100)	Rank	Type of economy
United States	83.6	1	Developed
Switzerland	80.4	2	Developed
Canada	79.2	3	Developed
United Kingdom	77.8	4	Developed
Australia	75.5	5	Developed
United Arab Emirates	53.5	26	Rapidly developing
Singapore	52.7	27	Rapidly developing
China	41.4	43	Rapidly developing
Greece	37.1	48	Rapidly developing
Russia	25.2	78	Rapidly developing
Ghana	21	93	Developing
Nigeria	19.7	101	Developing
Sierra Leone	12.3	132	Developing
Bangladesh	11.8	134	Developing
Chad[+]	9.0	137	Developing

[+]Lowest ranked nation in 2018

Indeed, as may be seen in Figure 5a, the GEI growth curves for the advanced economies display a distinct S-shape dynamics with respect to time between 2010 to 2018 while those for the developing nations are somewhat less recognizable as evident from Figure 5b.

Factor-driven economies are typically countries with low per capita GDP such as Pakistan, Bangladesh and poor sub-Saharan African nations which are consistently placed at the bottom of the GEI table in the annual GEDI Report since 2011. Indeed, in 2018, Botswana was the best sub-Saharan African country with a GEI score of 35. Even so, the 2018 GEDI Report indicates that improvement in startup skills for entrepreneurship-supporting careers provides the path to quickest gains for factor-driven sub-Saharan African countries. It is in this respect that a paradigm shift in the university education model from the inherited colonial type to an entrepreneurial approach is urgently needed.

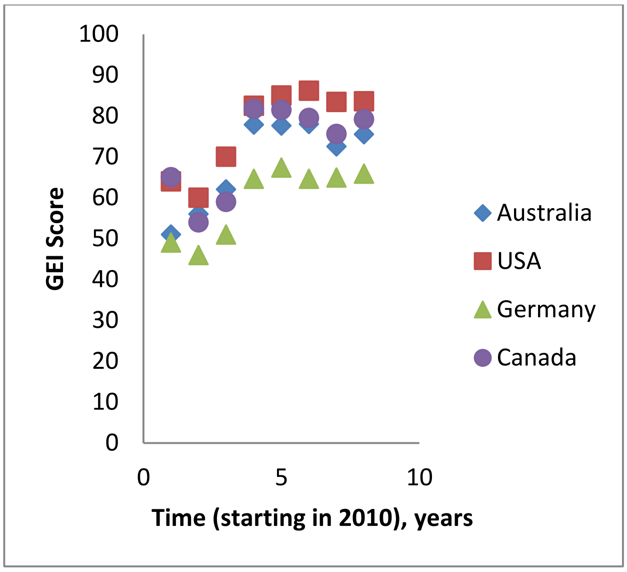

Figure 5a: Entrepreneurial growth dynamics for developed nations

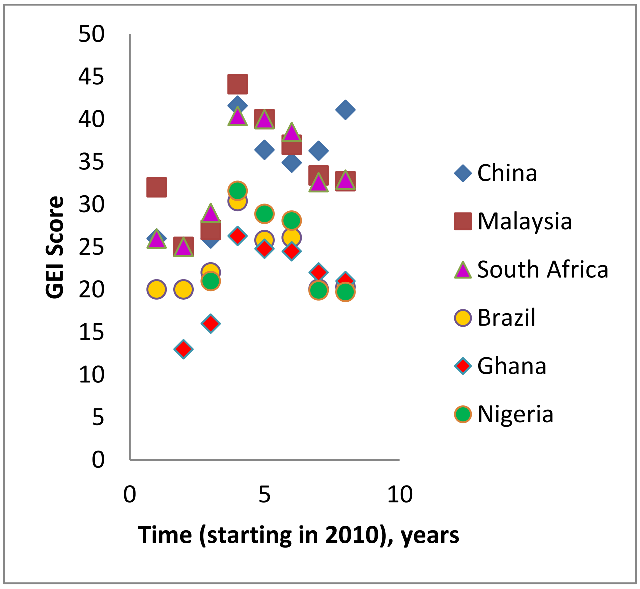

Figure 5b: Entrepreneurial growth dynamics for developing nations

In order to explore the connection between national economic development and the *modus operandi* for university system, we note that the S-shape behaviour in Figure 4 may be captured by the Chapman-Richard growth equation:

$$GEI = \alpha_0 + \alpha_1[1 - \exp(-\alpha_2 EDI)]^{\alpha_3} \quad (2)$$

where,

GEI = global entrepreneurship index

EDI = an economic development indicator such as RGDP.

with α_0 as the innate global entrepreneurship index of the particular economy when there is no economic activity, α_1 is difference between the limiting GEI value for a fully (infinitely) developed economy, GEI_∞ (=$\alpha_0+\alpha_1$), and the GEI for null economic activity (α_0), while α_2 is the characteristic economic development resistance coefficient for that country and α_3 is a the entrepreneurship shape factor in the particular context - a composite coefficient for sociopolitical norms. Given that the contemporary knowledge-based economy is a strong reflection of the generated waves of entrepreneurial universities in USA, Canada and Western Europe as well as the recent crest in Asian and Latin American countries, it is instructive to correlate the growth history of such universities with the GEI score. Table 4 displays national demographic data, GEI scores and the number of entrepreneurial universities for representative economies.

Table 4: GEI data for selected top entrepreneurial countries in 2015 (Adapted from Acs, Szerb & Autito, 2015)

Rank	Country	GEI Score (%)	Current Population (millions)	Total number of universities	Number of entrepreneurial universities*	Entrepreneurial university per capita
1	United States	85	322	1845	252	0.783
2	Canada	81.5	35.5	98	27	0.761
3	Australia	77.6	23.6	43	17	0.720
4	United Kingdom	72.7	63.5	163	41	0.646
5	Sweden	71.8	9.6	14	5	0.521
6	Denmark	71.4	5.6	7	3	0.536
7	Iceland	70.4	0.33	5	1	3.030***
8	Taiwan	69.1	23.4	35	6	0.256
9	Switzerland	68.6	8.2	22	5	0.61
10	Singapore	68.1	5.5	6	2	0.364
11	Germany	67.4	82.7	70	12	0.145
84	Nigeria	28.9	178.5	126	15	0.084
130**	Bangladesh	14.4	161.2	110	4	0.025

*Self-identified through their various websites.
** Country with the lowest GEI score in 2015
*** Iceland data appears to be an outlier

We have accepted the self-identification of the individual university as being entrepreneurial in orientation largely because the literature on the characterization of the entrepreneurial university is still evolving[22]. In any event, the attributes should be are publicly available and may always be vetted by the user. Figure 6 shows the plot of GEI score against the per capita entrepreneurial university for these countries (the per capita entrepreneurial university - number of entrepreneurial universities in a country per population million) is an N-curve (inflexion profile). This behaviour may be conveniently represented by:

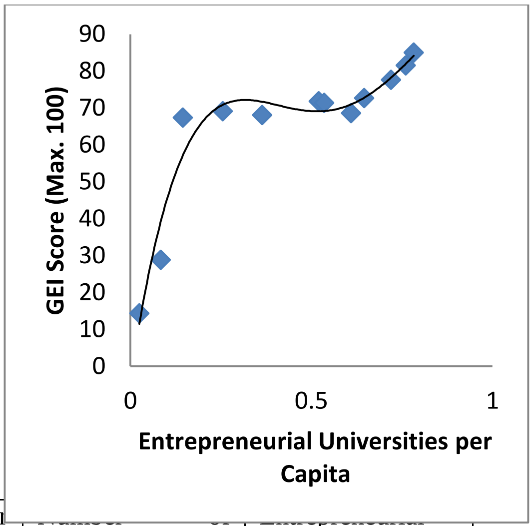

Figure 6: The dependency of GEI score on entrepreneurial universities per capita across different economies in 2015.

$$GEI = \gamma_0 + \gamma_1 \exp(\gamma_2 EUC) - \gamma_0 \exp(-\gamma_3 EUC) \quad (3)$$

where, γ_0, γ_1, γ_2 and γ_3 are model parameters with γ_1 as the GEI for the country with no entrepreneurial university while γ_2 and γ_3 are the intellectual productivity growth constants for the developed and developing economy class respectively. For the data on Table 4, nonlinear regression of Eqn (3) using Sigma Plot 10™ provides, $\gamma_0 = 71.67$, $\gamma_1 = 10.02$, $\gamma_2 = 15.28$ and $\gamma_3 = 8.62 \times 10^{-5}$. The associated correlation coefficient of 0.966 suggests an excellent fit of the data to the model. It is to be expected that the intellectual productivity growth constant in the developed society, γ_2, would be higher than its value in the less developed economy, γ_3, not because of an intrinsic differentiation in mental capacity between nationalities (or races for that matter) but partly because of human migration advantage to centres of learning in modern history[23]. Even so, it is somewhat troubling to realize that the intellectual productivity growth constant in the developed nations is about six orders (!!) of magnitude greater than that for the developing countries (for the present data). This should be a catalyst for concerted government efforts to stemming the 'brain-drain' phenomenon and promoting research exchange with its nationals in diaspora[24].

Although the exact numerical values of γ_0, γ_1, γ_2 and γ_3 may change from year to year, the applicability of N-curve is time-invariant. As a result, it is possible to obtain an explicit relationship between the economic development indicator, EDI, and the number of entrepreneurial universities per capita for any country by combining Eqns (2) and (3) to solve for EDI in terms of EUC. This algebraic exercise yields;

$$z = \frac{1}{\alpha_2} ln \left\{ \left[\frac{1}{\alpha_1} \left\{ (\gamma_0 - \alpha_0) + \gamma_1 \left[e^{\gamma_2 x} - \left(\frac{\gamma_0}{\gamma_1} \right) e^{-\gamma_3 x} \right] \right\} \right]^{1/\alpha_3} - 1 \right\} \quad (4)$$

where z = EDI and x = EUC. We note that the set α_i and γ_i (i=0,1,..3) are all positive constants with γ_i's as global data-based parameters and α_i's being country-specific values. In particular, with $\gamma_0 > \alpha_0$ and $\gamma_2 > \gamma_3$, further simplification of Eqn (4) may be possible in many cases. Significantly, this is the first time, to the best of the author's knowledge, that an explicit mathematical relationship has been established between economic development indicator and a strategic educational orientation metric, i.e. entrepreneurial universities per capita (a policy-driven independent variable). It is also apparent from Eqn (4) the actual EDI is also a reflection of the input from the global environment (γ_i's) consistent with the NSI framework, as diagrammatically illustrated in Figure 3. Indeed, Eqn (4) being a nonlinear function offers an interesting opportunity for parametric analysis of the feasible solution space. This is the subject of a future publication by the author.

Conclusions

This paper has demonstrated that despite the positive growth in Nigeria's real GDP within the last few decades, the inability of the country to be competitive in the current global knowledge-based economy may be rooted in the lack of entrepreneurial orientation in our tertiary educational system. Specifically, while the trend in GCI score for many countries has been positive in the last decade, Nigeria's global competitiveness index displayed a downward slope (ca. -0.37% per year). Moreover, on a comparative basis with other nations, Nigeria is actually regressing in terms of real economic criteria governing the global marketplace. Consistent with the thesis of the study, the countries outperforming Nigeria did so largely because of the transformation of the university education structure to an entrepreneurial model. Statistical analysis of national data related R&D funding source and research innovation contributors further revealed strong interaction effects between different elements of the NSI framework, such as; university-industry, industry-government, university-government, etc as significant positive contributors to national innovation performance in addition to the obvious importance of the various fund providers.

Innovation-based economic development is manifested in the growth of the global entrepreneurial index. The investigation revealed that the entrepreneurial growth dynamics during the past decade has a characteristic sigmoid feature in agreement with the S-shape evolution of GEI with economic development easily represented by a Chapman-Richard equation. Using the per capita entrepreneurial universities (i.e. number of entrepreneurial universities per population million), the correlation with GEI score was adequately by an N-curve represented by the empirical equation, seen in Eqn (3). These two mathematical expressions were then combined to explicitly obtain, for the first time, a functional relationship between economic development indicator and the per capita entrepreneurial universities. An important corollary of this analysis is that it now provides an incentive for seeking paradigm shift in the tertiary education system via an intensification of the NSI framework and the underpinning science & technology policy. The opportunity for predicting entrepreneurial performance is an additional benefit in the integrated control of our university education and economic development policies and their implementation.

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