

Research Africa Network (RAN)

RAN Working Paper

WP/18/008

**Human Capital, Knowledge Creation, Knowledge Diffusion, Institutions
and Economic Incentives: South Korea versus Africa**

Forthcoming: Contemporary Social Science

Simplice A. Asongu

Development Finance Centre,
Graduate School of Business,
University of Cape Town, Cape Town, South Africa.

E-mails: asongusimplice@yahoo.com /
asongus@afridev.org

Vanessa S. Tchamyou

Faculty of Applied Economics,
University of Antwerp, Antwerp Belgium

E-mails: simenvanessa@yahoo.com /
simenvanessa@afridev.org

Research Department

Human Capital, Knowledge Creation, Knowledge Diffusion, Institutions and Economic Incentives: South Korea versus Africa**Simplice A. Asongu & Vanessa S. Tchamyou**

January 2018

Abstract

This article compares African countries to South Korea in terms of knowledge economy (KE). Emphasis is laid on human capital, knowledge creation, knowledge diffusion, institutions and economic incentives. The analytical approach consists of providing knowledge economy catch-up strategies that can be understood within the context of country-specific gaps between the frontier country in KE and laggard African countries. The empirical evidence is based on sigma convergence with data for the period 1996-2010. Overall, a KE diagnosis is provided by assessing KE gaps (between South Korea and specific-African countries) and suggesting compelling catch-up strategies with which to reduce identified gaps. Contemporary and non-contemporary policies from South Korea and more contemporary policies based on challenges of globalisation are discussed. The policy relevance of this inquiry aligns with the scholarly perspective that catch-up between South Korea and more advanced economies was accelerated by the former adapting to and assimilating relatively obsolete technological know-how from more developed nations.

JEL Classification: O10; O30; O38; O55; O57

Keywords: Knowledge economy; Benchmarks; Policy syndromes; Catch-up; Africa

1. Introduction

The positioning of this inquiry is motivated by at least three main trends in contemporary African development literature, namely: (i) the growing relevance of knowledge economy (KE) in the 21st century development; (ii) the lagging position of African countries in terms of KE and (iii) the need for countries in the continent to catch-up with frontier KE nations, in the light of gaps in the literature. The underpinnings are developed chronologically.

First, today KE is central to addressing competitive challenges imposed by the globalisation phenomenon. Hence, in this contemporary era, for countries to be prosperous and remain competitive in the global economy, they have to adjust and adapt to competitive rules that are particularly linked to KE-based advantages. No wonder that KE has been central in the reports by and strategic plans of the Organisation for Economic Co-operation and Development (OECD) since the beginning of the third millennium (World Bank, 2007; Weber, 2011).

Second, despite the growing importance of KE in Africa, compared to other regions of the world, the overall knowledge index of the continent has been falling since the beginning of the third millennium (see Anyanwu, 2012). This trend is disturbing because Asian and Latin American countries have been engaging in calculated steps that emphasise the importance of KE in their pursuits of regional and national initiatives (Dahlman, 2007; Tchamyou, 2017). Hence, it is not surprising that the patterns of development in the international arena are constantly shaped by Europe and North America which have understood the dynamics of KE. In the catch-up process, the historic trend that was established by Japan has shaped the pattern of the New Industrialised Asian Economies (Hong Kong, Singapore, South Korea and Taiwan) as well as Malaysia and China. It is within this framework that Asian economies have been experiencing substantial progress towards knowledge-based economies from 'product-based economies' in the post-industrialisation era. It is also along this prism that the East Asian Miracle has inspired a recent stream of KE literature on the catch-up process, essentially because lagging countries can learn successful lessons from frontier nations (Kim, 2013; Asongu, 2017).

Third, whereas the East Asian Miracle has been the object of recent scholarly attention, the KE literature on lessons from frontier East Asian countries to laggard African

nations is scarce. While Asongu (2017) has focused on lessons from South Korea¹ to specific fundamental characteristics of African development (e.g. legal origins, income levels, religious-domination, *inter alia*), we argue that focusing on fundamental features leads to blanket policies and blanket measures that are unlikely to be effective unless they are contingent on country-specific analyses. South Korea as a frontier nation is worthwhile because the country was less developed than most countries in Africa during colonial independence (see Tran, 2011).

The underlying literature is fundamentally motivated by the imperative to articulate research on KE that provide lessons and strategies with which to reduce the gap between lagging countries and their benchmark counterparts in KE (Lightfoot, 2011; Makinda, 2007; Chavula, 2010; Bizri, 2009). As far as we have reviewed, contemporary literature on lessons from the Newly Industrialized Asian countries (like South Korea) on Africa is sparse. The purpose of this study is therefore to bridge the gap by assessing country-specific differences and discussing corresponding policy implications.

The fact that the relationship between Korea and Africa has been comparatively less studied in contemporary development literature (see Kim, 2013) may be traceable to some scepticism in the literature about the relevance of South Korea as a development model for other developing countries: “*There is some scepticism about Korea as role model of development as the Korean model involved a considerable degree of state activism, unacceptable in today’s global environment*” (Lee, 2009, p.1).

Consistent with Suh and Chen (2007), the economic development that South Korea has been enjoying since the 1960s has enabled the country to rise dramatically to a high-income industrialised country from a low-income agricultural nation. The authors suggest that the economic miracle of the country is considerably traceable to the accumulation of know-how instead of traditional features of production: capital and labour. The narrative maintains that Korea achieved its knowledge-focused development by, *inter alia*: substantially investing in education and training; improving modern infrastructure; employing intensive research and development (R&D) to enhance innovation; articulating incentives to economic activities and improving institutional regimes that are favourable to investment which are knowledge-related. With this underpinning in mind, Korea’s economic miracle substantially relied on KE: an experience which can offer valuable lessons to African economies in their current pursuit of Knowledge-based economies.

¹ South Korea and Korea are used interchangeably throughout the paper.

Noticeably, the positioning of this study contributes to the literature in at least three ways. First, a KE diagnosis is provided by assessing KE gaps (between South Korea and specific-African countries) and suggesting compelling catch-up strategies with which to reduce identified gaps. Second, a unique opportunity also emerges from the study of examining whether the impressive economic growth that African nations have witnessed over the past decades has been accompanied by some form of convergence in KE. Third, in the light of a growing body of work on the central role of KE in the 21st development (see Lightfoot, 2011; Makinda, 2007; Tchamyou, 2017), the comparison between frontier and peripheral countries could provide specifically-targeted practical lessons to African countries currently in the course of achieving knowledge-based economies.

The intuition for convergence in KE is typically in line with the literature on cross-country income convergence which has been considerably documented within the context of neoclassical growth models and recently extended to other domains of economic development (Narayan et al., 2011; Mayer-Foulkes, 2010; Bruno et al., 2012). It is within the underlying framework that the theoretical background on convergence has been employed in the modelling of: strategies against software piracy (Asongu, 2013a) as well as the soundness of financial markets and optimal currency areas (Bruno et al., 2012; Narayan et al., 2011; Asongu, 2013b).

The paper employs the four dimensions of the World Bank's Knowledge Economy Index (KEI), namely: information and communication technology (ICT), economic incentives and institutional regime, education and innovation. The use of suggested dimensions of KE also builds on shortcomings in existing literature in which only few components of the KEI are employed (see Bizri, 2009; Britz et al., 2006).

We assess two main concerns between African countries and South Korea, notably: (i) gaps in KE and (ii) potential strategies with which to address identified gaps. The rest of the inquiry is structured in the following manner. The data and methodology are covered in Section 2 while the empirical results and implications are discussed in Section 3. We conclude in Section 4 with future research directions.

2. Data and methodology

2.1 Data

The study assesses 53 African countries with data from Principal Component Analysis (PCA) and World Development Indicators for the period 1996-2010. The adopted periodicity has two

main justifications. On the one hand, the interval begins from 1996 because government quality indicators that are needed for the institutional regime component of KE are only available from 1996. On the other hand, the end year is consistent with Anyanwu, (2012) on the drop of Africa's overall KE index. It is interesting to note that the periodicity is also consistent with Asongu (2017) which we are extending. The adopted KE indicators which are the four principal dimensions of the World Bank's Knowledge Economy Index are consistent with recent KE literature (see Tchamyou, 2017). These KE variables include: innovation, ICT, education and, economic incentives & institutional regime. Due to lack of space, the definitions of the variables, summary statistics and correlation matrix are available upon request.

2.2 Methodology

In accordance with recent KE studies in Africa (Asongu, 2015; Tchamyou, 2017), constituents of various dimensions in the World Bank's KEI are highly correlated. Therefore, the high degree of substitution among the indicators may lead to the redundancy of some information. The concern is addressed with the help of principal component analysis (PCA) which is a statistical technique that is often employed to reduce highly correlated variables into a smaller set of uncorrelated indicators called principal components (PCs). These derived indicators represent a substantial part of variability of or information in the underlying or constituent indicators². The selection of PCs is with the help of the Kaiser (1974) and Jolliffe (2002) criterion which recommends the choice of PCs corresponding to eigen values that are greater than the mean or higher than one.

Findings of the PCA are presented in Table 1. While Panel A shows results on factor loadings from African peripheral countries, Panel B discloses results on the frontier South Korean country. A separate PCA is needed for both frontier and peripheral countries to enable a comparative analysis. The Kaiser 1 criterion is respected in the selection of factor loadings. For example in Panel B, ICT denoted by *ICTex* (or selected PC) accounts for about 80.00% of information in the constituent indicators (mobile phone penetration, internet penetration and telephone penetration). The corresponding eigen value (or 2.400) is also greater than one.

² It is interesting to note that the proportion of common variations among KE components corresponding to the selected eigen values (which mirror the eigenvectors) justify the substantial correlation among KE dimensions.

Table 1: Principal Component Analysis (PCA) for KE Indicators

Knowledge Economy dimensions		Component Matrix (Loadings)						First PC	Eigen Value	Indexes
Education	School Enrolment	PSE		SSE		TSE		0.658	1.975	Educatex
		0.438		0.657		0.614				
Information & Infrastructure	ICTs	Internet		Mobile		Telephone		0.730	2.190	ICTex
		0.614		0.584		0.531				
Innovation System	Innovation	STJA		Trademarks		Patents		0.917	2.753	Innovex
		0.567		0.572		0.592				
Economic Incentive & Institutional regime	Economic Incentive	Private Credit			Interest rate Spread			0.656	1.313	Creditex
		-0.707			0.707					
	Institutional index	VA	PS	RQ	GE	RL	CC	0.773	4.642	Instireg
		0.383	0.374	0.403	0.429	0.443	0.413			

Knowledge Economy dimensions		Component Matrix (Loadings)						First PC	Eigen Value	Indexes
Education	School Enrolment	PSE		SSE		TSE		0.688	2.065	Educatex
		-0.359		-0.675		0.645				
Information & Infrastructure	ICTs	Internet		Mobile		Telephone		0.800	2.400	ICTex
		0.612		0.625		0.484				
Innovation System	Innovation	STJA		Trademarks		Patents		0.946	2.839	Innovex
		0.576		0.573		0.582				
Economic Incentive & Institutional regime	Economic Incentive	Private Credit			Interest rate Spread			0.682	1.365	Creditex
		0.707			0.707					
	Institutional index	VA	PS	RQ	GE	RL	CC	0.664	3.985	Instireg
		0.453	-0.064	0.487	0.460	0.458	0.364			

P.C: Principal Component. PSE: Primary School Enrolment. SSE: Secondary School Enrolment. TSE: Tertiary School Enrolment. ICTs: Information and Communication Technologies. Educatex is the first principal component of primary, secondary and tertiary school enrolments. ICTex: first principal component of mobile, telephone and internet subscriptions. STJA: Scientific and Technical Journal Articles. Innovex: first principal component of STJA, trademarks and patents (resident plus nonresident). VA: Voice & Accountability. RL: Rule of Law. R.Q: Regulation Quality. GE: Government Effectiveness. PS: Political Stability. CC: Control of Corruption. Instireg (Institutional regime): First PC of VA, PS, RQ, GE, RL & CC. Creditex: First PC of Private domestic Credit and Interest rate spread.

Country-specific gaps in KE are estimated by means of *sigma* convergence. The *beta* convergence approach is not used because it is panel-oriented. Moreover, the beta (conditional and unconditional) estimation strategy is also associated with issues of multiple equilibria and initial endowments (see Asongu, 2014a, 2014b; Monfort, 2008, p. 4-5). The corresponding sigma or cross-sectional catch-up approach is presented as in Eq. (1) below:

$$\sigma = \sqrt{\frac{1}{N} \sum_{i=1}^N (KE_i - \mu)^2} , \quad (1)$$

where $\mu = \frac{1}{N} \sum_{i=1}^N KE_i$

The procedure for estimating *sigma* convergence denoted by Eq. (1) consists of observing the evolution in standard deviations across time. A decreasing tendency implies convergence. The adoption of the sigma convergence approach for comparative catch-up is consistent with recent literature (Young *et al.*, 2008; Rapacki & Prochniak, 2009; Asongu *et al.*, 2018).

3. Empirical results and policy strategies that are implementable contingent on country-specific KE gaps

The KE gaps are presented in country-specific graphs disclosed in the appendix. For lack of space, while specific trends of the KE gaps pertaining to the 53 countries are not engaged, we discuss catch-up strategies based on the South Korean experience upon which African policy makers can rely on in order to engage appropriate policies to bridge corresponding gaps. In the sections that follow, we first discuss contemporary and non-contemporary South Korean policies before engaging more contemporary policies.

3.1 Education and Innovation strategies

3.1.1 Non-contemporary South Korean policies

The recommendations here are based on two main assumptions. On the one hand, human capital is crucial in boosting science and technology as well as economic development. On the other hand, competition within the market better motivates private enterprises to engage in the development of technology. These conditions are essential in improving avenues for innovation as well as firmly establishing scientific research capabilities. The strategies are engaged in three fronts.

First, it is imperative for nations within Africa to adopt ambitious measures in view of boosting both college enrolment and the budget for R&D. As demonstrated by Lee (2009), the suggested policies are especially effective when they are implemented alongside policy and institutional environments that are constantly improving. Education boosts the country's capacity to assimilate new knowledge and technology and also improves the ability of individuals to acquire tacit knowledge which is imperative for consolidating technological learning blocks. With the understanding of this framework, governments in Africa need to take bold measures toward promoting the development of core human resources (see Suh & Chen, 2007; Tchamyou, 2017). It is important to note that whereas the Korean economy relied

considerably on advanced countries for some of its sophisticated technology; it developed robust platforms for indigenous R&D to which about 3% of its annual GDP was allocated. In essence, the underlying policies related to education and technology best encapsulate the practical and disciplinary perspectives that can help African nations in their transition to knowledge based economies.

Second, if workers are to adapt to the ever rapidly improving technological circumstances, it will be essential for governments in the continent to improve conditions for technical and vocational trainings. Such trainings are necessary both at work places and intermittently when workers are moving from one job to another. The basis for this strategy is that as a country makes the transition from underdevelopment to development, some essential features that are associated with the corresponding economic prosperity are also linked to technological know-how. In order to effectively implement these strategies, policy makers in the continent would be required to nurture high-profile scientists and engineers that are able to tackle the challenges of economic development within boundaries of technology and science. From the Korean experience, education and industrialization moved hand-in-glove by complementing one another in the efforts toward accelerating development. It is well documented that education led to technology-driven learning and boosted industrialization on the one hand. On the other hand, industrialization increased the return of investing in education which further increased the need for education (see Suh & Chen, 2007; Tchamyou, 2017).

Third, going by the intellectual property rights literature which is more favourable towards less stringent property rights in developing countries (see Bezmen & Depken, 2004), the process of industrialization in Korea has been facilitated by ‘imitation to innovation’. Hence, less tight property rights and reverse engineering are requirements for technology-intensive goods and services to be copied. It is therefore important for laggard nations in Africa to adopt informal mechanisms of knowledge transfer that are more conducive to development when countries are at initial stages of industrialisation. Moreover, like in South Korea, the underlying strategies need to be implemented within a broadly policy framework of lifelong learning (Suh & Chen, 2007).

3.1.2 More contemporary policies

More contemporary policies are discussed in four main strands, notably: balancing general education with technical education; promoting cross-country R&D; a culture of

lifelong and the relevance of PhD by Publication. First, in technical and vocational education training (TVET)-oriented programs through entrepreneurship training, career guidance and counselling are important to promote self-employment. It is also important to note that while TVET provides more avenues for post-conflict reconstruction, it also greases the transition from the informal to the formal economy.

In view of the above, qualitative TVET should be designed to respond to the needs of the labour market. This requires collaborative programs between future employers and academic establishments. Such endeavours are considered as essential in providing prospects to an evolving number of fresh college and/or university graduates. In addition, TVET endows citizens with avenues along which indigenous knowledge and cultural practices can be preserved, namely: traditional arts and crafts. Acknowledging that a high rate of the youth population may neither make the transition through formal educational institutions nor through establishments of higher learning, complementing TVET schemes with non-formal modes of learning could be substantially beneficial for both girls and women. In essence, TVET policies need to be designed such that both R&D needs and requirements of the local market are met in the short-, medium- and long-terms. The African Union (AU, 2006) has documented a stream of measures that can be implemented by member states in order to improve TVET (see Table 5 of AU, 2006). The measures include: non-formal education; quality and relevance of national TVET programmes and systems; financing TVET; the employment of network strategies; equitable access to TVET for all and capacity building.

Second, it is relevant to promote cross-country R&D, regional research and innovation on the one hand and on the other hand, maintain good connections between industries, researchers and policy makers. It is important for policy makers to adopt cross-country or regional R&D initiatives that facilitate catch-up between laggard African and frontier countries. Such policy initiatives could focus on *inter alia*: monitoring and encouraging activities that articulate regional and local initiatives in the promotion of new ventures. The enterprise could encapsulate, among others: (i) cooperation within a transnational framework with the core aim of easing convergence in R&D and scientific output; (ii) articulation of R&D schemes to encapsulate both local actors and policy makers and (iii) orientation of collaborative research initiatives to address concerns about non-inclusive development. The third point is important because a recent World Bank report has revealed that poverty has been decreasing in all regions of the world with the exception of Africa (see Tchamyu, 2018).

The suggested policy measures can be boosted if adequate ICT facilities are provided to researchers on the one hand and appropriate linkages are established between researchers, policy makers and industries on the other hand. In essence, the construction of ICT networks that enhance the sharing of information is crucial for the successful outcome of a collaborative venture. In addition, models of reference such as successfully implemented projects in the past should be properly communicated so that they serve as role models for other research networks within the same framework. A good example of a collaborative project that is designed to promote cross-country research and combat brain drain is the an initiative by the Council for the Development of Social Science Research in Africa (CODESRIA) known as the ‘African Diaspora Support to African Universities’. Such an initiative is designed to mobilize researchers originally from Africa that are based in the Diaspora in view of contributing toward, *inter alia*: filling gaps in teaching, revitalizing social sciences, strengthening PhD programs, mentoring young researchers in social sciences and consolidating universities in Africa. In summary the initiative aims to improve linkages between Africa researchers in the diaspora, their institutions and universities in Africa.

Third, the lifelong learning strategy is best summarised in the AU (2006) plan for quality educational promotion in Africa. “*To re-align education systems in Member States so that young people are provided with compulsory basic education which imparts key generic competencies, skills and attitudes that lead to a culture of lifelong learning and entrepreneurship in order to empower individuals to live in peace and harmony, engage in the world of work, alleviate poverty and pursue further learning*” (p. 9). Corresponding priority areas are engaged in Table 5 of the same report.

Fourth, in the light of the low depth of Africa’s contribution to knowledge through scientific and technical journal articles (see Pailey, 2016), which is fundamentally traceable to the low production value of doctoral dissertations (Amavilah, 2009), higher educational policies that are friendly with the transition from classical/traditional to PhD schemes that are based on published works are more likely to improve catch-up in innovation and facilitate technology transfer between more advanced nations and African countries (Asongu & Nwachukwu, 2018). This policy recommendation builds on the evidence that the academic curricula in African countries is not adequately adapted to the challenges of 21st century globalization on the one hand and that developed countries would continue to dominate for a very long time unless bold steps are taken now to address issues surrounding the catch-up process (see Asongu & Nwachukwu, 2016).

3.2 ICT catch-up strategies

The success of South Korea's ICT strategy has revolved around the implementation of robustly-integrated schemes that combined three main policy frameworks, namely: a regulatory and competitive policy; an active informatization policy and an industrial policy. The frontier nation has invested substantially in multimedia, telephone lines and internet equipment, *inter alia*. Such collective investments have considerably boosted the country's economic development. In accordance with the underlying literature on South Korea's success (see Suh & Chan, 2007; Tchamyu, 2017), such policies have been tailored along three constructive lines, namely: (i) human resources, venture capital and R&D (an industrial policy); (ii) market liberalisation and privatization (consolidated regulatory and fiscal policy) and (iii) the establishment of e-government and building of 'state of the art' infrastructure (an active information policy).

In summary, a combination of the underlying policy areas was a fundamental determinant of South Korea's information technology (IT) strategy and success. Therefore, African countries can build on the underlined policy framework. Moreover the capacity of these countries to leverage on such a framework and generate substantial development externalities is potentially higher in this contemporary era because of the high ICT penetration potential in Africa. ICT can be effectively leveraged upon by policy makers to address development concerns like non-inclusive development in Africa because whereas ICT penetration has reached saturation levels in other regions of the world, there is still a great room for its penetration in Africa (see Penard et al., 2012)³.

3.3 Institutional regime and Economic incentive catch-up strategies

3.3.1 Contemporary and non-contemporary South Korean policies

Institutional regime

Fragile and fragile governance (political, economic and institutional) are partly responsible for Africa's lagging position in the drive toward knowledge-based economies. From an economic incentive standpoint, it is important for African institutions to be more market-oriented in the adoption of strategies of development that enable the liberation of competitive forces, which are drivers of KE. Such a market-linked strategy which boosts

³ There are a plethora of rewards that are linked to ICT penetration in inclusive development and economic prosperity (African Partnership Forum, 2008; Chavula, 2010; Butcher, 2011; Asongu, 2016).

competition necessitates the availability of competitive forces. Therefore, in order to mitigate the flight of capital, enable financial market transparency and provide an equal-playing terrain for all operators within the market, some policies that boost credible institutions are needed, notably: foreign investment, government accountability and trade liberalisation. These conditions were favourable in driving the KE of South Korea.

An example on how South Korea benefited from a credible institutional regime is the management of the 1997 crisis (see Tchamyu, 2017). This Korean experience holds valuable lessons for African countries their quest to fight illicit capital flight. Moreover, African governments can also leverage from the fact that the post-1997 reforms in Korea were feasible for the most part because Korea had an established reputation of credible long-run fiscal prudence. In essence, Korea implemented a number of policies that fundamentally worked because the country had historically demonstrated to have solid institutions. The implemented policies included: recapitalisation measures for financial institutions, elimination of non-performing loans, support for low-income families with financial facilities and social programmes. Ultimately, the government of South Korea could easily issue new debt in order to finance the needed reforms. In essence, Korea's history of fiscal prudence and financial credibility (especially in handling public debt) enabled it to easily raise the funds needed for the reforms. Governments in Africa can leverage on this lesson with the understanding that institutional credibility is important in lifting a country from crisis.

There is also an important concern of elites that are corrupt for the most part in Africa (Jellal & Bouzahzah, 2013). From the South Korean example, instead of cracking-down on a corrupt elite as the USA requested, the leader of the country (president Park) adopted a more pragmatic approach by urging the corrupt business men to invest in enterprises that were favourable to import-substitution. African governments can also be more pragmatic in their approaches to fighting corruption, which is a massive industry that represents a substantial part of the continent's GDP. Other policies that reflected the strength and credibility of the Korean government included polices designed to: assimilate foreign technologies; increase access to modern infrastructure; boost domestic R&D; increase mass education and train of the population and improve of the macroeconomic environment.

Economic incentives

Economic incentives in South Korea were fundamentally driven by an export-led industrialization strategy. In essence, an extensive development strategy may equally expose

African companies to global forces of competition which would in turn urge domestic corporations to invest in technological assimilation and innovation that are essential for competition in the global environment. Incentives from domestic governments are also essential in this KE drive. Such incentives could be of fiscal nature and/or intensive R&D schemes. Within the same framework, some necessary protectionist policies that are essential at the early stages of industrial development should be curtailed in tandem with the development of corporations in order to discourage complacency that decreases innovation. Furthermore, Small and Medium Size Enterprises (a sector which comparatively encapsulates more risk and greater requirements in capital) were substantially aided by government research institutions which provided the much needed know-how through collaborative R&D schemes.

3.3.2 More contemporary policies

Whereas extensive and/or liberalised policy measures have been advocated in the previous sections in the light of South Korea's KE pattern, protectionist schemes are needed in African countries for some sectors, at least in the short run. This is essentially because the same protectionist measures that are not consistent with the neoliberal approach or Washington Consensus were adopted by most developed countries in their early stages of industrialisation (Chang, 2008; Mshomba, 2011).

Even from a more contemporary perspective, some developed countries are yet inconsistent with the neoliberal policies they preach. For instance even by the United States' and European Union's standards, the design of free market competition policies are indirectly focused on stifling industrialisation and KE processes in Africa. It is important to substantiate this view with some examples. In 'Making Globalisation Work', Joseph Stiglitz (Stiglitz, 2007) has articulated that in order to be leading in the export of cotton, the USA has relied on subsidies from the government. The author also maintains that it is better to be a cow in Europe than a human being in Africa because whereas most of the population in the continent is living below the extreme poverty line, a cow in Europe is subsidised with 2 USD/day. Beyond this fact, the notion of comparative advantage leaves little to be desired because about half of the European Union's budget is allocated to subsidising agriculture and the agri-foods industry. Unfortunately, these sectors represent just about 6% of its GDP. Moreover, Africa's contribution to world trade has dropped to below 1.5% from 3.8% in the 1950s which

according to Fofack (2014) is an indication that the neoliberal experiment is not still working for the continent.

4. Conclusion and future research directions

This article has compared African countries to South Korea in terms of knowledge economy (KE). Emphasis has been laid on human capital, knowledge creation, knowledge diffusion, institutions and economic incentives. The analytical approach has consisted of providing knowledge economy catch-up strategies that can be understood within the context of country-specific gaps between the frontier country in KE and laggard African countries. The empirical evidence is based on sigma convergence with data for the period 1996-2010. Overall, a KE diagnosis is provided by assessing KE gaps (between South Korea and specific-African countries) and suggesting compelling catch-up strategies with which to reduce identified gaps. Contemporary and non-contemporary policies from South Korea and more contemporary policies based on challenges of globalisation are discussed.

Future studies can focus on considering the analysis within an intra-African framework. The suggested inquiry would be motivated by the need to position African countries vis-à-vis their best performing counterparts in order to assess which African countries are leading in the drive towards knowledge-based economies and what corresponding lessons can be drawn from the frontier countries.

References

- African Union (AU, 2006). "Second Decade of Education for Africa (2006-2015)", The African Union Draft Plan of Action (June 2006 version) http://www.adea-comed.org/version2/IMG/pdf/SECOND_DECADE_OF_EDUCATION_FOR.pdf (Accessed: 24/11/2016).
- Amavilah, V. H., (2009). "Knowledge of African countries: production and value of doctoral dissertations," *Applied Economics*, 41,(7-9), pp. 977-989.
- Amsden, A., (1989). *Asia's Next Giant*. New York: Oxford University Press.
- Anyanwu, J. C., (2012). "Developing Knowledge for the Economic Advancement of Africa", *International Journal of Academic Research in Economics and Management Sciences*, 1(2), pp. 73-111.
- Asongu, S. A., (2013a). "Harmonizing IPRs on Software Piracy: Empirics of Trajectories in Africa", *Journal of Business Ethics*, 118(3), pp. 667-682.
- Asongu, S. A., (2013b). "African Stock Market Performance Dynamics: A Multidimensional Convergence Assessment", *Journal of African Business*, 14(3), pp. 186-201.
- Asongu, S. A., (2014a). "African Development: Beyond Income Convergence", *South African Journal of Economics*, 82(3), pp. 334-353.
- Asongu, S. A., (2014b). "African Financial Development Dynamics: Big Time Convergence", *African Journal of Economic and Management Studies*, 5(2), pp. 160-194.
- Asongu, S. A., (2015). "Financial Sector Competition and Knowledge Economy: Evidence from SSA and MENA Countries", *Journal of the Knowledge Economy*, 6(4), pp. 717-748.
- Asongu, S. A., (2017). "Knowledge Economy Gaps, Policy Syndromes, and Catch-Up Strategies: Fresh South Korean Lessons to Africa", *Journal of the Knowledge Economy*, 8(1), pp. 211-253.
- Asongu, S. A., & Nwachukwu, J. C. , (2018). "PhD by Publication as an Argument for Innovation and Technology Transfer: with Emphasis on Africa", *Higher Educational Quarterly*, 72(1), pp. 15-28.
- Asongu, S. A., & Nwachukwu, J. C. , (2016). "A brief future of Time in the monopoly of scientific knowledge". *Comparative Economic Studies*, 58(4), pp. 638-671.
- Asongu, S. A., Tchamyu, V. S., Minkoua, N, J. R., Asongu, N., & Tchamyu, N. P., (2018). "Fighting terrorism in Africa: Benchmarking policy harmonization", *Physica A: Statistical Mechanics and its Applications*, 492(February), pp. 1931-1957.

- Bezmen, T. L., & Depken, C. A., (2004). "The impact of software piracy on economic development", Working Paper. Francis Marion University.
- Bizri, O., (2009). "The Knowledge economy and the Arab Countries: current climate and future prospects in education, innovation and technology", Carthage High Level International Conference on Building Knowledge Economies for job creation, increased competitiveness and balanced development. December, 1-3, 2009.
- Britz, J. J., Lor, P. J., Coetzee, I. E. M., & Bester, B. C., (2006). "Africa as a knowledge society: A reality check", *The International Information & Library Review*, 38(1), pp. 25-40.
- Bruno, G., De Bonis, R., & Silvestrini, A., (2012). "Do financial systems converge? New evidence from financial assets in OECD countries". *Journal of Comparative Economics*, 40(1), pp. 141-155.
- Chang, H.-J., (2008). *Bad Samaritans: The Myth of Free Trade and the Secret History of Capitalism*. Bloomsbury Press; Reprint edition (December 23, 2008).
- Chavula, H. K., (2010). "The Role of Knowledge in Economic Growth. The African Perspective", ICT, Science and Technology Division (ISTD), United Nations Economic Commission for Africa (UNECA).
- CODESRIA (2014). "CODESRIA Launches a New Programme: African Diaspora Support to African Universities", Council for the Development of Social Science Research in Africa, <http://www.codesria.org/spip.php?article2175&lang=en> (Accessed: 26/11/2016).
- Dahlman, C., (2007). "The Challenge of the Knowledge Economy for Latin America", *Globalization, Competitiveness and Governability Journal*, 1(1), pp. 18-46.
- Dahlman, C., Westphal, L. E., & Kim, L., (1985). "Reflections on Korea's Acquisition of Technological Capability". In N. Rosenberg and C. Frisctak (eds), *International Technology Transfer: Concepts, Measures and Comparisons*. New York: Pagamon.
- Fofack, H., (2014). "The Idea of Economic Development: Views from Africa", *WIDER Working Paper* No. 2014/093, Helsinki.
- Ford, D. M., (2007). "Technologizing Africa: On the bumpy information highway", *Computers and Composition*, 24(3), pp. 302-316.
- Jellal, M., & Bouzahzah, M., (2013). "Transparency and corruption: an optimal taxation policy", *European Economics Letters*, 2(2), pp. 66-70.
- Jolliffe, I. T., (2002). *Principal Component Analysis* (2ndEd.), New York: Springer.
- Kaiser, H. F., (1974). "An index of factorial simplicity". *Psychometrika*, 39(1), pp. 31-36.
- Kim, S., (2013). "Korea in Africa: A Missing Piece of the Puzzle?"; (ed. Kitchen Nicolas) in *Emerging Powers in Africa*, pp. 51-66.

<http://www.lse.ac.uk/IDEAS/publications/reports/pdf/SR016/SR-016-Kim.pdf> (Accessed: 14/03/2014).

Lee, K., (2009), “How Can Korea be a Role Model for Catch-up Development? A ‘Capability- based’ View”, *UN-WIDER Research Paper* No. 2009/34, Helsinki.

Lightfoot, M., (2011). “Promoting the Knowledge Economy in the Arab World”, London Knowledge Lab, Institute of Education.

Makinda, S. M., (2007). “How Africa can benefit from knowledge”, *Futures*, 39(8), pp. 973-985.

Mayer-Foulkes, D., (2010). “Divergences and Convergences in Human Development”. *UNDP Human Development Research Paper 2010/20*, New York.

Monfort, P., (2008). “Convergence of EU Regions: Measures and Evolution”, *European Union Regional Policy Paper* No. 01/2008, Brussels.

Mshomba, R. E., (2011). *Africa and the World Trade Organization*. Cambridge University Press; Reprint edition (February 21, 2011).

OECD (Organization for Economic Cooperation and Development) (1992). *Technology and Economy: The Key Relationships*. Paris: OECD.

Pailey, R. N., (2016). “Where is the ‘African’ in African Studies?”, *Africa at the London School of Economics*,
<http://blogs.lse.ac.uk/africaatlse/2016/06/27/where-is-the-african-in-african-studies/>
(Accessed: 25/07/2016).

Penard, T., Poussing, N., Yebe, G. Z., & Ella, P. N., (2012). “Comparing the Determinants of Internet and Cell Phone Use in Africa: Evidence from Gabon ”, *Communications & Strategies*, 86(2), pp. 65-83.

Rapacki, R., & Prochniak, M, (2009). “Real beta and sigma convergence in 27 transition countries, 1990-2005”, *Post-Communist Economies*, 21(3), pp. 307-326.

Stiglitz, J. E., (2007). *Making Globalization Work*. W. W. Norton & Company; Reprint edition (September 17, 2007).

Suh, J., & Chen, D. H. C., (2007). “Korea as a Knowledge Economy. Evolutionary Process and Lessons Learned”, Korea Development Institute,
https://www.usp.ac.fj/worldbank2009/frame/Documents/Publications_regional/409300PAPE_R0KR101OFFICIAL0USE0ONLY1.pdf (Accessed: 19/03/2014).

Tchamyou, V. S., (2017). “The Role of Knowledge Economy in African Business”, *Journal of the Knowledge Economy*, 8(4), pp. 1189–1228.

Tchamyou, V. S., (2018). “Education, Lifelong learning, Inequality and Financial access: Evidence from African countries”, *Contemporary Social Science*. DOI: 10.1080/21582041.2018.1433314.

Tran, M., (2011). “South Korea: a model of development?”, *The Guardian*, <http://www.theguardian.com/global-development/poverty-matters/2011/nov/28/south-korea-development-model> (Accessed: 14/03/2014).

Weber, A. S., (2011). “The role of education in knowledge economies in developing countries”, *Procedia Social and Behavioral Sciences*, 15(2011), pp. 2589-2594.

Young, A. T., Higgins, M. J., & Levy, N., (2008). “Sigma Convergence versus Beta Convergence: Evidence from U.S. County-Level Data”, *Journal of Money, Credit and Banking*, 40(5), pp. 1083–1093.

Graphs - 53 African countries (Human Capital ; Knowledge Creation and Knowledge Diffusion)



















