

AFRICAN GOVERNANCE AND DEVELOPMENT
INSTITUTE

A G D I Working Paper

WP/15/044

The Impact of Entrepreneurship on Knowledge Economy in Africa

Forthcoming: Journal of Entrepreneurship in Emerging Economies

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AGDI Working Paper

Research Department

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October 2015

Abstract

Purpose - The paper assesses how entrepreneurship affects knowledge economy (KE) in Africa.

Design/methodology/approach – Entrepreneurship is measured by indicators of starting, doing and ending business. The four dimensions of the World Bank’s index of KE are employed. Instrumental variable panel fixed effects are applied on a sampled of 53 African countries for the period 1996-2010.

Findings –The following are some findings. First, creating an enabling environment for starting business can substantially boost most dimensions of KE. Second, doing business through mechanisms of trade globalisation has positive effects from sectors that are not ICT and High-tech oriented. Third, the time required to end business has negative effects on KE.

Practical implications – Our findings confirm the narrative that the technology in African countries at the moment may be more imitative and adaptive for reverse-engineering in ICTs and high-tech products. Given the massive consumption of ICT and high-tech commodities in Africa, the continent has to start thinking of how to participate in the global value chain of producing what it consumes.

Originality/value – This paper has a twofold motivation. First, given the ambitions of African countries of moving towards knowledge based economies, the line of inquiry is timely. Second, investigating the nexus may have substantial poverty mitigation and sustainable development implications. These entail *inter alia*: the development of technology with value-added services; enhancement of existing agricultural practices; promotion of conditions that are essential for competitiveness and adjustment of globalization challenges.

JEL Classification: L59; O10; O30; O20; O55

Keywords: Entrepreneurship; Knowledge Economy; Development; Africa

Acknowledgements

The authors are highly indebted to the editors and reviewers for constructive comments.

1. Introduction

It is now abundantly apparent that for countries to be integrated into and competitive within the global arena, they have to adapt to the rules of competition that are consistent with globalisation: a phenomenon that has become an ineluctable process, whose challenges can be neglected only at the expense of the wealth of nations (Tchamyou, 2014; Asongu, 2015a). Competition in the 21st century is fundamentally centred on knowledge economy (KE). Unfortunately, recent evidence suggests KE in the African continent has been decreasing since the year 2000 (Asongu, 2015b).

The 2014 African Economic Conference on “Knowledge and Innovation for Africa's Transformation” has clearly articulated, *inter alia*: the imperative of investing in innovations and technology that are centered on people, for Africa’s development and the importance of knowledge economy in shaping Africa’s future. This is broadly consistent with the recent stream of research on entrepreneurship (Brixiova et al., 2015) and innovation (Oluwatobi et al., 2014) for the continent’s emergence from poverty (Kuada, 2011a) and stylized facts on doing business challenges on the continent (Ernst & Young, 2013; Leke et al., 2010). We discuss recent African KE and entrepreneurship literature motivating the present line of inquiry in three main strands: need for entrepreneurship and investment, business strategies for achieving sustainable progress and KE on the continent.

First, on entrepreneurship, in line with Tchamyou (2014), doing business in Africa is extremely risky (Alagidede, 2008; Asongu, 2012). Doing business indicators of the World Bank do not fully reflect the African situation in terms of the impact of labour regulation (Paul et al., 2010). This is in accordance with an earlier position by Eifert et al. (2008) that the performance of African firms is undervalued by these indicators. The study is based on 7000 companies in 17 countries with data for the period 2002-2003. This finding does not overlook the current challenges of entrepreneurship in the continent (Taplin & Synman, 2004) which have culminated in, among others: studies encouraging more entrepreneurial lessons in undergraduate university programs (Gerba, 2012); a growing body of work on female entrepreneurial motivation (Singh et al., 2011) to bridge the substantially documented gender gap in doing business (Kuada, 2009); the fundamental roles of community and family relationships in the decision to become an entrepreneur (Khavul et al., 2009) and the effects of macroeconomic pressures on doing business in the continent (Kuada, 2011b)¹.

¹ Other recently documented issues include, among others, the need for higher intra-trade intensity to synchronization of business cycles across the continent (Tapsoba, 2010); more socially responsible investments (Bardy et al., 2012); the need for more investment (Rolfe & Woodward, 2004) and good understanding of factors affecting investment

With the post-2015 development agenda approaching, the second strand entails an evolving body of African business literature on strategies needed to achieving development that is sustainable. Sustainable development relationships from a plethora of business fields have been documented by Rugimbana (2010) who has also provided interesting strategies for the future. The long-term impact of training in entrepreneurship is more rewarding than short-term government hand-outs which for the most part culminate in violent protests and unanticipated ramifications (Mensah & Benedict, 2010). The authors conclude that entrepreneurial facilities as well as training enable small corporations with avenues of ameliorating their livelihoods and ultimately emerging from poverty. This is consistent with conclusions of Oseifuah (2010) and Brixiova et al. (2015) on the need to train more African youths in order to address long-term unemployment concerns that can only be handled by massive engagement of the private sector (Asongu, 2013a). Above all, the role of KE in sustainable development is an indispensable dimension in the 21st century (Tchamyu 2014), especially to the African continent that has been witnessing a declining KE potential (Anyanwu, 2012b).

We devote some space to engaging the relationship between entrepreneurship and economic development. Entrepreneurship has been substantially documented to be a source of poverty mitigation (Bruton et al., 2015; Si et al., 2015). This narrative is consistent with social entrepreneurship (Alvarez et al., 2015) as well as institutional entrepreneurship (George et al., 2015) which are both favorable with, *inter alia*: (i) conducive politico-economic institutions (Autio & Fu, 2015) and (ii) microfinance institutions following social-welfare logic as opposed to the profitability logic (Im & Sun, 2015).

In the third strand, recent KE literature in Africa has established that formal institutions may not be a necessary condition for the enhancement of the phenomenon (Andrés et al., 2014). A tendency that has been relaxed in a latter study by the same authors using more macroeconomic indicators (Amavilah et al., 2014). The need for more investment in education to enhance doctoral productivity (Amavilah, 2009) and relaxing of intellectual property rights (IPRs) to improve scientific publications (Asongu, 2014). The literature is broadly consistent on the need to invest more in KE for African development in order catch-up with failures in industrialization (AfDB, 2007; Chavula, 2010).

The paper unites the three strands above by assessing the role of entrepreneurship on KE. It examines the impact of starting business, doing business and ending business on the four

location decisions (Bartels et al., 2009, 2014; Anyanwu, 2007, 2012a; Amendolagine et al., 2013; Kinda, 2010; Tuomi, 2011; Yin & Vaschetto, 2011; Kolstad & Wiig, 2011; De Maria, 2010; Darley, 2012; Asiedu, 2002, 2006; Asiedu & Lien, 2011).

dimensions of KE identified by the World Bank, notably: education, innovation, information and communication technology (ICT) and economic incentives and institutional regime. By uniting these streams, it has a twofold contribution to existing literature. First, given the ambitions of African countries of moving towards knowledge-based economies, the line of inquiry is timely. Second, investigating the nexus may have substantial poverty mitigation and sustainable development implications. These entail inter alia: the development of technology with value-added services; enhancement of existing agricultural practices; conditions that are essential for competitiveness and adjustment of globalization challenges.

In light of the above, the research question assessed by this inquiry is: how does entrepreneurship influence KE in Africa? Instrumental variable panel fixed effects are applied on a sample of 53 African countries for the period 1996-2010. Three main findings are established. First, creating an enabling environment for starting business can substantially boost most dimensions of KE. Second, doing business through mechanisms of trade globalisation has positive effects from sectors that are not ICT and High-tech oriented. Third, the time required to end business has negative effects on KE.

The rest of the study is organized as follows. Section 2 presents stylized facts, theoretical highlights and the relevant knowledge economy literature. Section 3 discusses the data and methodology. The empirical analysis is covered in Section 4, while Section 5 concludes.

2. Stylized facts, theoretical underpinnings and knowledge economy in Africa

2.1 Stylized facts and theoretical underpinnings

In accordance with recent literature (Such & Chen, 2007; Tchamyou, 2014; Asongu, 2015ab), over the past decades, there has been a considerable soar in the production and dissemination of knowledge. This tendency can be traceable to the proliferation of ICTs which have facilitated electronic networking and consolidated computing strength. In essence, modern ICTs are becoming more and more affordable, hence, easing efficiency in the diffusion of existing and new knowledge. Within this framework, some benefits include: (i) the possibility of scholars from various locations to collaborate and enhance scientific productivity and (ii) the production of novel knowledge and technology. To put these facts into perspective, between 1981 and 2005, the number of patents and trademarks granted in the United States of America (USA) witnessed a rise by more than 120%, hence, illustrating an increasing pace in the creation of new knowledge and technologies. Comparatively, during the same periodic interval, patents delivered outside of the USA increased from 39% to 48%. It is also important to note that, competition during the same interval has increased in the world economy. The pace and magnitude of this competition has

been facilitated by the creation and diffusion ICTs and knowledge. As substantiated by Suh and Chen (2007), the size of global trade as a proportion of GDP (which is a proxy for globalization and global competition) increased from 24% in 1960 to 47% in 2003.

In light of the above, it is therefore reasonable to infer that entrepreneurship has increased KE. The stylized facts are consistent with Kim (1997) and Kim and Kim (2014) on the entrepreneurship-driven KE in South Korea. This intuition which serves as theoretical basis for this line of inquiry is also broadly in accordance with entrepreneurship literature, notably: Bruton et al. (2008, 2010) and Bruton & Ahlstrom (2003, 2006). For instance according to Bruton et al. (2008), entrepreneurship has played a key role in emerging countries' increasing orientation towards market orientation, KE and economic development.

2.2 Knowledge economy in Africa

In accordance with Tchamyu (2014) and Asongu (2015ab), the KE literature on Africa can be engaged in eleven principal strands, namely: general narratives, education, innovation, economic incentives and institutional regimes, ICTs, research and development (R&D), intellectual capital and economic development, indigenous knowledge systems, IPRs, spatiality in the production of knowledge and KE in the transformation of space.

General narratives about KE in Africa in first strand are consistent with the perspective that compared to other regions of the world; KE is lower on the continent. For instance, Anyanwu (2012b) has shown that the knowledge economy index (KEI) of the continent has dropped during the period 2000-2009. Rooney (2005) had earlier established from dominant discourses that Africa is limited in technocracy and understanding of KE. The relationship between KE and growth has been examined by Lin (2006) who has articulated the relevance of rethinking the KE-growth nexus and incorporating some previously missing dimensions, like the importance of knowledge in facilitating environmental conservations, wealth and equality.

Education in the second strand can be emphasized with the following interesting findings: (i) the lagging position of Africa in the information highway (Ford, 2007); (ii) the low production/value of doctoral dissertations in Africa (Amavilah, 2009); (iii) need for more quality education, essential for the stimulation of growth (Chavula, 2010); (iv) the imperative of education in preserving cultural integrity, ending illiteracy and diversifying the economy (Weber, 2011) and (v) the importance of education in stimulating positive human capital externalities (Wantchekon et al., 2004).

In the third strand on innovation: Anyanwu (2012b) has emphasized the need for more innovation on the continent; Oyelaran-Oyeyinka and Gehl (2007) have articulated that policy makers on the continent need to take the phenomenon more seriously because it is the main source of productivity and economic growth, while Carisle et al. (2013) have examined the innovation-tourism nexus to establish that institutions are important in networking, transfer of knowledge and preservation of best practices.

Concerning 'institutional regime and economic incentives' in the four strand, valuable insights into lessons from other developing nations and best practices have been provided by Cogburn (2003) who has attempted to clarify the transition in regimes of international telecommunications. Letiche (2006) has employed Behavioral economics to elucidate the success of economic transition and disclosed an examination of developing nations with varying determining factors like traditions and customs. The relevance of formal institutions in KE has been examined by Andrés et al. (2014) to establish that based on the instrumentality of IPRs, formal institutions are a necessary but not a sufficient condition for KE in Africa. The same authors had previously concluded that corruption-control is the best institutional weapon in the fight against software piracy (Andrés & Asongu, 2013a). The absence of financial incentives or credit unavailability is also a major constraint in the African business environment owing to substantially documented issues of surplus liquidity (Saxegaard, 2006; Asongu & De Moor, 2015ab).

Consistent with Asongu (2015ab), ICTs in the fifth strand are essential for mitigating poverty and boosting economic prosperity. According to the discourse, novel income-generating avenues are created with ICTs. Moreover, ICTs also enable access to new services and markets, enhance government and ameliorate efficiency. This narrative is consistent with Chavula (2010) and Butcher (2011).

With regard to 'indigenous knowledge systems' in the sixth strand, Roseroka (2008) has investigated mechanisms by which: comparative advantages of oral knowledge can be emphasized and indigenous knowledge space preserved. Lwoga et al. (2010), upon applying knowledge management frameworks to indigenous KE have concluded that knowledge management could be used to manage indigenous KE after controlling for specific features.

In the seventh stream on 'intellectual capital and economic development', Wagiciengo and Balal (2012) are focused on the disclosure of information and lifelong learning. They establish that the disclosure of intellectual capital is growing in companies across Africa. In the same light, the nexus between international lifelong-learning policies and development assistance in Africa is unappealing because international priorities in development have

negatively affected government choices towards domestic lifelong learning policies (Preece, 2013).

R&D is the focus of the eighth strand. Within this framework, Sumberg (2005) has assessed the growing international architecture of agricultural research and concluded that African research realities are not in harmony with global research systems. German and Stroud (2007) have undertaken a study to improve the applications and understanding of R&D in order to present lessons, types and implications of learning approaches. In the same vein, the need for more emphasis on R&D in the drive towards African KE has been consistently articulated by the literature in the area, notably: African Development Bank (2007), Chavula (2010) and Anyanwu (2012b).

In the tenth strand, we find literature that has focused on spatiality in the production of knowledge. Within this framework, Bidwell et al. (2011) have examined how technology can be adapted to heritages and needs of the rural population, in order to elucidate how the information can be temporarily and spatially managed by the rural community. Variations in bioprospecting have been provided by Neimark (2012) on Madagascar.

We discuss IPRs in the tenth stream. Here, Zerbe (2005) has investigated the legislation of the African Union for the protection of indigenous knowledge and found that, it is consistent with the needs and requirements of nations on the continent as it provides some balance between the rights of indigenes and those of monopoly breeders. Lor and Britz (2005) have investigated trends in knowledge and corresponding impacts on the flow of international information to provide three principal pillars that elucidate such flows, namely: common good, human rights and social justice. Myburgh (2011) reviews legal processes for the protection of knowledge related to plant in order to present the views of an IPRs lawyer on variations in the protection of plant-based traditional knowledge. Asongu (2013b) and Andrés and Asongu (2013b, 2016) have provided timelines for global IPRs protection initiatives while Asongu (2013c) has modeled the future of African KE. In an earlier inquiry, Andrés and Asongu (2013a) had established that corruption-control is the most relevant weapon in the battle against software piracy, contingent on the enforcement of IPRs. Within the same stream of contingency in IPRs, Andrés et al. (2014) have shown that formal institutions are not enough for the development of KE in Africa.

The last strand engages KE in space transformation. Here, Maswera et al. (2008) have assessed the rate of adoption of electronic (e)-commerce in the tourism industry to conclude that, whereas there are websites of information in Africa, they are substantially lacking in interactive e-transaction facilities.

We steer clear of above literature by assessing the impact of entrepreneurship on KE in Africa. The contributions of the inquiry to the literature have already been discussed in the introduction.

3. Data and methodology

3.1 Data

The study assesses a balanced panel of 53 African nations with World Bank Development indicators for the period 1996-2010². The start year is constrained by governance data which is available only from 1996. The end year is 2010 to enable comparison with the literature motivating the study that is based on the same periodicity. The choices of the KE, entrepreneurship and control variables defined in Table 1 are broadly consistent with the underlying literature (Tchamyou 2014; Andres et al., 2014). The KE dependent variables entail the four components of the World Bank's KE index: education, innovation, economic incentives and institutional regime and ICTs. The principal component analysis (PCA) approach used to mitigate potential overparameterization and multicollinearity issues is discussed in Section 3.2.1. The entrepreneurship indicators are classified in terms of: starting business, doing business and ending business. For brevity, the definitions of these variables are found in Table 1.

The control variables which are in line with the underlying KE literature (Andrés et al., 2014; Amavilah et al., 2014) entail: *population growth, inflation, government expenditure, financial size, financial efficiency and economic prosperity*. The expected signs on KE depend on the dimensions of KE investigated. Apart from inflation, the other control variables should generally stimulate KE (see Amavilah et al., 2014, p. 24). However, the expected signs still remain dynamic because the KE indicators have distinct features. The control variables are defined in Table 1.

² It is important to note that: (i) missing observations and (ii) variables included in the specifications; ultimately influence the number of observations in the regression output.

Table 1: Variable definitions

Variables	Signs	Variable definitions	Sources
Panel A: Dimensions in Knowledge Economy (KE)			
A1: Education			
Primary School Enrolment	PSE	“School enrolment, primary (% of gross)”	World Bank (WDI)
Secondary School Enrolment	SSE	“School enrolment, secondary (% of gross)”	World Bank (WDI)
Tertiary School Enrolment	TSE	“School enrolment, tertiary (% of gross)”	World Bank (WDI)
Education in KE	Educatex	First PC of PSE, SSE & TSE	PCA
A2: Information & Infrastructure			
Internet Users	Internet	“Internet users (per 100 people)”	World Bank (WDI)
Mobile Cellular Subscriptions	Mobile	“Mobile subscriptions (per 100 people)”	World Bank (WDI)
Telephone lines	Tel	“Telephone lines (per 100 people)”	World Bank (WDI)
Information & Communication Technology (ICT) in KE	ICTex	“First PC of Internet, Mobile & Tel”	PCA
A3: Economic Incentive & Institutional Regime			
Financial Activity (Credit)	Pcrbof	“Private domestic credit from banks and other financial institutions”	World Bank (FDSD)
Interest Rate Spreads	IRS	“Lending rate minus deposit rate (%)”	World Bank (WDI)
Economic Incentive in KE	Creditex	“First PC of Pcrbof and IRS”	PCA
Corruption-Control	CC	“Control of Corruption (estimate): Captures perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as ‘capture’ of the state by elites and private interests”.	World Bank (WDI)
Rule of Law	RL	“Rule of Law (estimate): Captures perceptions of the extent to which agents have confidence in and abide by the rules of society and in particular the quality of contract enforcement, property rights, the police, the courts, as well as the likelihood of crime and violence”.	World Bank (WDI)
Regulation Quality	RQ	“Regulation Quality (estimate): Measured as the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development”.	World Bank (WDI)
Political Stability/ No violence	PS	“Political Stability/ No Violence (estimate): Measured as the perceptions of the likelihood that the government will be destabilized or overthrown by unconstitutional and violent means, including domestic violence and terrorism”.	World Bank (WDI)
Government Effectiveness	GE	“Government Effectiveness (estimate): Measures the quality of public services, the quality and degree of independence from political pressures of the civil service, the quality of policy formulation and implementation, and the credibility of	World Bank (WDI)

Voice & Accountability	VA	governments commitments to such policies”. “Voice and Accountability (estimate): Measures the extent to which a country’s citizens are able to participate in selecting their government and to enjoy freedom of expression, freedom of association, and a free media”.	World Bank (WDI)
Institutional Regime in KE	Instireg	First PC of CC, RL, RQ, PS, GE & VA	PCA
A4: Innovation			
Scientific & Technical Publications	STJA	“Number of Scientific & Technical Journal Articles”	World Bank (WDI)
Trademark Applications	Trademark	“Total Trademark Applications”	World Bank (WDI)
Patent Applications	Patent	“Total Residents + Nonresident Patent Applications”	World Bank (WDI)
Innovation in KE	Innovex	“First PC of Trademarks and Patents”	World Bank (WDI)

Panel B: Business Indicators

B1: Starting Business

Time to Start-up	Timestart	“Log of Time required to start a business (days)”	World Bank (WDI)
Cost of Start-up	Coststart	“Log of Cost of business start-up procedures (% of GNI per capita)”	World Bank (WDI)
New business density	Newbisden	“New business density (new registrations per 1,000 people ages 15-64)”	World Bank (WDI)
Newly registered businesses	Newbisreg	“Log of New businesses registered (number)”	World Bank (WDI)

B2: Doing Business

B2a: Trade

Cost of Export	Costexp.	“Log of Cost to export (US\$ per container)”	World Bank (WDI)
Trade Barriers	Tariff	“Tariff rate, applied, weighted mean, all products (%)”	World Bank (WDI)
Trade Openness	Trade	“Export plus Import of Commodities (% of GDP)”	World Bank (WDI)

B2b: Technology Exports

ICT Goods Exports	ICTgoods:	“ICT goods exports (% of total goods exports)”	World Bank (WDI)
ICT Service Exports	ICTser	“ICT service exports (% of service exports, BoP)”	World Bank (WDI)
High-Technology Exports	Hightecexp	“High-technology exports (% of manufactured exports)”	World Bank (WDI)

B2c: Property Rights

Contract Enforcement	Contentfor	“Log of Time required to enforce a contract (days)”	World Bank (WDI)
Registration of Property	Regprop	“Log of Time required to register property (days)” “Business extent of disclosure index (0=less disclosure to 10=more disclosure). It	World Bank (WDI)

Investor Protection	Bisdiclos	measures the extent to which investors are protected through disclosure of ownership information”	World Bank (WDI)
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B3: Closing Business

Insolvency Resolution	Insolv	“Time to resolve insolvency (years). The number of years from the filling of insolvency in court until the resolution of distressed assets”.	World Bank (WDI)
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Panel C: Control Variables

Government Expenditure	Gov. Exp.	“Government final consumption expenditure (% of GDP)”	World Bank (WDI)
Inflation	Infl.	“Consumer Price Index (annual %)”	World Bank (WDI)
Economic Prosperity	GDPg	“GDP Growth Rate (annual %)”	World Bank (WDI)
Financial Size	Dbacba	“Deposit bank assets on Total assets”	World Bank (WDI)
Financial Efficiency	BcBd	“Bank Credit on Bank Deposits”	World Bank (WDI)
Population Growth	Popg	“Population growth (% of GDP)”	World Bank (WDI)

“WDI: World Bank Development Indicators. GNI: Gross National Income. BoP: Balance of Payment. GDP: Gross Domestic Product. PC: Principal Component. PCA: Principal Component Analysis. Log: logarithm. Educatex is the first principal component of primary, secondary and tertiary school enrolments. ICTex: first principal component of mobile, telephone and internet subscriptions. Creditex: First PC of Private domestic credit and interest rate spread. P.C: Principal Component. 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. FDS: Financial Development and Structure Database”.

3. 2 Exploratory analysis

3.2.1 Principal component analysis (PCA)

Following Andres et al. (2014) and Amavilah et al. (2014), the KE dimensions are reduced by PCA to mitigate potential concerns of information redundancy among indicators of various components. Table 2 which is in line with Tchamyu (2014) shows that the first principal component (PC) of each KE dimension is enough to proxy of a given KE dynamic because it respects the Kaiser (1974) and Joliffe (2002) criterion for the selection of first PCs: an eigenvalue superior to one. For instance, *ICTex* which is the ICT index represents about 73% of common information in *internet*, *mobile* and *telephone*.

Table 2: 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			

“P.C: Principal Component. PSE: Primary School Enrolment. SSE: Secondary School Enrolment. TSE: Tertiary School Enrolment. PC: Principal Component. 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 principal component of private domestic credit and interest rate spread”.

3.2.2 Summary statistics and correlation analysis

The summary statistics of the variables presented in Table 3 has helped the exposition in a threefold manner. First, the variables are quite comparable. Second, there is a substantial degree of variation which implies that significant relationships should be expected. Third, given the low degrees of freedom in the *trademark and patent applications* variables, instead of *innovex* from Table 2 above, we use Scientific and Technical Journals Articles (STJA) as a proxy for innovation. This assumption is consistent with recent literature (Chavula, 2010; Tchamyou, 2014).

Table 3: Summary statistics and Presentation of Countries

		Panel A: Summary Statistics				
		Mean	S.D	Min	Max	Obs.
Knowledge Economy	Educatex (Education)	-0.075	1.329	-2.116	5.562	320
	ICTex (Information & Infrastructure)	0.008	1.480	-1.018	8.475	765
	Creditex (Economic Incentive)	-0.083	0.893	-4.889	2.041	383
	Instireg (Institutional Regime)	0.105	2.075	-5.399	5.233	598
	Scientific and Technical Journal Articles(log)	1.235	0.906	-1.000	3.464	717
	Trademarks(log)	6.973	1.567	0.000	10.463	276
	Patentes(log)	5.161	2.077	1.386	9.026	121
Starting Business	Time to Start-up (log)	3.624	0.812	1.098	5.556	386
	Cost of Start-up (log)	4.354	1.312	0.741	8.760	386
	New business density	1.032	1.962	0.002	10.085	111
	Newly registered businesses (log)	7.965	1.878	2.639	11.084	111
	Cost of Export (log)	7.282	0.517	6.137	8.683	305
	Trade Barriers (Tariff)	11.474	5.611	0.000	39.010	347
	Trade Openness (log)	4.239	0.476	2.882	5.617	719

Doing Business	ICT Goods Exports	0.788	1.979	0.000	20.944	391
	ICT Service Exports	6.098	5.792	0.017	45.265	277
	High-Technology Exports	4.640	7.192	0.000	83.640	455
	Contract Enforcement (log)	6.434	0.383	5.438	7.447	383
	Registration of Property (log)	4.175	0.756	2.197	5.983	346
	Investor Protection: Disclosure	4.774	1.976	0.000	8.000	293
Closing Business	Insolvency Resolution	3.337	1.452	1.300	8.000	330
Control variables	Inflation	57.556	955.55	-100.00	24411	673
	Government Expenditure	4.392	12.908	-57.815	90.544	468
	Economic Prosperity	4.763	7.293	-31.300	106.28	759
	Financial Size	0.70273	0.25169	0.017332	1.6093	693
	Financial Efficiency	0.75523	0.42385	0.13754	2.6066	567
	Population Growth	2.3565	1.0059	-1.0811	10.043	795

Panel B: Presentation of Countries (53)

Algeria, Angola, Benin, Botswana, Burkina Faso, Burundi, Cameroon, Cape Verde, Chad, Central African Republic, Comoros, Congo Democratic Republic, Congo Republic, Côte d'Ivoire, Djibouti, Egypt, Equatorial Guinea, Eritrea, Ethiopia, Gabon, The Gambia, Ghana, Guinea, Guinea-Bissau, Kenya, Lesotho, Liberia, Libya, Madagascar, Malawi, Mali, Mauritania, Mauritius, Morocco, Mozambique, Namibia, Niger, Nigeria, Senegal, Sierra Leone, Somalia, Sudan, Rwanda, Sao Tomé & Príncipe, Seychelles, South Africa, Swaziland, Tanzania, Togo, Tunisia, Uganda, Zambia, Zimbabwe.

S.D: Standard Deviation. Min: Minimum. Max: Maximum. Obs: Observations

The objective of the correlation matrix in Table 4 is to mitigate issues of multicollinearity and over-parameterization. Based on the analysis, the issues are not of serious nature to bias estimated results.

Table 4: Correlation Matrix

Knowledge Economy (KE)					Business Indicators														Control Variables							
Educ atex	IC Tex	Cred itex	Insti reg	STJ A	Starting Business				Doing Business						Closing Business	Infl- ation	Gov. Exp.	GDP g	Fin. Eff.	Fin. Size	Pop. g.					
					Time Start	Cost Start	Bis den	Bis num	Trade			Technology Exports										Property Rights				
									Cexp	Tariff	T.O	ICTg	ICTs	HT	C.En	P.R	BDis	Insolv.								
1.00	0.69	-0.54	0.44	0.36	-0.20	-0.74	0.47	0.65	-0.46	0.09	0.36	0.32	-0.42	-0.07	0.05	0.09	-0.34	-0.54	-0.089	0.04	0.003	-0.04	0.39	-0.50	Edctex	
	1.00	-0.55	0.44	0.20	-0.26	-0.61	0.63	0.54	-0.42	-0.09	0.34	0.26	-0.15	-0.006	0.03	-0.15	0.04	-0.30	0.002	-0.02	-0.05	0.07	0.39	-0.44	ICTex	
		1.00	-0.61	-0.48	0.25	0.59	-0.30	-0.52	0.35	0.19	0.032	-0.18	0.13	-0.01	0.03	0.27	-0.38	0.32	0.15	0.04	0.13	-0.63	-0.44	0.36	Credtx	
			1.00	0.31	-0.25	-0.69	0.61	0.48	-0.36	-0.15	0.20	0.25	-0.27	-0.10	-0.03	-0.06	0.03	-0.37	-0.09	0.05	0.03	0.24	0.51	-0.30	Instireg	
				1.00	-0.37	-0.47	-0.22	0.68	-0.11	-0.10	-0.25	0.08	-0.18	-0.08	-0.07	-0.07	0.25	-0.46	0.01	0.09	-0.13	0.26	0.27	-0.17	STJA	
					1.00	0.39	-0.09	-0.09	0.12	0.08	0.27	-0.12	0.02	0.02	0.22	-0.03	-0.03	0.31	0.07	-0.03	-0.03	-0.21	-0.08	0.00	T.Start	
						1.00	-0.50	-0.64	0.24	0.26	-0.16	-0.26	0.44	0.07	0.03	0.31	-0.05	0.45	0.10	-0.10	0.04	-0.24	-0.48	0.49	C.Start	
							1.00	0.25	-0.29	-0.34	0.56	0.49	-0.28	0.21	0.33	0.03	0.15	-0.16	-0.11	-0.05	-0.22	0.05	0.25	-0.54	Bis den	
								1.00	-0.44	-0.23	0.25	0.29	-0.64	-0.24	0.10	-0.18	0.007	-0.52	0.09	0.04	0.02	0.23	0.34	-0.61	Bis.N	
									1.00	-0.08	-0.17	-0.19	0.15	0.15	-0.12	-0.15	0.002	0.15	0.03	0.14	-0.004	-0.06	-0.29	0.25	Cexp	
										1.00	0.09	0.03	0.03	-0.02	0.17	0.05	-0.15	0.20	0.02	-0.09	-0.03	-0.15	-0.19	-0.19	Tariff	
											1.00	0.21	-0.09	-0.02	0.20	-0.06	-0.03	0.001	0.03	-0.05	0.09	-0.13	0.24	-0.26	T.O	
												1.00	-0.002	0.13	-0.03	0.16	-0.13	-0.30	-0.01	-0.008	0.05	0.01	0.17	-0.25	ICTg	
													1.00	0.21	-0.05	0.05	-0.02	0.34	-0.09	-0.03	-0.15	-0.06	-0.22	0.38	ICTs	
														1.00	-0.04	0.14	-0.05	0.11	-0.14	-0.04	0.05	0.08	0.01	0.08	HT	
															1.00	0.05	0.04	0.17	-0.07	-0.04	0.04	-0.15	0.06	-0.04	C.En	
																1.00	0.02	0.08	-0.06	-0.06	0.09	-0.17	-0.02	0.21	P.R	
																	1.00	0.09	0.10	-0.09	-0.20	0.21	0.02	-0.07	BDis	
																		1.00	0.001	-0.09	0.07	-0.09	-0.16	0.29	Insolv.	
																			1.00	-0.13	-0.06	-0.07	-0.05	-0.10	Infl.	
																				1.00	0.10	-0.01	0.07	0.01	Gov.E.	
																					1.00	-0.07	-0.07	0.34	GDPg	
																						1.00	0.26	-0.07	Fin.Eff	
																							1.00	0.26	-0.07	Fin.Siz
																								1.00	0.26	Pop.g

Educatex: Education. ICTex: Information & Communication Technology. Creditex: Economic Incentives. Instireg: Institutional Regime. STJA: Scientific & Technical Journal Articles. Time Start: Time to Start a Business. Cost Start: Cost of Starting a Business. Bisdens: Business density. Bisnum: Business number. Cexp: Cost of exports. Tariff: Trade Barriers. T.O: Trade Openness. ICTg: ICT goods exports. ICTs: ICT service exports. HT: High-tech exports. C. En: Contract Enforcement. P.R: Property Registration Time. Dis: Business Extent Disclosure. Insolv: Insolvency. Gov. Exp: Government Expenditure. GDPg: Gross Domestic Product growth rate. Fin. Eff.: Financial Efficiency. Fin. Size: Financial Size. Pop.g: Population Growth.

3.3 Estimation technique

Consistent with Tchamyou (2014), the estimation approach controls for potential endogeneity between KE and entrepreneurship. It follows the Ivashina (2009, p. 301) approach of regressing the entrepreneurship variables on their first lags and using the saved fitted values as loadings for main equation regressions at the second-stage. The following stages embody the following estimation process.

First-stage regression:

$$E_{it} = \gamma_0 + \gamma_1(\text{Instruments})_{it} + \gamma_j X_{it} + \nu_{it} \quad (1)$$

Second-stage regression:

$$KE_{it} = \beta_0 + \beta_1(\text{StartBis})_{it} + \beta_2(\text{DoingBis})_{it} + \beta_3(\text{EndingBis})_{it} + \beta_j X_{it} + \xi_t + \mu_{it} \quad (2)$$

Where *KE* denotes: institutional regime (*Instireg*), ICTs (*ICTex*), innovation (*STJA*), education (*Educatex*) and economic incentives (*Creditex*). *E* represents entrepreneurship indicators, notably: *starting business*, *doing business* and *closing business*, defined in Table 1. The first lags of the entrepreneurship variables are used as *Instruments*. *X* in the two equations denotes the control variables: *population growth*, *inflation*, *government expenditure*, *financial size*, *financial efficiency* and *economic prosperity*. While ξ_t and μ_{it} respectively represent the time-specific constant and error terms in Eq. (2), ν_{it} denotes the error term in Eq. (1).

The estimation technique consists of regressing the entrepreneurship variables separately on their first lags using robust Heteroscedasticity and Autocorrelation Consistent (HAC) standard errors and then saving the fitted or instrumented values. These instrumented entrepreneurship indicators are then used in the second-stage HAC standard errors regressions.

4. Empirical results

4.1 Presentation of results

The empirical results presented in Table 5 below summarise the findings of Table 6 (Education), Table 7 (ICT), Table 8 (Economic incentives), Table 9 (institutional regime) and Table 10 (Innovation). The following are note-worthy with regards to the summarised results. First on starting business, the following findings have been established. (1) The time to start a business: (a) increases educational enrolment; (b) augments economic incentives in terms of private domestic credit and (c) decreases possibilities of innovation. (2) Depending on dynamics, the cost of starting business may have ‘ex-ante negative’ and ‘ex-post positive’ effects. (3) But for two negative expected signs in business number (for institutional regime) and business density (for innovation), the signs of the last-two starting business indicators are in line with economic theory.

Second, with regards to doing business the following are apparent. (1) Cost of export and Tariffs for the most part negatively affect the KE dimensions (but for the effect of Tariffs on Creditex and STJA). The effects of trade openness which are consistently positive show that trade restrictions are an impediment to KE, with the exception of innovation captured by STJA. Hence, the signs of the first-two trade variables (cost of export and tariffs) are supported by the third (trade openness). (2) The effects of technology exports run counter to the effect of trade for the most part. (3) The effects of property rights institutions which are not very apparent do not motivate us to draw comparative conclusions.

Third, the effects of the time needed to resolve insolvency (ending business) do not broadly encourage the building of knowledge-based economies, but for the positive role it has on requiring more private credit from domestic banks.

Most of the control variables are significant with the expected signs. Government expenditure and financial size potentially have positive educational externalities. Inflation decreases private domestic credit and the unexpected effect of financial dynamics of size and efficiency on economic incentives could be traceable to surplus-liquidity issues in African banks (Saxegaard, 2006). Economic prosperity and government expenditure potentially have positive effects in improving institutional regime and stimulating innovation by means of STJA. The consistent negative effect of population growth could be explained by the fact that, quantity of population decreases quality in human resources (Asongu, 2013) and hence, a negative externality on KE.

Table 5: Summary of the results

Entrepreneurship dimensions		Variables	KE Dimensions (Indexes)				
			Education	ICT	Economic Incentives	Institutional regime	Innovation
			Educatex	ICTex	Creditex	Instireg	STJA
Starting Business		Time Start	+	- ^o	+	- ^o	-
		Cost Start	-	+	-	+	+
		Bis. Den.	+	+	- ^o	+	-
		Bis. Num.	+	+	+	-	+
Doing Business	Trade	Cost Exp.	-	-	-	+ ^o	- ^o
		Tariff	-	-	+	-	+
		T.O	+	+	+	+	-
	Technology Exports	ICT goods	+ ^o	- ^o	-	+	+ ^o
		ICT ser.	+	-	n.a	-	+
		HT	-	-	n.a	-	+ ^o
	Property Rights	C.En	- ^o	n.a.	n.a	- ^o	-
		P.R	n.a.	n.a.	n.a	-	+
Bus. Dis		n.a.	n.a.	n.a	n.a.	+	
Closing Business		Insolv.	-	-	+	-	-

^oEducatex: Education. ICTex: Information & Communication Technology. Creditex: Economic Incentives. Instireg: Institutional Regime. STJA: Scientific & Technical Journal Articles. Time Start: Time to Start a Business. Cost Start: Cost of Starting a Business. Bisen: Business density. Bisnum: Business number. Cexp: Cost of exports. Tariff: Trade Barriers. T.O: Trade Openness. ICTg: ICT goods exports. ICTs: ICT service exports. HT: High-tech exports. C. En: Contract Enforcement time. P.R: Property Registration time. Dis: Business Extent Disclosure. Insolv: Insolvency". +: significantly positive. -: significantly negative. -^o: not significantly negative. +^o: not significantly positive. na: not applicable. +^o: sign cannot be determined.

Table 6: Educatex (HAC Instrumental variable panel fixed effects)

		Education (Educatex)					
Starting Business		Constant	-3.642** (0.0241)	1.883 (0.533)	0.070 (0.963)	-4.076 (0.179)	4.80*** (0.002)
		Time Start(log)	0.199** (0.0418)	---	---	0.216** (0.041)	-0.091 (0.233)
		Cost Start (log)	-0.0045 (0.975)	---	---	-0.84*** (0.000)	-0.67*** (0.001)
		Bis. Den.	0.143*** (0.000)	---	---	-0.066 (0.364)	0.018 (0.721)
		Bis. Num.(log)	0.828*** (0.000)	---	---	0.137** (0.019)	-0.32*** (0.000)
Doing Business	Trade	Cost Exp.(log)	---	-0.90*** (0.000)	---	-0.117 (0.616)	0.100 (0.357)
		Tariff	---	-0.28*** (0.000)	---	-0.016 (0.541)	0.013 (0.557)
		T.O (log)	---	1.9*** (0.003)	---	1.76*** (0.000)	0.68*** (0.004)
	Technology Exports	ICT goods	---	0.037* (0.080)	---	-0.09*** (0.000)	---
		ICT ser.	---	0.07*** (0.000)	---	---	---
		HT	---	-0.03*** (0.000)	---	---	---
	Property Rights	C.En (log)	---	-0.162 (0.512)	---	---	---
		P.R (log)	---	---	---	---	---

	Bus. Dis	---	---	---	---	---
Closing Business	Insolv.			-0.130 (0.430)		-1.01*** (0.000)
	Inflation	---	---	0.010 (0.648)	---	---
Control variables	Gov.E.	0.003** (0.036)	---	-0.003 (0.480)	---	---
	GDPg	-0.05*** (0.001)	0.014 (0.701)	-0.023 (0.273)	---	---
	Fin.Eff	-0.761 (0.268)	---	-0.008 (0.985)	---	---
	Fin.Siz	1.148*** (0.000)	---	2.97*** (0.006)	---	---
	Pop.g	-1.57*** (0.000)	---	-0.75** (0.015)	---	---
Information criteria	Time effects	No	No	No	No	No
	Adjusted R ²	0.983	0.886	0.907	0.930	0.958
	Fisher	124.4***	14.61***	38.4***	26.93***	45.83***
	Observations	39	34	70	34	34
	Countries	10	12	12	10	10

*,**,***: significance levels of 10%, 5% and 1% respectively. Gov. Exp: Government Expenditure. GDPg: GDP growth. Fin. Eff.: Financial Efficiency. Fin. Size: Financial Size. Pop.g: Population Growth. HAC: Heteroscedasticity & Autocorrelation Consistent. Log: logarithm.

Table 7: ICTex (HAC Instrumental variable panel fixed effects)

		ICT (ICTex)					
Starting Business	Constant	-6.017 (0.205)	61.5*** (0.000)	1.448* (0.056)	-19.94* (0.068)	19.57 (0.612)	
	Time Start(log)	-0.264 (0.260)	---	---	0.072 (0.832)	-0.366 (0.123)	
	Cost Start (log)	-0.751 0.137	---	---	0.008 (0.942)	0.67** (0.026)	
	Bis. Den.	0.212** (0.036)	---	---	-0.065 (0.180)	-0.119 (0.235)	
	Bis. Num.(log)	1.05*** (0.007)	---	---	1.25*** (0.002)	0.90** (0.044)	
Doing Business	Cost Exp.(log)	---	-2.28** (0.026)	---	0.725 (0.655)	0.342 (0.726)	
	Trade	Tariff	---	-0.050 (0.483)	---	-0.33*** (0.000)	-0.46*** (0.000)
		T.O(log)	---	2.09** (0.016)	---	1.635 (0.128)	-1.037 (0.322)
		ICT goods	---	0.108 (0.405)	---	-0.078 (0.135)	-0.017 (0.698)
	Technology Exports	ICT ser.	---	-0.234* (0.059)	---	---	---
		HT	---	-0.028 (0.143)	---	-0.011 (0.553)	-0.031* (0.066)
	Property Rights	C.En(log)	---	-7.5*** (0.000)	---	---	---
	P.R(log)	---	-0.8*** (0.000)	---	---	---	

	Bus. Dis	---	0.027 (0.930)	---	---	---
Closing Business	Insolv.			-0.83*** (0.000)		-6.953 (0.627)
	Inflation	0.005 (0.788)	0.05** (0.048)	0.04*** (0.003)	-0.038 (0.141)	0.009 (0.498)
Control variables	Gov.E.	0.005 (0.496)	-0.03** (0.018)	-0.0001 (0.979)	-0.006* (0.098)	-0.0002 (0.935)
	GDPg	-0.040 (0.120)	-0.054 (0.473)	-0.009 (0.636)	---	---
	Fin.Eff	1.133 (0.555)	-0.704 (0.654)	0.322 (0.245)	0.514 (0.845)	---
	Fin.Siz	1.042 (0.294)	2.85* (0.096)	3.62*** (0.000)	1.65*** (0.001)	---
	Pop.g	-0.141 (0.837)	---	-0.73*** (0.000)	---	---
	Information criteria	Time effects	No	No	Yes	No
	Adjusted R ²	0.870	0.808	0.761	0.911	0.933
	Fisher	23.48***	10.3***	7.31***	19.25***	26.29***
	Observations	71	56	143	40	39
	Countries	12	12	14	10	10

*, **, ***: significance levels of 10%, 5% and 1% respectively. Gov. Exp: Government Expenditure. GDPg: GDP growth. Fin. Eff.: Financial Efficiency. Fin. Size: Financial Size. Pop.g: Population Growth. HAC: Heteroscedasticity & Autocorrelation Consistent. Log: logarithm.

Table 8: Creditex (HAC Instrumental variable panel fixed effects)

		Economic Incentives (Creditex)				
Starting Business	Constant	-1.135 (0.453)	-6.740 (0.391)	-0.574 (0.219)	-0.989 (0.552)	-11.4*** (0.006)
	Time Start(log)	0.234* (0.082)	---	---	0.0681 (0.723)	-0.008 (0.969)
	Cost Start (log)	-0.313** (0.043)	---	---	0.0515 (0.794)	0.066 (0.682)
	Bis. Den.	0.013 (0.595)	---	---	-0.0974 (0.234)	-0.069 (0.385)
	Bis. Num.(log)	0.249* (0.059)	---	---	-0.185 (0.197)	0.227 (0.383)
		Cost Exp.(log)	---	-0.060 (0.930)	---	-0.230* (0.073)
Trade	Tariff	---	0.014 (0.830)	---	0.048** (0.029)	0.033** (0.045)
	T.O(log)	---	-0.791 (0.230)	---	0.719 (0.343)	1.206** (0.030)
	ICT goods	---	-0.036 (0.274)	---	-0.05*** (0.005)	---
Doing Business	Technology Exports	---	0.012 (0.763)	---	---	---
	HT	---	0.010 (0.417)	---	---	---
	C.En(log)	---	2.046* (0.058)	---	---	---
	Property Rights	---	-0.310	---	---	---

	Bus. Dis	---	(0.244)	---	---	---
			-0.4***			
			(0.000)			
Closing Business	InsoLv.			0.43***		2.95**
				(0.003)		(0.019)
Control variables	Inflation	-0.017**	---	0.008	0.0030	---
		(0.048)		(0.228)	(0.692)	
	Gov.E.	0.005*	---	-0.0002	---	---
		(0.074)		(0.935)		
	GDPg	0.018*	---	-0.02**	---	---
		(0.067)		(0.047)		
	Fin.Eff	-3.36***	---	-0.63**	---	---
		(0.001)		(0.019)		
	Fin.Siz	-0.618**	---	-0.80***	---	---
		(0.050)		(0.005)		
	Pop.g	0.83***	---	-0.075	---	---
		(0.001)		(0.795)		
Information criteria	Time effects	No	No	Yes	No	No
	Adjusted R ²	0.984	0.950	0.887	0.952	0.967
	Fisher	162.03***	44.1***	12.5***	45.9***	70.7***
	Observations	50	44	102	44	43
	Countries	10	11	12	11	11

*, **, ***: significance levels of 10%, 5% and 1% respectively. Gov. Exp: Government Expenditure. GDPg: GDP growth. Fin. Eff.: Financial Efficiency. Fin. Size: Financial Size. Pop.g: Population Growth. HAC: Heteroscedasticity & Autocorrelation Consistent. Log: logarithm.

Table 9: Instireg (HAC Instrumental variable panel fixed effects)

		Institutional regime (Instireg)				
Starting Business	Constant	4.704*	-5.378	-1.067	21.33**	-16.25
		(0.050)	(0.362)	(0.291)	(0.041)	(0.372)
	Time Start(log)	-0.014			0.111	-0.067
		(0.928)			(0.231)	(0.645)
	Cost Start (log)	0.386***			0.151	0.426*
	(0.003)			(0.249)	(0.076)	
	Bis. Den.	0.325***			0.36***	0.281
		(0.000)			(0.000)	(0.022)**
	Bis. Num.(log)	-0.088			-0.397**	-0.168
		(0.682)			(0.024)	(0.425)
Doing Business	Cost Exp.(log)	---	0.750	---	0.116	-0.041
			(0.400)		(0.411)	(0.948)
	Trade	---	-0.1***	---	-0.041	-0.056
			(0.002)		(0.303)	(0.232)
	T.O(log)	---	2.32***	---	0.320	-0.438
			(0.000)		(0.353)	(0.525)
	ICT goods	---	0.162*	---	0.035	0.088**
			(0.084)		(0.192)	(0.013)
Technology Exports	---	-0.2***	---	---	---	
		(0.008)				
	HT	---	-0.03**	---	---	-0.05***
			(0.022)			(0.008)
Property Rights	C.En(log)	---	-0.675	---	-1.964	4.284
			(0.489)		(0.231)	(0.145)
	P.R(log)	---	-0.7***	---	---	-0.49***

	Bus. Dis	---	(0.001) 0.175 (0.586)	---	---	(0.008) -0.129 (0.511)
Closing Business	InsoLv.			-0.84*** (0.000)		-1.69*** (0.002)
	Inflation	0.009 (0.475)	0.015 (0.387)	0.054** (0.023)	0.001 (0.924)	0.005 (0.802)
Control variables	Gov.E.	-0.001 (0.685)	-0.009* (0.065)	-0.010* (0.099)	0.006** (0.019)	---
	GDPg	0.043*** (0.002)	0.016 (0.742)	0.029 (0.106)	---	0.096*** (0.007)
	Fin.Eff	-1.202* (0.069)	2.382 (0.193)	3.35*** (0.000)	-2.08** (0.013)	---
	Fin.Siz	-0.085 (0.905)	-1.274 (0.162)	2.58*** (0.003)	-1.52*** (0.001)	---
	Pop.g	-1.76*** (0.000)	---	0.422* (0.084)	-2.02*** (0.000)	---
Information criteria	Time effects	No	No	Yes	No	No
	Adjusted R ²	0.950	0.902	0.796	0.971	0.961
	Fisher	64.49***	21.39***	8.69***	65.40***	46.41***
	Observations	71	56	143	49	47
	Countries	12	12	14	12	11

*, **, ***: significance levels of 10%, 5% and 1% respectively. Gov. Exp: Government Expenditure. GDPg: GDP growth. Fin. Eff.: Financial Efficiency. Fin. Size: Financial Size. Pop.g: Population Growth. HAC: Heteroscedasticity & Autocorrelation Consistent. Log: logarithm.

Table 10: STJA (HAC Instrumental variable panel fixed effects)

		Innovation (logSTJA)					
Starting Business	Constant	0.935** (0.029)	11.006*** (0.000)	1.95*** (0.000)	2.264*** (0.000)	3.604*** (0.000)	
	Time Start(log)	-0.110 (0.269)	---	---	-0.085* (0.074)	-0.020 (0.660)	
	Cost Start (log)	0.155 (0.140)	---	---	0.110*** (0.007)	0.040 (0.331)	
	Bis. Den.	-0.17*** (0.000)	---	---	-0.131*** (0.000)	-0.11*** (0.000)	
	Bis. Num.(log)	0.26*** (0.000)	---	---	0.098*** (0.007)	0.180*** (0.001)	
Doing Business	Trade	Cost Exp.(log)	---	-0.038 (0.897)	---	-0.001 (0.991)	0.068 (0.313)
		Tariff	---	0.015 (0.259)	---	0.018** (0.026)	0.018* (0.058)
		T.O(log)	---	-0.493*** (0.000)	---	-0.330** (0.024)	-0.291* (0.063)
		ICT goods	---	-0.018 (0.154)	---	0.010 (0.246)	0.0009 (0.934)
	Technology	ICT ser.	---	0.05*** (0.000)	---	---	---
	Exports	HT	---	0.002 (0.491)	---	---	---
	Property Rights	C.En(log)	---	-1.44*** (0.000)	---	---	---
	P.R(log)	---	0.17**	---	---	---	

	Bus. Dis	---	(0.039) 0.43*** (0.000)	---	---	---
Closing Business	Insolv.			-0.3*** (0.000)		-1.01*** (0.001)
	Inflation	0.010 (0.100)	-0.0001 (0.960)	0.024** (0.018)	0.016*** (0.000)	0.011** (0.043)
Control variables	Gov.E.	-0.0005 (0.743)	0.005*** (0.000)	0.001 (0.357)	0.0007 (0.451)	0.001*** (0.003)
	GDPg	0.002 (0.795)	0.025 (0.132)	0.023** (0.019)	0.025*** (0.000)	0.015* (0.065)
	Fin.Eff	-0.142 (0.562)	-0.950 (0.113)	0.618*** (0.005)	0.762*** (0.006)	0.394 (0.146)
	Fin.Siz	0.204 (0.340)	---	-0.219 (0.333)	0.154 (0.150)	---
	Pop.g	-0.53*** (0.000)	---	-0.29*** (0.008)	-0.303* (0.097)	---
Information criteria	Time effects	No	No	Yes	No	No
	Adjusted R ²	0.958	0.948	0.822	0.979	0.983
	Fisher	77.91***	43.96***	10.14***	93.06***	115.49***
	Observations	71	57	143	49	48
	Countries	12	12	14	12	12

*, **, ***: significance levels of 10%, 5% and 1% respectively. Gov. Exp: Government Expenditure. GDPg: GDP growth. Fin. Eff.: Financial Efficiency. Fin. Size: Financial Size. Pop.g: Population Growth. HAC: Heteroscedasticity & Autocorrelation Consistent. Log: logarithm.

4.2 Further discussion and implications

We devote some space to further engaging the results in light of stylized facts and existing literature. First, we have established that increasing the time of starting a business has a positive effect on educational enrolment. Accordingly, the positive effect may be traceable to the education being perceived as an easier alternative to getting a job. This is the case in most African countries where educational enrolments are substantially high while corresponding entrepreneurship initiatives are low (Tvedten et al., 2014). Accordingly, most students engage in formal education as a means of travelling abroad upon graduation and contributing to African development by means of remittances (Ngoma & Ismail, 2013; Osabuohien & Efobi, 2013; Ssozi & Asongu, 2015a) or being recruited by the public sector instead of engaging in entrepreneurship activities. The latter perspective is consistent with an interesting literature on youth employment by Baah-Boateng (2013, 2015).

Second, we have also seen that increasing the time of starting a business has a positive effect on economic incentives in term of private domestic credit. It should be noted that economic incentives are measured in this study with private domestic credit. Hence, the finding is consistent with economic theory because an extension of the time to start a business is inherently an additional cost to the doing of business. When this inference is reflected in the light of the cost of bureaucracy in many African countries, it is logical that potential entrepreneurs should recourse for more financial resources if their files are delayed and/or go through more public administration offices. This interpretation aligns with evidence that applications/files in public offices often have to be pushed from one step to another by means of bribery and corruption (Kiggundu, 2002).

Third, we have also observed that augmenting the time of starting a business has a negative effect on innovation. This nexus is consistent with the predictions of economic theory. In essence, the most innovative countries in Africa (e.g Rwanda and Mauritius) are associated with the lowest time to start a business (World Bank, 2014).

Fourth, interestingly, we have also broadly established that, but for a few exceptions, an increase in the number of businesses has a positive effect on KE dimensions. This relationship is consistent with the stylized facts engaged in Section 2, notably: (i) Suh and Chen (2007) on global trends; (ii) Tchamyu (2014) and Asongu (2015a) in the African literature; (ii) Kim (1997) and Kim and Kim (2014) on the theoretical positions of South Korea's economic miracle and (iv) Asongu (2015b) on catch-up between South Korea and Africa.

Fifth, our findings broadly show that the doing of business is positively linked to the development of knowledge-based economies in Africa. Accordingly, while the effects of openness in trade are consistent with the signs of negative signals like ‘cost of exports’ and tariffs for the most part, align with those of positive signals. The positive relationship between doing business and the growth of knowledge based societies is consistent with the bulk of literature engaged in the theoretical highlights, namely: Kim (1997); Bruton and Ahlstrom (2003, 2006); Suh and Chen (2007); Bruton et al. (2008, 2010); Tchamyou (2014); Kim and Kim (2014) and Asongu (2015ab). On a practical front, the findings point to the positive nexus between globalisation (especially trade openness) in the drive towards KE.

Accordingly, societies that are more open are very likely to be rewarded with higher levels of KE. Other examples beside South Korea discussed above include: Thailand and Singapore (see Kim, 1997). As a policy implication, whereas openness may engender potential KE rewards, African governments should be cautious of the fact that, openness *per se* is not necessarily good when absorptive capacities are not available for reverse engineering. This line of inference is consistent with Ssozi and Asongu (2015b) on the African comparative economics of catch-up in SSA.

Sixth, we have seen that the effects of technology exports run counter to the impacts of trade for the most part. This may indicate a lack of competitiveness in the trade of ICT and High-tech commodities by African countries or the need to specialise more in KE-oriented agricultural products. While African economies’ have an agricultural inclination, there are growing calls for policy makers in Africa to catch-up with global value chains by contributing to the production of what the continent consumes. For instance, whereas the continent is the witnessing comparatively higher mobile phone penetration rates (Asongu, 2013d, 2015c), there are growing calls for governments in the continent to tailor policies towards contributing more to this value chain (Asongu & Ssozi, 2015).

Seventh, the fact that the impacts of property rights institutions are not very apparent may be an indication that policy makers on the continent need to improve property right laws so that they should be more conducive for the development of knowledge-based societies. Accordingly, the positive effect on innovation may also imply that these rights are more skewed towards encouraging contributions to knowledge by means of scientific and technical journal publications, as opposed to mainstream entrepreneurial activities.

Eighth, we have noted that the impact of the time needed to resolve insolvency (or ending business) does not broadly encourage the building of knowledge-based economies. This finding is in accordance with intuition in the perspective that societies with swift

procedures of filing for bankruptcy and ending a business are traditionally associated with comparatively higher levels of KE (e.g the USA).

Ninth, as concerns the poverty implications of the study, the broadly positive nexus between entrepreneurship and KE is quite appealing given that both KE (Tchamyou, 2014; Asongu, 2015ab) and entrepreneurship (Bruton et al., 2015; Si et al., 2015; Alvarez et al., 2015 ; George et al., 2015; Autio & Fu, 2015; Im & Sun, 2015) have been documented to mitigate poverty.

5. Concluding remarks

While we have broadly found entrepreneurship to be playing an appealing role on KE, unexpected signs were also expected because Andrés et al. (2014) have established that the nexuses depends substantially on government policies and commitment to enforcing them. While their conclusions show that formal institutions are not a necessary condition for KE, good policies could change the tendency. This narrative is consistent with Oluwatobi et al. (2014) who have recently established that government effectiveness and regulation quality are the most important determinants of innovation in African countries. This recent literature has a twofold interest for our results: (1) there may be unexpected signs when government policy is not effective and; (2) improving on the formulation and implementation of mechanisms could change the dynamics of these results.

The findings also show for the most part that, creating an enabling environment for starting business and doing business by means of trade globalization substantially boosts KE. While the former is consistent with intuition, the latter which cautions on specializing in trade activities for which the country already has a competitive advantage (like commodities that are not high-tech and ICT related) may not be very positive for long-term development. But at the initial levels of development, policy favoring reverse-engineering accompanied by lowering of IPRs would benefit domestic economies. This line of interpretation is consistent with a recent finding by Asongu (2014) who has established that, lower IPRs in software products could boost scientific publications and hence prospects of innovation in Africa. Thus, our findings confirm the narrative that the technology in African countries at the moment may be more imitative and adaptive for reverse-engineering in ICTs and high-tech products. However, given the massive consumption of ICT and high-tech commodities in Africa, the continent has to start thinking of how to participate in the global value chain of producing what it consumes.

We have also seen that when the time required to resolving insolvency stretches substantially, it prolongs the time required for ending a business. This may be substantially affect the motivation of entrepreneurs in starting a new business, hence, negatively affect KE. Overall, the findings are broadly consistent with a growing body of African entrepreneurship literature on, *inter alia*: management studies (Gerba, 2012) or general education (Singh et al., 2011), entrepreneurial intentions (Gerba, 2012) and the appealing role of entrepreneurship in poverty mitigation by means of KE (Mensah & Benedict, 2010). Hence, investigating the interactions between entrepreneurship and KE in poverty mitigation is an interesting future research direction.

References

- African Development Bank (2007, December). "Growing a Knowledge Based Economy: Evidence from Public Expenditure on Education in Africa", *Economic Research Working Paper Series* No. 88.
- Alagidede, P., (2008). "African Stock Market Integration: Implications for Portfolio Diversification and International Risk Sharing", *Proceedings of the African Economic Conferences 2008*.
- Alvarez, S. A., Bamey, J. B., & Newman, A. M. B., (2015). "The poverty problem and the industrialization solution", *Asia Pacific Journal of Management*, 32(1), pp. 23-37.
- Amavilah, V. H. S., (2009). "Knowledge of African countries: production and value of doctoral dissertations", *Applied Economics*, 41 (8), pp. 977-989.
- Amavilah, V. S. H., Asongu, S. A., & Andrés, A., R., (2014). "Globalization, Peace & Stability, Governance and Knowledge Economy", *African Governance and Development Institute Working Paper* No. 14/12.
- Amendolagine, V., Boly, A., Coniglio, N. D., Prota, F., & Seric, A., (2013). "FDI and Local Linkages in Developing Countries: Evidence from Sub-Saharan Africa", *World Development*, 50, pp. 41-56.
- Andrés, A. R., & Asongu, S. A., (2013a). "Fighting software piracy: which governance tools matter in Africa?" *Journal of Business Ethics*: 118(3), pp. 667-682.
- Andrés, A. R., & Asongu, S. A., (2013b). "Global dynamic timelines for IPRs harmonization against software piracy", *Economics Bulletin*, 33(1), pp. 874-880.
- Andrés, A. R., & Asongu, S. A., (2016). "Global trajectories, dynamics, and tendencies of business software piracy: benchmarking IPRs harmonization", *Journal of Economic Studies*: Forthcoming.
- Andrés, A. R., Asongu, S. A., & Amavilah, V. H. S., (2014). "The Impact of Formal Institutions on Knowledge Economy", *Journal of the Knowledge Economy*: Forthcoming. <http://link.springer.com/article/10.1007%2Fs13132-013-0174-3> (accessed: 2/12/2013).
- Anyanwu, J., C., (2012a). "Why Does Foreign Direct Investment Go Where It Goes?: New Evidence From African Countries", *Annals of Economics and Finance*, 13(2), pp. 425-462.
- Anyanwu, J. C., (2012b). "Developing Knowledge for the Economic Advancement of Africa", *International Journal of Academic Research in Economics and Management Sciences*, 1(2), pp. 73-111.
- Anyanwu, J., (2007). "Promoting Investment in Africa", *African Development Review*, 18(1), pp. 42-71.
- Asiedu, E., (2002). "On the Determinants of Foreign Direct Investment to Developing Countries: Is Africa Different?", *World Development*, 30, pp. 107-119.

- Asiedu, E., (2006). “Foreign Direct Investment in Africa: The Role of Natural Resources, Market Size, Government Policy, Institutions and Political Instability”. *The World Economy*, 29, pp. 63–77.
- Asiedu, E., & Lien, D. (2011). “Democracy, foreign direct investment and natural resources”. *Journal of International Economics*, 84, pp. 99–111.
- Asongu, S. A., (2012). “Government quality determinants of stock market performance in African countries”, *Journal of African Business*, 13(2), pp. 183-199.
- Asongu, S. A., (2013a). “How would population growth affect investment in the future? Asymmetric panel causality evidence for Africa”, *African Development Review*, 25(1), pp. 14-29.
- Asongu, S. A., (2013b). “Harmonizing IPRs on Software Piracy: Empirics of Trajectories in Africa”, *Journal of Business Ethics*, 118 (1), pp. 45-60.
- Asongu, S. A., (2013c). “Modeling the future of Knowledge Economy: evidence from SSA and MENA countries”, *Economics Bulletin*, 33 (1), pp. 612-624
- Asongu, S. A., (2013d). “How has mobile phone penetration stimulated financial development in Africa?”, *Journal of African Business*, 14(1), pp. 7-18.
- Asongu, S. A., (2014). “Software piracy and scientific publications: knowledge economy evidence from Africa”, *African Development Review*, 26(4), pp. 572-583.
- Asongu, S. A., (2015a). “The Comparative Economics of Knowledge Economy in Africa: Policy Benchmarks, Syndromes and Implications”, *Journal of the Knowledge Economy*
<http://link.springer.com/article/10.1007/s13132-015-0273-4>
- Asongu, S. A., (2015b). “Knowledge Economy Gaps, Policy Syndromes and Catch-up Strategies: Fresh South Korea Lessons to Africa”, *Journal of the Knowledge Economy*
<http://link.springer.com/article/10.1007%2Fs13132-015-0321-0>
- Asongu, S. A., (2015c). “Conditional Determinants of Mobile Phone Penetration and Mobile Banking in Sub-Saharan Africa”, *Journal of the Knowledge Economy*
<http://link.springer.com/article/10.1007%2Fs13132-015-0322-z>
- Asongu, S. A., & De Moor, L., (2015a). “Financial globalisation and financial development in Africa: assessing marginal, threshold and net effects”, *African Governance and Development Institute Working Paper No. 15/040*, Yaoundé.
- Asongu, S. A., & De Moor, L., (2015b). “Financial globalisation dynamic thresholds for financial development: evidence from Africa”, *Revised and Resubmitted: European Journal of Development Research*.
- Asongu, S. A., & Ssozi, J., (2015). “Sino-African relations: some solutions and strategies to the policy syndromes”, *Journal of African Business*: 10.1080/15228916.2015.1089614

- Autio, E., & Fu, K., (2015). "Economic and political institutions and entry into formal and informal entrepreneurship", *Asia Pacific Journal of Management*, 32(1), pp. 67-94.
- Baah-Boateng, W., (2013). "Determinants of Unemployment in Ghana", *African Development Review*, 25(4), pp. 385-399
- Baah-Boateng, W., (2015). "Unemployment in Africa: How appropriate is the global definition and measurement for policy purpose", *International Journal of Manpower*, 36(5), pp. 650-667.
- Bardy, R., Drew, S., Kennedy, T. F., (2012). "Foreign Investment and Ethics: How to Contribute to Social Responsibility by Doing Business in Less-Developed Countries", *Journal of Business Ethics*, 106, pp. 267–282.
- Bartels, F. L., Alladina, S. N., & Lederer, S., (2009). "Foreign Direct Investment in Sub-Saharan Africa: Motivating Factors and Policy Issues", *Journal of African Business*, 10(2), 141-162.
- Bartels, F. L. Napolitano, F., & Tissi, N. E., (2014). "FDI in Sub-Saharan Africa: A longitudinal perspective on location-specific factors (2003–2010)", *International Business Review*: 23(3), pp. 516-529.
- Brixiova, Z., Ncube, M., & Bicaba, Z., (2015). "Skills and Youth Entrepreneurship in Africa: Analysis of with Evidence from Swaziland", *World Development*, 67, pp. 11-26.
- Bruton, G. D., & Ahlstrom, D., (2006). "Venture Capital in Emerging Economies: Networks and Institutional Change", *Entrepreneurship Theory and Practice*, 30(2), pp. 299-320.
- Bruton, G. D., & Ahlstrom, D., (2003). "An institutional view of China's venture capital industry: Explaining the differences between China and the West", *Journal of Business Venturing*, 18(2), pp. 233-259.
- Bruton, G. D., Ahlstrom, D., & Li, H-L, (2010). "Institutional Theory and Entrepreneurship: Where Are We Now and Where Do We Need to Move in the Future?", *Entrepreneurship Theory and Practice*, 34(3), pp. 421-440.
- Bruton, G. D., Ahlstrom, D. & Obloj, K., (2008). "Entrepreneurship in Emerging Economies: Where Are We Today and Where Should the Research Go in the Future", *Entrepreneurship Theory and Practice*, 31(1), pp. 1-14.
- Bruton, G. D., Ahlstrom, D., & Si, S., (2015). "Entrepreneurship, poverty, and Asia: Moving beyond subsistence entrepreneurship", *Asia Pacific Journal of Management*, 32(1), pp. 1-22.
- Butcher, N., (2011). *ICT in Africa. A Few Key Challenges*, in: ICT, Education, Development, and the Knowledge Society, Thematic Paper prepared for GeSCI African Leadership in ICT Program, December 2011, pp. 33-39.
- Carisle, S., Kunc, M., Jones, E., & Tiffin, S., (2013). "Supporting innovation for tourism development through multi-stakeholder approaches: Experiences from Africa", *Tourism Management*, 35, pp. 59-69.

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)*.

Cogburn, D., (2003). "Governing global information and communications policy: Emergent regime formation and the impact on Africa", *Telecommunications Policy*, 27, pp. 135-153.

De Maria, W., (2010). "Why is the president of Malawi angry? Towards an ethnography of corruption", *Culture and Organization*, 16(2), pp. 145-162.

Eifert, B., Gelb, A., & Ramachandran, V., (2008). "The Cost of Doing Business in Africa: Evidence from Enterprise Survey Data", *World Development*, 36(9), pp. 1531-1546.

Ernst & Young (2013). "Doing business in Africa: From strategy to execution", *Growing Beyond*

[http://www.ey.com/Publication/vwLUAssets/Doing_business_in_Africa -
From_strategy_to_execution/\\$FILE/130130%20SGF%20Thought%20Leadership%20email
%20version.pdf](http://www.ey.com/Publication/vwLUAssets/Doing_business_in_Africa_-_From_strategy_to_execution/$FILE/130130%20SGF%20Thought%20Leadership%20email%20version.pdf) (Accessed : 07/12/2013).

Ford, D. M., (2007). "Technologizing Africa: On the bumpy information highway", *Computers and Composition*, 24 (2007), pp. 302-316.

George, G., Rao-Nicholson, R., Corbishley, C., & Bansal, R., (2015). "Institutional entrepreneurship, governance, and poverty: Insights from emergency medical response services in India", *Asia Pacific Journal of Management*, 32(1), pp. 39-65.

Gerba, D. T. (2012). "Impact of entrepreneurship education on entrepreneurial intentions of business and engineering students in Ethiopia", *African Journal of Economic and Management Studies*, 3(2), pp. 258-277.

German, L., & Stroud, A., (2007). "A Framework for the integration of diverse learning approaches: Operationalizing agricultural research and development (R&D) linkages in Eastern Africa", *World Development*, 35(5), pp. 792-814.

Im, J., & Sun, S. L., (2015). "Profits and outreach to the poor: The institutional logics of microfinance institutions", *Asia Pacific Journal of Management*, 32(1), pp. 95-117.

Ivashina, V., (2009), "Asymmetric information effects on loan spreads", *Journal of Financial Economics*, 92, pp. 300-319.

Jolliffe, I. T., (2002). *Principal Component Analysis* (2nd Ed.), New York: Springer.

Kaiser, H.F., (1974). "An index of factorial simplicity". *Psychometrika*, 39, pp. 31-36.

Khavul, S., Bruton, J. D., & Wood, E., (2009). "Informal Family Business in Africa", *Entrepreneurship: Theory & Practice*, 33(6), pp. 1219-1238.

Kiggundu, M., N., (2002). "Entrepreneurs and entrepreneurship in Africa: What is known and what needs to be done", *Journal of Developmental Entrepreneurship*, 7(3), pp. 239-258.

Kim, E. M., (1997). *Big Business, Strong State: Collusion and Conflict in South Korean Development, 1960-1990*. State University of New York Press: New York.

Kim, E. M., and Kim, P. H., (2014). *The South Korean Development Experience: Beyond Aid*. Critical Studies of the Asia Pacific, Palgrave Macmillan.

Kinda, T., (2010). "Investment Climate and FDI in Developing Countries: Firm-Level Evidence", *World Development*, 38(4), pp. 498-513.

Kolstad, I., & Wiig, A., (2011). "Better the Devil You Know? Chinese Foreign Direct Investment in Africa", *Journal of African Business*, 12(2), 31-50.

Kuada, J., (2009). "Gender, Social Networks, and Entrepreneurship in Ghana", *Journal of African Business*, 10(1), pp. 85-103.

Kuada, J., (2011a), "Understanding growth options and challenges in African economies", *African Journal of Economic and Management Studies*, 2(1),

Kuada, J., (2011b), "Macroeconomic pressures and their implications for business development in Africa", *African Journal of Economic and Management Studies*, 2(2).

Leke, A., Lund, S., Roxburgh, C., & Van Wamelen, A., (2010). "What's driving Africa's growth", McKinsey & Company report.

http://www.mckinsey.com/insights/economic_studies/whats_driving_africas_growth
(Accessed: 31/03/2014).

Letiche, J. M., (2006). "Positive economic incentives. New behavioural economics and successful economic transitions", *Journal of Asian Economics*, 17, pp. 775-796.

Lin, B., (2006). "A sustainable perspective on the knowledge economy: A critique of Austrian and mainstream view", *Ecological Economics*, 60(1), pp. 324-332.

Lor, P. J., & Britz, J., (2005). "Knowledge Production from an African perspective: International information flows and intellectual property", *The International Information & Library review*, 37, pp. 61-76.

Lwoga, E. T., Ngulube, P., & Stilwell, C., (2010). "Managing indigenous knowledge for sustainable agricultural development in developing countries: Knowledge management approaches in the social context", *The International Information & Library Review*, 42(3), pp. 172-185.

Maswera, T., Dawson, R., & Edwards, J., (2008). "E-commerce adoption of travel and tourism organisations in South Africa, Kenya, Zimbabwe and Uganda", *Telematics and Informatics*, 25 (3), pp. 187-200.

Mensah, S. N., & Benedict, E., (2010). "Entrepreneurship training and poverty alleviation: Empowering the poor in the Eastern Free State of South Africa", *African Journal of Economic and Management Studies*, 1(2), pp. 138-163.

- Moodley, S., (2003). "The Challenge of e-business for the South African apparel sector", *Technovation*, 23, pp. 557-570.
- Myburgh, A. F., (2011). "Legal developments in the protection of plant-related traditional knowledge: An intellectual property lawyer's perspective of the international and South African legal framework", *South African Journal of Botany*, 77, pp. 844-849.
- Neimark, B. D., (2012). "Industrializing nature, knowledge, and labour: The political economy of bioprospecting in Madagascar", *Geoforum*, 43, pp. 980-990.
- Ngoma, A. L., & Ismail, N. W., (2013). "The Impact of Brain Drain on Human Capital in Developing Countries", *South African Journal of Economics*, 81(2), pp. 221-224.
- Oluwatobi, S., Efobi, U., Olurinola, I., & Alege, P., (2014). "Innovation in Africa: Why Institutions Matter?", *South African Journal of Economics*; <http://onlinelibrary.wiley.com/doi/10.1111/saje.12071/abstract> (Accessed: 15/11/2014).
- Osabuohien, E., & Efobi, U. (2013). "Africa's Money in Africa", *South African Journal of Economics*, 81(2), pp. 292-306.
- Oyelaran-Oyeyinka, B., & Gehl Sampath, P., (2007). "Innovation in African Development. Case Studies of Uganda, Tanzania and Kenya", A World Bank Study. <http://info.worldbank.org/etools/docs/library/239730/InnovationInAfricaFinalPaper.pdf> (Accessed: 28/03/2014).
- Paul, B., Bhorat, H., & Cheadle, H., (2010). "The cost of "doing business and labour regulation: The case of South Africa", *International Labour Review*, 149 (1), pp. 73-91.
- Preece, J., (2013). "Africa and international policy making for lifelong learning: textual revelations", *International Journal of Educational Development*, 33, pp. 98-105.
- Raseroka, K., (2008). "Information transformation Africa: Indigenous knowledge – Securing space in the knowledge society", *The International Information and Library Review*, 40, pp. 243-250.
- Rolfe, R. J., & Woodward, D. P., (2004). "Attracting foreign investment through privatization: the Zambian experience", *Journal of African Business*, 5(1), pp.5-27.
- Rooney, D., (2005). "Knowledge, economy, technology and society: The politics of discourse", *Telematics and Informatics*, 22, pp. 405-422.
- Rugimbana, R., (2010). "Business strategies for achieving sustainable development in Africa: Introduction to the special issue", *African Journal of Economic and Management Studies*, 1(2), pp. 121-127.
- Saxegaard, M., (2006). "Excess liquidity and effectiveness of monetary policy: evidence from sub-Saharan Africa", *IMF Working Paper* No. 06/115.
- Ssozi, J., & Asongu, S. A., (2015a). "The Effects of Remittances on Output per Worker in Sub-Saharan Africa: A Production Function Approach", *South African Journal of Economics*,

<http://onlinelibrary.wiley.com/doi/10.1111/saje.12100/abstract>

Ssozi, J., & Asongu, S. A., (2015b). “The Comparative Economics of Catch-Up in Output per worker, total factor productivity and technological gain in Sub-Saharan Africa”, *African Governance and Development Institute Working Paper No. 15/038*.

Si, S., Yu, X., Wu, A., Chen., S., Chen, S., & Su, Y., (2015). “Entrepreneurship and poverty reduction: A case study of Yiwu, China”, *Asia Pacific Journal of Management*, 32(1), pp. 119-143.

Singh, S., Simpson, R., Mordi, C., & Okafor, C., (2011). “Motivation to become an entrepreneur : a study of Nigerian women’s decisions”, *African Journal of Economic and Management Studies*, 2(2), pp. 202-219.

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).

Sumberg, J., (2005). “Systems of innovation theory and the changing architecture of agricultural research in Africa”, *Food Policy*, 30 (1), pp. 21-41.

Taplin, R., & Snyman, M., (2004). “Doing business in South Africa’s new mining environment: A legal perspective”, *CIM Bulletin*, 97.1078, pp. 91-98.

Tapsoba, S. J-A., (2010). “Trade Intensity and Business Cycle Synchronicity in Africa”, *African Development Review*, 22(1), pp. 149–172.

Tchamyou, S. V., (2014). “The role of Knowledge Economy in African Business”, HEC-Management School, University of Liege.

Tuomi, K., (2011). “The Role of the Investment Climate and Tax Incentives in the Foreign Direct Investment Decision: Evidence from South Africa”, *Journal of African Business*, 12(1), pp.133-147.

Tvedten, K., Hansen, M. W., & Jeppesen, S., (2014). “Understanding the rise of African business In search of business perspectives on African enterprise development”, *African Journal of Economic and Management Studies*, 5(3), pp. 249-268.

Wagiciengo, M. M., & Belal, A. R., (2012). “Intellectual capital disclosure by South African companies: A longitudinal investigation”, *Advances in Accounting*, 28 (1), pp. 111-119.

Wantchekon, L., Klasnja, M., & Novta, N., (2014). “Education and Human Capital Externalities: Evidence from Colonial Benin”, Department of Politics, Princeton University.

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

World Bank (2014). “Doing Business 2014:Understanding Regulations for Small and Medium-Size Enterprises”, World Bank Publication

<http://elibrary.worldbank.org/doi/book/10.1596/978-0-8213-9984-2>

Yin, J. Z., & Vaschetto, S., (2011). “China’s Business Engagement in Africa”, *The Chinese Economy*, 44 (2), pp. 43-57.

Zerbe, N., (2005). “Biodiversity, ownership, and indigenous knowledge: exploring legal frameworks for community, farmers, and intellectual property rights in Africa”, *Ecological Economics*, 53, pp. 493-506.