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6 December 2014

AFRICAN GOVERNANCE AND DEVELOPMENT INSTITUTE

A G D I Working Paper

WP/14/023

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AGDI Working Paper

Research Department

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Abstract

This paper develops an empirically-relevant framework (a) to examine whether or not the African business environment hinders or promotes the knowledge economy (KE), (b) to determine how the KE which emerges from such an environment affects economic growth, and (c) how growth in turn relates to the 'inclusive development' of 53 African countries during the 1996-2010 time period. The framework provides a modest guide to policymaking about, and further research into, such relationships. We implement the framework by building a three-stage model and rationalizing it as five interrelated hypotheses. To allow greater concentration on the issues that are themselves already complex, our model is very simple, but clear. For example, we make neither an attempt to evaluate causality nor to test for it, even though we suspect the links to be multi-directional – opportunity costs are everywhere. Instead we focus on fundamental relationships between the dynamics of starting business and doing business as expressed in the state of KE, and through it to the inclusive development via the economic growth of those countries. Estimation results indicate that the dynamics of starting and doing business explain strongly a large part of variations in KE. The link between KE and economic growth exists, but it is weak, and we provide plausible reasons for such a result. Despite the weak association between KE and economic growth, KE-influenced growth plays a very important role in inclusive development. In fact, growth of this kind has stronger effects on inclusive development and by implication on poverty reduction, than some of conventional controls in this study such as FDI, foreign aid, and even private investment. There is clearly room for further research to improve the results, but just as clearly practical policy is best served by not neglecting the relationships examined in this paper.

JEL Code: L59; O10; O30; O20; O55
Keywords: Business Dynamics; Knowledge Economy; Development; Africa

1. Introduction

The objective of this paper is three-fold: (a) to examine whether or not the African business environment hinders or promotes the knowledge economy (KE), (b) to determine how the KE which emerges from such an environment affects economic growth, and (c) how growth in turn relates to the 'inclusive development' of 53 African countries during the 1996-2010 time period. By the national business environment we mean conditions surrounding starting business and doing business. More specifically, we refer to such conditions as business dynamics, and they include: (a) dynamics of starting business, and (b) dynamics of doing (operating) business. Even though we will be talking only of "doing business", technically the dynamics of doing business include (i) trade, (ii) technology exports and/or imports, (iii) property rights and, (iv) closing business[1].

The examination is important for a number of reasons including the following four. First, at the microeconomic level business dynamics influence the value of the firm, and in a world increasingly driven by technologies of all sort, the value of the firm affects the long-term development, sustainability, and performance of the KE (Ernst & Young, 2013; Leke et al., 2010; Anyanwu et al., 2012; Kuada, 2009). This first contribution is in line with the Sustainable Development Goals (UN, 2013, pp. 7-13).

Second, the performance of KE ultimately affects the competitiveness of nations, which in turn has measurable implications for economic growth and *inclusive development*. We *deliberately* utilize the notion of inclusive development to suggest that our analysis goes beyond assessing the growth-development nexus of the conventional variety to inclusive development, because '*output may be growing, and yet the mass of the people may be becoming poorer*' (Lewis, 1955, emphasis added). This Lewisian thesis has been recently rediscovered by Piketty's (2014) '*Capital in the 21st Century*' in developed countries along with a growing stream of literature on developing nations (Kalwij & Verschoor, 2007; Thorbecke, 2013; Fosu, 2009, 2014; Singh, 2014).

[1] These business dynamics are not affected by multicollinearity and overparameterization issues. Hence, unlike the KE indicators, there is no need to construct indices in order to avoid redundancy of information. The correlation analysis can be provided upon request. Moreover, Tchamyou (2014a) and Tchamyou (2014b) have used them distinctly as dependent and independent variables respectively.

Third, there is continued effort aimed at enhancing understanding of the factors and forces determining the KE in African countries to which this paper seeks to contribute. The contribution extends recent African literature on institutional determinants of innovation (Oluwatobi et al., 2014), business research (Sigue, 2011), and entrepreneurship (Brixiova et al., 2015) needed for the continent to emerge from poverty (Kuada, 2011). Studies closest to the current exposition in the literature include Tchamyou (2014ab). Tchamyou (2014a) has investigated the role of KE in African business while Tchamyou (2014b) has assessed the reverse relationship, i.e., the impact of entrepreneurship on KE in Africa. The latter study informs the first-stage of empirical analysis of the current study. We build on it by incorporating economic growth in the second stage, and inclusive human development in the third stage. While business dynamics might obviously influence KE, we go two steps further in investigating how the nexuses are growth-enhancing on the one hand, and on the other hand, how 'the positive externalities of the growth-enhancing KE from business dynamics' might seep through onto inclusive development.

Finally, and as far as we know, extant theoretical and empirical work ignores, and/or pays insufficient attention to, the essential links between African business dynamics, KE, economic growth, and inclusive development.

We approach the issues in a stylized three-stage fashion (model) in which business dynamics affect KE, KE affects economic growth, and growth affects inclusive development. The model is estimated and tested as five interrelated hypotheses. In doing so we find that starting and doing business do indeed explain a large part of variations in KE observed in African countries, and that KE has affected growth, and through growth inclusive development. The magnitudes of the effects are low at all three stages, but they are reasonably signed and statistically and/or economically significant. We conclude that the three stages are critical to the future progress of African countries, and call policy and further research attention to them.

The rest of the paper is organized as follows. Section 2 reviews the relevant literature, and is followed by the methodology in Section 3. Section 4 presents the empirical results, while Section 5 discusses the concluding economic implications of results for policy and further research.

2. Literature

This section is divided into four sub-sections, each with a specific theme that forms the basis for the structure of the hypotheses and the estimation technique deployed in subsequent parts of the paper. While stylized, the approach is simple, clear, and easy both to implement and follow.

2.1 Business Dynamics and Business Performance

The general literature on the effects of the business environment (climate) on the performance of firms is huge and very old. Michael E. Porter (1990, 1998) traces the literature back to Adam Smith's concepts of division of labor, comparative advantage, and specialization across economies as illustrated by the example of the safety pin factory (Smith, 1937[1776], cf. Stigler, 1957).[2] Influenced by Smith regional economists (like Krugman) and other regional scientists (mainly economic geographers) have long insisted that the optimal location of an economic activity is a function of the basic business costs as well as location-specific costs (Richardson, 1969). The determinants of such costs (and benefits) include the availability of primary factors of production (land, labor, capital, and entrepreneurship), availability of, and accessibility to, local and global product and money markets, availability of good transport and physical infrastructure systems, and opportunities for agglomeration and other external economies made possible by the availability of amenities like libraries, schools/colleges/universities, social networks, and so on. Porter (1998) has depicted all these in a simple but clarifying diagram with four interactive vortexes, representing the "firm strategy, structure, and rivalry" in one vortex, "related and supporting industries" in the second vortex, the "factor conditions" (supply) in the third vortex, and in the fourth vortex "demand conditions" – all subject to random chance and non-random government policy (see Porter's Figure 1, 1990, p. 127, or 1998, p. 9). David Neven and Cornelia Droge (2001) have dubbed Porter's scheme the "Porter's diamond model."

Despite Porter's brilliant effort, the general theory of the business climate is a lot more complex than the optimal location theory of the firm (business). Experts know from observations that businesses do not always set up in their lowest cost and/or highest profit locations. However, old

[2] We assume that the economist reader already knows that the concept of comparative advantage is due David Ricardo as a correction to Adam Smith's mistaken view that specialization required absolute advantage. Paul Krugman is an excellent guide on these matters and the interested reader can start with his Nobel Prize Lecture.

ideas hardly die; they only find new applications, and African countries are no exceptions to this rule. Let's take a quick look.

According to N'da (2012) the cost of doing business in Sub-Saharan African countries (SSACs), as assessed by the World Bank in its annual *Doing Business* reports, depends on nine main indicators of the quality of business environment. They are: the ease of setting up a business, obtaining construction permits, enforcing and transferring property rights, securing loans, protecting investors, paying taxes and fees, cross border trade and other transactions, fulfilling contractual obligations, and resolving insolvency, and other shut-down conditions. Together these indicators suggest further that the transparency of the business dynamics are important to trade and foreign direct investment (FDI), and hence to the KE. Furthermore, the recent co-publication of the World Bank (WB) and the International Finance Corporation (IFC) on *Doing Business in the East African Community* (2013) revealed that only 10 SSACs rank among the top 100 of 185 countries in which it is easy to do business. The next small group fall somewhere between 109 and 134 places, and the majority of SSACs rank below the 169th place (cf. other regions http://www.doingbusiness.org). More importantly, while the report is recent, the issues it raises about the business environment are not new, at least not to the experts in the area. For example, Eifert, Gelb, and Ramachandan (2005) pulled together microeconomic and macroeconomic evidence on the competitiveness of African manufacturing sectors. They found that it is determined by the business climate, which affects the relative advantages and external economies of those sectors. They concluded that "Africa is high-cost relative to its income and productivity," and they recommended reforming business attitudes and practices there.

Spring, Rolfe, and Odera (2013) studied the SSA business environment by major regions. They found improving economic factors and forces including economic growth, trade, infrastructure, and FDI. Political dimensions of the business climate are a toss with some regions and countries being more unstable than others. Health, cultural and social aspects of the business dynamics remain somewhat negative. Consequently the authors surmised that the business environment remains challenging in SSACs where regulatory, contract enforcement, difficulty of starting business, and corruption are the highest hurdles.

Although the business environment and its effects on business activity have origins in standard economic theory, recent traditional economic literature on the topic is not as voluminous as the literature coming from business economists and economic journalists. A rare exception is that the *Journal of African Economies* devoted space in one of its 2001 issues to the African business environment with special reference to investment. Fosu, Mlambo, and Oshikoya led the discussion with an overview and they concluded that "despite more than a decade of reform in many African countries, investment and growth rates are still far below the levels required for sustainable development" (p.1). In particular, Mlambo and Oshikoya examined macroenomic factors and forces affecting investment in Africa and discovered that the business climate, represented by fiscal, financial and monetary policy, as well as macroeconomic uncertainty and trade-related issues have had enormous influence on private investment. They concluded that the political setting, more precisely political (in)stability as a proxy for the business climate, "matters for investment," and external shocks resulting from the volatility of the narrow export base and unfavorable terms of trade "have had a negative impact on private investment recovery" (ib.).

Also in the same issue Jan W. Gunning and Taye Mengistae (2001) surveyed microeconomic evidence on manufacturing investment in Africa during the 1990s. They uncovered that the market processes have selected the survival of efficient firms in African countries as strongly as they did elsewhere, so that while macroeconomic literature show that low returns of investment in Africa explain poor economic growth there, microeconomic evidence suggest high returns. Thus, the low real rates of investment are more likely due to the politically risky business environment than anything else. Devarajan, Easterly and Pack (2001) appear to disagree with Gunning and Mengistae's assessment, because their cross-country data and micro data from Tanzania indicate that investment in Africa is not too low. In fact the low marginal impacts of investment on growth suggest too much, not too little, investment.

Marcel Fafchamps's (2001) very interesting and unique article focused on network and other externalities of business dynamics. He reasoned that network and external transaction costs have a tendency to lock market participants into inefficient and unequal long-term relationships. According to this perspective the effects of the African business environment may not be

particularly peculiar. We concur that a methodological approach like Fafchamps's which does not seem to assume a negative business climate *a priori* is attractive to us as it allows for exceptions to the rule. Variations in the business environment across countries, regions and industries even within the same country clearly show that exceptions do exist. For instance, with respect to revenue in the mobile technologies sectors in Africa higher operators' tariffs may be attributable to less than conducive business dynamics surrounding mobile technologies in Africa compared to other regions in the world. However, over the 2003-2008 years, measured by the Herfindahl index, African mobile markets have become more competitive than before and market penetration rate has increased. Consequently variable network cost/traffic minute for 14 African mobile operators have fallen – implying considerable economies of scale along with network effects (Gutierrez, Lee and Virto, 2009; Gille, Noumba Um, Rudel, and Simon, 2002; Esselaar, Gilwald, and Stork, 2007; Gilwald and Stork, 2008). All these cannot be explained by a negative business climate, perhaps not even by a positive one alone.

2.2 From Business Dynamics to KE

A KE is a shortcut for a knowledge-based economy. According to the WB a KE has four pillars, and their corresponding indicators. Therefore any business environment that affects the creation, transfer, and spread of knowledge essentially affects the very foundation of the KE. Changes in any of the four pillars, or indicators, of the KE are changes in the KE itself, with all potential to lower, or raise countries' performance and ranking on the knowledge economy index (KEI). Again as indicated in the introduction above, we are unaware of any study that specifically links business dynamics, or their indicators, to the KE. This study attempts to fill that gap in understanding.

The attempt is not starting from scratch in the literal sense. It is commonsensical that since KE is a function of investment in the four pillars or their indicators, any business climate that interferes with the investment in the four pillars, also interferes with the KE. We know, for instance, from Erik Stan and Elizabeth Garnsey (2006) that knowledge facilitates entrepreneurship and the latter leads to knowledge growth which stimulates the KE in turn (cf. Tchanyou, 2014ab). Zakic, Jovanovic, and Stamatovic (2008) discuss nine external and internal factors that determine product and process innovations. The discussion concluded that "the companies in new

industries compete with the help of product innovations comparing with mature industries dominated by process innovations" (p. 26)[3]

Even though there is no one-on-one mapping of the business dynamics to the KE, or its indicators, there are two studies relevant to this current effort. First, Andres, Asongu and Amavilah (2014) estimated the impact on KE in African and MENA countries of formal institutions through governance. They found that formal institutions are necessary, but not strong enough, determinants of KE. Second, Amavilah, Asongu, and Andres (2014) extended the previous study, by considering the effects on KE of globalization-related peace and stability acting through governance. It turned out that governance affects KE differently depending on the kind of globalization, the peace and stability it induces, and the type of governance through which it influences the KE. In general the peace and stability induced by trade-related globalization have stronger effects on governance, and hence on KE, than peace and stability resulting from FDI-related stability associated with globalization represented as financial flows.

2.3 From KE to Economic Growth

The importance of the relationship between the KE and the general economy depends on the intensity of the knowledge underlying the KE itself. At the early stages of progress KE acts like technology and each general economy has some KE just as it has some knowledge. Think of an x-dimensional plane with a tiny dot in it. As the economy grows, the dot (KE) also gets bigger and bigger. How big KE is at any point in time depends on the relative difference between the rates of growth of the KE and the general economy. If KE grows faster than the general economy, then KE essentially becomes a factor of production that encompasses human capital itself. In highly knowledge-intensive economies, KE and the general economy are the same things. Thus, the special nature of the KE is that it can be both an input and an output.

Now, KE viewed as technology, changes in it would lead to changes in both production and consumption possibilities, depending on whether they affect the demand or supply side. Economists would recognize that sustained expansion of production possibilities is economic

[3] In the authors' own words and order, the nine external and internal factors are: industry maturity; customer needs and expectations; demand; technological opportunities; attractiveness for investments; intensity of competition; company size; origin of ownership; and export orientation.

growth, and improvement in consumption possibilities is a sign of economic well-being, which when sustained makes for inclusive development. We return to the preceding statement in the next sub-section, and later.

If KE is taken to be a factor of production, that is an index of a kind of aggregate human capital, then it would have institutional effects on other factors of production as well as on national innovation systems. This is the perspective implicit in Andres, Asongu, and Amavilah's (2014) study on the impact of formal institutions on KE, which was recently extended by Amavilah, Asongu, and Andres's (2014) examination of the effects of globalization-induced peace and stability on KE via governance. The literature which guided both papers above is relevant to this one as well, and we strongly encourage the interested reader to go to that literature for further elucidation. Suffice to say that the literature illustrates clearly the importance of the links between the KE and the growth of the general economy. What we do in this paper is quantify that link in a way that acknowledges the surrounding business context – and that, as far as we know, has never been done for developing countries, and most certainly not for African countries.

2.4 From Economic Growth to Economic Development

Economic growth improves production possibilities, but possibilities do not always mean equal benefits. A number of UN reports are full of recent examples of growth that is accompanied by inequality, poverty, or both. Indeed, inspired by Kuznets's (1955, 1971) work, not long ago many development economists accepted an inverted-U relationship between inequality and growth as an unavoidable aspect of economic development. In the years 1990-2010 economic growth coincided with both inequality and poverty in SSACs, although both Alwyn Young (2012) and Maxim Pinkivskiy and Xavier Sala-i-Martin (2014) show that African countries on average have done well in terms of consumption growth and poverty reduction. Over the same time period OECD, MENA, and South Asian countries have seen inequality rise with some growth, while Latin American and South East Asian countries with high growth and inequality in the 1980-2000 time period, have experienced significant reductions in inequality along with slow growth. Perhaps J. Bhagwati (1958) was correct after all that there is such a thing as "immiserizing growth". One may rhetorically ask whether or not there is also such thing as

"equalizing slow or no growth".

According to the UN, growth is inclusive if it (a) creates decent employment for all; (b) provides opportunities to all social segments of the economy; (c) promotes equality of money and non-money gains from growth; (d) improves human capital (education, skills, health, longevity (life-expectancy), mobility) for at least the poorest; and (e) makes attainable social justice, individual liberty, and other forms of freedom. Thus, inclusive growth contrasts with sustained growth which is simply the shifting out rightwards of the production possibilities due to changes in the technical capability of the economy resulting from technological change (productivity shift) and/or changes in the quantity or quality of resources or improvements in efficiency (free lunches). *In fact, sustained growth plus inclusive growth is sustainable growth, which is the objective dimension of sustainable development*.

Kjoller-Hansen and Sperling (2013) quantify inclusive growth "by setting up five distinct criteria for inclusive growth in relation to productive employment", and they used household data to evaluate the experiences of Albenia, Burkina Faso, Egypt, Romania, and Tajikistan. They found that countries' experiences differed given their "timespan, history, income level, culture, political structure, religious orientation, etc." (p. 10). For example, "more diversified economies at a higher income level seem to perform better against the five criteria of inclusive growth" (p. 15) – suggesting further that "… growth in GDP per capita is not enough for development to be inclusive, [and that] more moderate growth rates, coupled with structural changes, can be as inclusive as high growth rates without" (p. 15). This is consistent with our statements above.

Finally, Ianchovichina and Lundstrom's (2009) framework and its application to Zambia are both very well done and we rely on their paper to benchmark ours. Clearly growth is meaningful only if it reduces poverty and inequality, and if it does so in a sustained and sustainable manner. To be sustainable it has to be "broad-based." To be sustained inclusive growth needs a viable technology and be able to remove micro- and macro-economic constraints imposed by business dynamics, and the conventional factors and forces of production. In the case of Zambia the constraints included: (a) the employability of the poor themselves, (b) the cost of physical capital, (c) low social returns to natural resource endowments, (d) geography, (e) infrastructure,

(f) human capital, (g) government failures with respect to the macroeconomic environment and taxation, (h) governance, and (i) pure market failures due to public goods/services, common resources, externalities, and/or asymmetric information costs (uncertainty and risks).

Both Ianchovichina and Lundstrom, and Kjoller-Hansen and Spirling provide practical formulas for characterizing income from employment of resources which individual persons or countries need to meet the requirement, the Euler or Keynes-Ramsey, conditions for inclusiveness which captures the welfare effects of inclusive growth.

We use innovate around the Ianchovichina and Lundstrom (2009) insight to argue that since sustainable growth is sustained inclusive growth, it is a good enough proxy for inclusive development. This means that we take Sen's (1983, 1999) definition of development as the capability that allows for freedom. In other words, the object of such development is national well-being. Thus, the human development index (HDI) is a better measure of well-being (standard of living) than per capita GDP (Sen, 1997, Anand and Sen, 1994). In addition, instead of focusing on the HDI, we rely on the inequality-adjusted human development index (IHDI).

As described in various Human Development Reports (HDRs) the IHDI accounts for HDI Less the "loss of human development due to inequality." The larger the distance between the HDI and the IHDI, the greater inequality, and the coefficient of human development inequality measure the intensity of such inequality, i.e., $Coefficent\ of\ inequality = \left[\frac{HDI-IHDI}{HDI}\right] = 1 - \frac{IHDI}{HDI}$, or the "loss in HDI due to inequality" (HDR, 2014, p. 4). Various HDRs reveal that SSACs have the highest IHDI in health, South Asia and the Arab States have the highest IHDI in education, while Latin American and the Caribbean have the highest IHDI in income. A more appropriate measure to use, but for which data is currently incomplete for SSACs, would be the poverty-adjusted HDI, technically called the "multidimensional poverty index" (MPI). Thus, we understand that using IHDI is admission on our part that any statement we ultimately make about poverty reduction or increase is an inference from the assumption that inequality and poverty are positively correlated.

3. Methodology

Our methodology has a number of stylized components. First, we describe the theoretical model we assume. Second, we construct testable hypotheses that would allow us to implement our model. Third, we outline key variables of interest, and corresponding data and data sources, and subject the data to the principal component analysis to deal with the usual statistical problems. Finally, we characterize our estimation technique and put it to work.

3.1 Model

At the empirical level we solve the problem in parts for reasons discussed later. This section summarizes the relationships described above concisely. We begin the description with an assumption that all SSACs in our sample have two coexisting theoretical economies: the KE, Y_1, and the general economy, Y_2 (cf. Lucas and Moll, 2013). Y_1 depends on micro- and macro-economic determinants among them our business dynamics which we designate as Z_i as well as controls (X_1), where all countries are identified and the variables are time-indexed, but for simplicity country and time subscripts are ignored. Then

$$Y_1 = A_1 e^{\alpha Z + \mu_1} X_1^{\beta_1}. \tag{1}$$

Normalizing (1) by dividing through with some specific $X_{i,j,}$ $i \neq j$, we get

$$y_1 = a_1 + \alpha_1 z + \beta_1 x_1 + \mu_1, \tag{2}$$

where the lowercase letters are logarithmic data and uppercase are raw data.

If we suppose that the link between (Y_1, y_1) and the general economy (Y_2, y_2) is either very weak or non-existent, so that the latter depends only on its own factors (X_2) and forces (A_2), then it would be determined as $Y_2 = A_2 X_2^{\beta_2} e^{\mu_2}$. However, we know that every economy has its own (Y_1, y_1), that the difference across economies is of the size and sophistication of (Y_1, y_1), not its existence. Hence, (Y_1, y_1) affects (Y_2, y_2) either as a productivity shifter (technological constant) acting through A_2, or as a factor of production and in that case it is an element of X_2. There is a lot and interesting things that can be done and said here, but for simplicity we let $Y_1 = A_2$, such that

$$Y_2 = Y_1 X_2^{\beta_2}\, e^{\mu_2} = A_2 X_2^{\beta_2} e^{\mu_2}\,. \tag{3}$$

To be able to associate Y_2 with growth, we divide (3) by either population to get per capita income (real GDP) or by labor to obtain per labor (worker) income (output). After taking the natural logs, (3) becomes,

$$y_2 = a_2 + \alpha_1' y_1 + \beta_2 x_2 + \mu_2\,, \tag{4}$$

which represents the growth equation and its Euler or Keynes-Ramsey conditions discussed in the papers we cite in the preceding section.

Eqs. (3) and (4) put us right in the middle of the neoclassical growth debate, whether in its Solow (1956, 1957) and Swan (1956, 2002) exogenous version, or its new endogenous version according to Lucas (1988, 1993), Rome (1990), Aghion and Howitt (1992), Mankiw, Romer, and Weil (1992), Barro (1991), and many others. We welcome the debate, but resist the itch and temptation to pursue that route for now. Instead, we restate that the principal goal of all economic activities is to enhance human development in a sustainable way. We then accept Sen's modified capabilities model that inequality, by implication poverty, adjusted human development index (IHDI) is a reasonable measure of the welfare effect of growth, that is, the national well-being or national standard of living. For this reason, let $IHDI \equiv (Y_3, y_3)$, and note that as described and calculated in the Human Development Reports, Y_3 is determined by the (a) longevity and health of the population, measured by life-expectancy at birth, (b) the knowledge available to the economy, measured by education and training, and (c) a "decent standard of living", represented by per capita income. All three dimensions are adjusted by their respective inequalities.

Put in a language familiar to growth economists, we designate the sum of the inequality adjusted longevity and health, and knowledge as human capital, H, i.e., $H = Knowledge + Health$ Then per capita H, $\frac{H}{X_{2,j}} = h = y_1$, and one can show, at least theoretically, that $y_3 = \gamma_1 h + \gamma_2 y_2 = \gamma_1 y_1 + \gamma_2 y_2, \gamma_1 + \gamma_2 = 1$ being the shares (weights) of y_1 and y_2 in y_3, such that

$$y_3 = a_3 + \alpha_2' y_2 + \beta_3 x_3 + \mu_3.^{4} \quad (5)$$

Taken together, it is clear that Equations 1 to 5 face the usual statistical culprits such as heteroskedasticity and multicollinearity, which in turn would compromise the technical efficiency of the estimates and thereby complicate their economic significance and relevance. To alleviate those problems we apply the principal component analysis to the relationships to minimize the risks posed by overparameterization and multiple correlations. First things, first.

3.2 ***Testable Hypotheses***

We claim that in the first stage the dynamics of starting and doing business affect KE in African countries. In the second stage we propose that as determined by business dynamics, KE is important to economic growth in African countries. In other words, (i) growth from starting business is related KE, and (ii) growth from doing business related KE. The third-stage of the estimation process is the most critical one and it deals with the effect on inclusive development of growth-ehancing KE from business dynamics.[5] Consequently, the entire estimation process reduces to the following fiver testable hypotheses:

Hypothesis 1: *Education* (Edutex) from starting and doing business is associated with growth which influences the quality of development (IHDI).

Hypothesis 2: *ICT* from starting and doing business is associated with growth which influences the quality of inclusive development (IHDI).

Hypothesis 3: *Innovation* (Innovx = STJA) from starting and doing business is associated with growth which influences the quality of development (IHDI).

Hypothesis 4: *Economic incentives* (Creditex) from starting and doing business are associated

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[4] Prior to 2010 Human Development Reports estimated $\gamma_1 = \frac{2}{3} = \frac{1}{3} for\ the\ health\ and\ longevity + \frac{1}{3} for\ the\ knowledge$ parts of human capital, and $\gamma_2 = \frac{1}{3} for\ per\ capita\ income.$ From 2010, components of the HDI were not longer equally weighted; they are computed as $HDI = \sqrt[3]{\gamma_1 * \gamma_2 * \gamma_3}$ (see UNDP, HDR Technical Notes, 2014; Majerova, 2012), and adjusted the whole series.

[5] We use the "quality of development" and "inclusive development" interchangeably.

with growth which influences the quality of development (IHDI).

Hypothesis 5: *Institutional regime* (Instireg) from starting and doing business is associated with growth which influences the quality of development (IHDI).

3.3 ***Variables and Data and Principal Component (PCA)***

In this part of the methodology we describe briefly key variables, their corresponding data and data sources. As often is the case in developing countries, available data is both limited and inaccurate. However, instead of filling in existing gaps with data from different sources, we chose to use World Bank (WDI) data primarily. Such a choice comes with a trade-off between consistency and small-size sample.

3.3.1 *Variables and Data*

Table 1 characterizes the variables of particular interest to this study. Panel A displays the five representations of KE. Panel B lists three indicators of what we refer to throughout this paper as 'business dynamics", but our empirical focus is only on two – starting and doing business dynamics.[6] Our primary interest is in how these dynamics affect KE in the African countries presented in Table 2, Panel B. Panel C of Table 1 outlines control and other variables. Most data used in this study are standard; they do not need special treatment. They allow us to extend the links the business dynamics and KE to economic growth and inclusive development. Last, but equally important, Table 2, Panel A, presents descriptive statistics. The definitions of variables are broadly consistent with Tchamyou (2014ab).

Table 1: Variables: signs, definitions, and data sources

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

[6] Note again that doing business has three components: trade, technology, and property rights.

	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 governments commitments to such policies".	World Bank (WDI)
Voice & Accountability	VA	"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	World Bank (WDI)

		expression, freedom of association, and a free media".	
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	Contenfor	Log of Time required to enforce a contract (days)	World Bank (WDI)
Registration of Property	Regprop	Log of Time required to register property (days)	World Bank (WDI)
Investor Protection	Bisdiclos	Business extent of disclosure index (0=less disclosure to 10=more disclosure). It measures the extent to which investors are	World Bank (WDI)

		protected through disclosure of ownership information	
		B3: Closing Business	
Insolvency Resolution[7]	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)
		Panel C: Control & Other Variables	
Inclusive Human Development	IHDI	Inequality Adjusted Human Development Index	World Bank (WDI)
Economic Prosperity	GDPg	GDP Growth Rate (annual %)	World Bank (WDI)
Foreign Aid	NODA	Net Official Development Assistance (% of GDP)	World Bank (WDI)
Inflation	Infl.	Consumer Price Index (annual %)	World Bank (WDI)
Foreign Investment	FDI	Gross Foreign Direct Investment (% of GDP)	World Bank (WDI)
Public Investment	Pub Ivt.	Gross Public Investment (% of GDP)	World Bank (WDI)
Private Investment	Priv. Ivt.	Gross Private Investment (% 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.

Table 2: Summary statistics and presentation of countries

Panel A: Descriptive 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
Doing Business	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 (log)	4.239	0.476	2.882	5.617	719
	ICT Goods Exports	0.788	1.979	0.000	20.944	391
	ICT Service Exports	6.098	5.792	0.017	45.265	277

[7]Although the dynamics of closing business (Insolvency Resolution) would clearly affect KE, it is not included in empirical estimations, because issues in degrees of freedom.

	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
	Growth	4.763	7.293	-31.300	106.28	759
Control & Other variables	Inclusive Human Development	1.351	6.341	0.127	47.486	551
	Net Official Development Assistance(NODA)	10.811	12.774	-0.251	148.30	704
	Inflation	57.556	955.55	-100.00	24411	673
	Trade	77.853	39.698	17.859	275.23	719
	Private Investment	12.979	9.400	-2.437	112.35	658
	Public Investment	7.449	4.500	0.000	39.984	655
	Foreign Direct Investment	4.221	8.451	-8.629	145.20	557

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 & Principe, Seychelles, South Africa, Swaziland, Tanzania, Togo, Tunisia, Uganda, Zambia, Zimbabwe.

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

3.3.2 KE Indicators and Principal Component Analysis (PCA)

Even without formal diagnostics, it is clear from Table 1 that there are bound to be significant correlations among the indicators of KE, and between KE indications and business dynamics. Since Jolliffe's (1986) seminal work, research has shown that the PCA can be utilized to reduce highly correlated variables into a smaller set of uncorrelated indicators called principal components (PCs) that retain a substantial portion of information in the initial dataset, see, e.g., Kaiser (1974; Fomby, Hill, and Johnson, 1984; Jolliffe, 2002). The research recommends the retention of PCs with an eigenvalue that is greater than the mean, or greater than one. In the present case eigenvalues range from 1.31 for the Economic Incentive (*Creditex*) variable to as high as 4.64 for the Institutional Regime (*Instireg*) variable. We use logSTJA to proxy for Innovation (*Innovex = logSTJA*) because of limited degrees of freedom in the other components.[8] Again, the importance of eigenvalues is that they denote eigenvectors that have a significant proportion of the initial information or total variability. As Table 3 reveals the first PCs for education (*Educatex)*, information and communication technology (*ICTex), Innovex,Creditex*, and *Instireg* correspond consistently to eigenvalues that are greater than one – meaning the

[8] logSTJA is the natural logaritnm of STJA, and STJA is Scientific & Technical Journal Articles. A number of studies have used the STJA to proxy for innovation in the KE literature (Chavula, 2010; Tchamyou, 2014ab).

vectors retain between 66% and 77% of overall information.

Table 3: Principal Component Analysis (PCA) for KE Indicators

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

"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".

*3.4 **Estimation Technique***

We estimate the model in three stages we describe next below.

Stage 1: KE in Africa, designated by (Y_1, y_1) depends on the dynamics of starting business (Table 1, Panel A), dynamics of doing business (Table 1, Panel B); globalization, governance, controls, and some random error.[9] This first-stage builds upon Tchamyou's (2014b) notion of 'the effect of entrepreneurship on KE'. It includes two sets of equations: KE from starting business, and KE from "doing business" (actually operating business). It is essentially Equations 1 and 2. Hence, $H_0: \alpha_1 = 0 \; versus \; H_A: \alpha_1 \neq 0$.

Stage 2: Economic growth (Y_2, y_2) is a function of KE estimated in Stage 1, controls and other relevant variables, and random chances. This stage entails two sets of equations: Growth related to KE from starting business, and Growth emanating from doing business. This stage is anchored in Equations 3 and 4, implying $H_0: \alpha_i' = \alpha_1 + \beta_1 = 0 \; versus \; H_A: \alpha_1' = \alpha_1 + \beta_1 \neq 0$.

[9]Once more, note that the dynamics of doing business include trade dynamics (Panel Ba), technological dynamics (Panel Bb), and dynamics of property rights (Panel Bc). The dynamics of closing business are not considered in this study.

Stage 3: Inclusive development measured as inequality adjusted HDI = (Y_3, y_3) is related to estimated growth from Stage 2 in addition to other variables and controls. This stage involves two sets of equations also, i.e., inclusive development that is influenced by the KE from starting business, and inclusive development from growth associated with KE from doing business. The theoretical basis of this stage is Equation 5 for which H_0: $\alpha_2' = \alpha_1' + \beta_2 = 0$ $versus$ H_A: $\alpha_2' = \alpha_1' + \beta_2 \neq 0$.

Figure 1 summarizes the essential parts of the approach utilized.

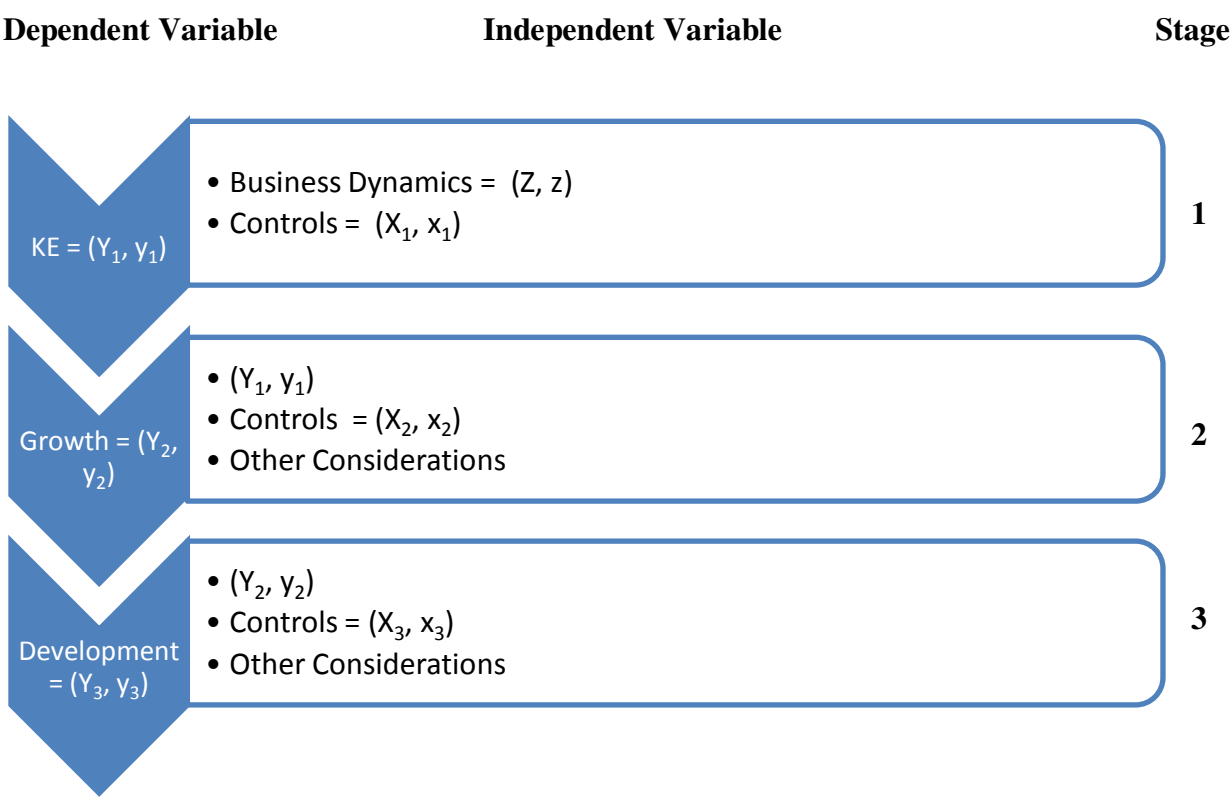

Figure 1 - Business Dynamics, Growth, and Inclusive Development in African countries.

The figure suggests the following reduced form estimation specifications:

$$y_{1t} = a_1 + \alpha_1 z + \beta_1 x_{it} + \eta_{1i} + \xi_{1t} + \mu_1$$

$$y_{2t} = a_2 + \alpha_1' \dot{y}_{1t} + \beta_2 x_{2t} + \eta_{2i} + \xi_{2t} + \mu_2^* \qquad (6)$$

$$y_{3t} = a_3 + \alpha_2' \dot{y}_{2t} + \beta_3 x_{3t} + \eta_{3i} + \xi_{3t} + \mu_3^* ,$$

Where $\dot{y}$ is estimated y from the preceding stage, and $\mu_i$are error terms of an unknown structure a

priori, but assumed to be random. Thus, in (6) $H_0: \alpha_1 = 0; H_0: \alpha_1' = \alpha_1 + \beta_1 = 0; H_0: \alpha_2' = \alpha_1' + \beta_2 = 0$, as opposed to the alternatives.

4. Results

Tables 4-8 present estimation results by stage, and it is to those we turn next.

4.1 First-stage KE-Business dynamics Nexus

Table 4A reveals that overall the dynamics of starting business explains 40% to 67% of all variations in KE. However, the dynamics of starting business in these countries differ across KE dimensions, being lowest for the Creditex variable, and highest for the logSTJA = Innovex variable. Moreover, the dynamics of doing (operating) business explains 36% to 42% of changes in KE (the five KE indicators). Among these, doing business dynamics explain the Educatex dimension of KE the least.

How strong are the instruments for starting and doing business as determinants of KE? The answer is in Table 4B, and it differs across the KE dimensions and the dynamics of starting and doing business themselves. The results show that starting business explains between 43% and 99% of the variations in KE. On average doing business is responsible for only about 46% of variations in KE dimensions. Respectively, starting business dynamics are first, second, and third strongest explainers of Educatex, ICTex, and logSTJA indicators of KE, and weakest for Creditex. By contrast, the strengths of doing business on KE indicators are nearly uniform at about 45%.

Table 4: KE from starting and doing business (First-stage)

Panel A: Instrumentation (Dependent variable: KE dynamics. Independent variables: Business dynamics).

	KE from starting business					KE from doing business				
	Educatex	ICTex	logSTJA	Creditex	Instireg	Educatex	ICTex	Innovex	Creditex	Instireg
Adjusted R^2	0.634	0.641	0.667	0.397	0.484	0.364	0.414	0.415	0.419	0.406
Fisher	**30.060*** **	**49.258*** **	**55.634*** **	**12.073*** **	**25.190*** **	**4.661*** **	**10.82*** **	**10.17*** **	**6.235*** **	**10.317*** **
Observations	68	109	110	68	104	52	112	104	59	110
Countries	17	20	20	14	19	23	32	32	20	31

Panel B: Testing the strength of instruments (Dependent variable: KE dynamics. Independent variables: Instrument KE dynamics)

Instrument	**1.000*** **	**1.000*** **	**1.000*** **	**1.000*** **	**1.000*** **	**1.000*** **	**1.000*** **	**1.000*** **	**1.000*** **	**1.000*** **
	(0.000)	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**
Adjusted R^2	0.988	0.900	0.676	0.425	0.499	0.453	0.451	0.456	0.490	0.444
Fisher	5821.4***	977.3 ***	228.89***	50.59***	103.81***	43.36***	92.44***	87.35***	56,86***	88,259***
Observations	68	109	110	68	104	52	112	104	59	110
Countries	17	20	20	14	19	23	32	32	20	31

*,**,***: significant levels at 10%, 5% and 1% respectively. 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. KE: Knowledge Economy.

4.2 Second-stage Growth-KE Nexus

Table 5 reports the results of the estimation (Panel A) and the testing of the strength (Panel B) results of KE as determined by the dynamics of starting and doing business, and how these relate to economic growth. Average KE from starting business and average KE from doing business account for 81% and 80% of all fluctuations in economic growth, respectively. In this case, however, specific KE from starting and doing business are high only for the Innovex = logSTJA dimension of KE. For others adjusted R-squares and Fisher statistics are low. Although the explanatory power of the regressions are low, we know for certain that the results do not mean that there is no relationship; there is one because average KE is responsible for up to 83% of variations in economic growth. We offer plausible explanation in the section on the concluding implications of the study.

Table 6 shows the correlations among control and other variables and KE from starting business (Panel A) and doing business (Panel B), while Table 7 displays descriptive statistics. An important note from these matrices is that there are considerable positive and negative correlations between starting business dynamics and control variables (Panel A). High correlations between doing business dynamics and control variables are few (Panel B). We discuss expected signs and strong correlations in subsequent sections of this study.

Table 5: Growth related to KE from starting and doing business (Second-stage)

Panel A: Instrumentation (Dependent variable: GDP growth. Independent variables: Instrumented KE dynamics)

	KE from starting business						KE from doing business					
	Educatex	ICTex	Innovex	Creditex	Instireg	KE	Educatex	ICTex	Innovex	Creditex	Instireg	KE
Adjusted R²	0.047	0.154	0.731	0.233	0.304	0.806	0.077	0.302	0.638	0.179	0.171	0.797
Fisher	**3.337***	**19.69*****	**297.07*****	**2.427*****	**45.16*****	**26.592*****	**4.196****	**48.09*****	**180.19*****	**12.653*****	**22.54*****	**18.13*****
Observations	68	109	110	68	104	32	51	112	103	59	110	23
Countries	17	20	20	14	19	10	23	32	32	20	31	13

Panel B: Testing the strength of instruments (Dependent variable GDP growth. Independent variables: Instrumented GDP growth)

	KE from starting business						**KE from doing business**					
	Educatex	ICTex	Innovex	Creditex	Instireg	KE	Educatex	ICTex	Innovex	Creditex	Instireg	KE
Instrument	1.000	**1.000*** **	**1.000*** **	**1.000*** **	**1.000*** **	**1.000*** **	**1.000*** **	**1.000*** **	**1.000*** **	**1.000*** **	**1.000*** **	**1.000*** **
	(0.174)	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.020)**	**(0.020)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**
Adjusted R²	0.047	0.154	0.731	0.233	0.304	0.831	0.077	0.302	0.638	0.179	0.171	0.834
Fisher	**3.337***	**19.69*****	**297.07*****	**21.42*****	**45.168*****	**152.65*****	**4.196****	**48.09*****	**180.19*****	**12.653*****	**22.54*****	**110.8*****
Observations	68	109	110	68	104	32	51	112	103	59	110	23
Countries	17	20	20	14	19	10	23	32	32	20	31	13

*,**,***: significant levels at 10%, 5% and 1% respectively. 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. KE: Knowledge Economy.

Table 6: Correlation matrix of Growth related to KE from business dynamics

Panel A: Growth related to KE from Starting Business

	Control Variables				Starting Business						IHDI	
NODA	Inflation	FDI	Priv Invt.	Pub. Invt	IVGrEduSB	IVGrICTSB	IVGrSTJASB	IVGrCredSB	IVGrInstSB	IVGrKESB		
1.000	-0.004	0.165	-0.222	0.195	-0.749	-0.633	-0.457	0.835	-0.612	0.852	-0.072	NODA
	1.000	0.011	-0.042	-0.072	-0.017	-0.046	0.105	0.290	-0.049	0.226	-0.009	Inflation
		1.000	0.635	0.074	0.183	0.074	0.154	0.164	0.060	0.294	-0.042	FDI
			1.000	-0.037	0.443	0.350	0.132	-0.302	0.336	-0.453	0.025	Priv. Invt.
				1.000	-0.125	-0.162	0.041	0.263	-0.198	0.190	-0.151	Pub. Invt.
					1.000	0.913	0.583	-0.972	0.859	-0.930	0.880	IVGrEduSB
						1.000	0.331	-0.801	0.986	-0.703	0.784	IVGrICTSB
							1.000	-0.447	0.228	-0.168	0.400	IVGrSTJASB
								1.000	-0.735	0.864	-0.721	IVGrCredSB
									1.000	-0.622	0.757	IVGrInstSB
										1.000	-0.743	IVGrKESB
											1.000	IHDI

Panel A: Growth related to KE from Doing Business

	Control Variables				Doing Business						IHDI	
NODA	Inflation	FDI	Priv Invt.	Pub. Invt	IVGrEduDB	IVGrICTDB	IVGrSTJADB	IVGrCredDB	IVGrInstDB	IVGrKEDB		
1.000	-0.004	0.165	-0.222	0.195	-0.525	-0.450	-0.218	-0.340	-0.485	0.608	-0.072	NODA
	1.000	0.011	-0.042	-0.072	-0.089	-0.208	0.042	-0.124	-0.006	0.325	-0.009	Inflation
		1.000	0.635	0.074	0.146	0.399	-0.260	-0.106	0.100	-0.166	-0.042	FDI
			1.000	-0.037	0.329	0.421	0.073	0.180	0.266	-0.086	0.025	Priv. Invt.
				1.000	-0.301	-0.174	0.024	-0.105	-0.108	0.230	-0.151	Pub. Invt.
					1.000	0.0737	0.143	0.545	0.817	-0.651	0.778	IVGrEduDB
						1.000	0.086	0.506	0.764	-0.694	0.600	IVGrICTDB
							1.000	0.596	0.409	0.146	0.286	IVGrSTJADB
								1.000	0.780	-0.327	0.536	IVGrCredDB
									1.000	-0.736	0.637	IVGrInstDB
										1.000	-0.652	IVGrKEDB
											1.000	IHDI

NODA: Net Official Development Assistance. FDI: Foreign Direct Investment. Priv. Invt: Private Investment. Pub. Invt: Public Investment. IVGrEduSB: Growth related to Education from Starting Business. IVGrICTSB: Growth related to ICT from Starting Business. IVGrSJTASB: Growth related to STJA from Starting Business. IVGrCredSB: Growth related to Economic Incentives from Starting Business. IVGrInstSB: Growth related to Institutional regime from Starting Business. IVGrKESB: Growth related to KE from Starting Business. IVGrEduDB: Growth related to Education from Doing Business. IVGrICTDB: Growth related to ICT from Doing Business. IVGrSJTADB: Growth related to STJA from Doing Business. IVGrCredDB: Growth related to Economic Incentives from Doing Business. IVGrInstDB: Growth related to Institutional regime from Doing Business. IVGrKEDB: Growth related to KE from Doing Business. IHDI: Inequality Adjusted Human Development Index.

Table 7: Descriptive statistics of instrumented variables (Growth related to KE from business dynamics)

Panel A: KE from Starting Business						Panel B: KE from Doing Business					
	Mean	S.D	Min	Max	Obs.		Mean	S.D	Min	Max	Obs.
IVGrEduSB	0.446	1.352	-2.362	3.082	68	IVGrEduDB	0.774	1.539	-2.128	6.384	51
IVGrICTSB	1.252	2.016	-2.512	8.353	109	IVGrICTDB	2.162	2.288	-4.566	8.130	112
IVGrSTJASB	4.979	1.450	1.231	7.356	110	IVGrSTJADB	4.279	1.381	0.304	6.869	103
IVGrCredSB	5.745	1.477	3.162	9.024	68	IVGrCredDB	1.460	2.052	-3.106	5.687	59
IVGrInstSB	2.322	2.378	-1.703	11.504	104	IVGrInstDB	1.444	1.882	-3.721	5.072	110
IVGrKESB	6.302	1.801	3.474	9.662	32	IVGrKEDB	5.327	2.181	2.057	9.485	23

IVGrEduSB: Growth related to Education from Starting Business. IVGrICTSB: Growth related to ICT from Starting Business. IVGrSJTASB: Growth related to STJA from Starting Business. IVGrCredSB: Growth related to Economic Incentives from Starting Business. IVGrInstSB: Growth related to Institutional regime from Starting Business. IVGrKESB: Growth related to KE from Starting Business. IVGrEduDB: Growth related to Education from Doing Business. IVGrICTDB: Growth related to ICT from Doing Business. IVGrSJTADB: Growth related to STJA from Doing Business. IVGrCredDB: Growth related to Economic Incentives from Doing Business. IVGrInstDB: Growth related to Institutional regime from Doing Business. IVGrKEDB: Growth related to KE from Doing Business. S.D: Standard Deviation. Min: Minimum. Max: Maximum. Obs: Observations.

4.3 Third-stage: Development-Growth Nexus -- Panel Fixed Effects regression

The results from the third-stage estimation are in Table 8. They associate economic growth as determined by KE with inclusive development measured by the IHDI. The effects on IHDI of growth based on KE from starting business without and with time effects (Panel A) are positive, except in the cases of ICTex, Creditex, and Instireg, which are negative when time effects are included, albeit not significant. The included variables explain up to 70% of variations when time effects are not considered and up to 89% when time effects are considered. Comparatively such effects are more important than the effects of foreign aid (NODA) which are negative across the board. They also compare favorably to the effects of private investment. More on this later.

In Panel B of Table 8 the effects on inclusive development of growth associated with KE from doing business without and with time effects are less impressive, and in fact negative for ICT without and with time effects, negative for Creditex and Innovex = STJA, and average KE with time effects. Excluding time effects, growth that is influenced by KE from doing business explains 26% - 96%. In summary, without the time effects a one percent increase in growth enhanced by KE from starting business improves inclusive development by 1.3%, and only by half a percent when the time effects are included. Inclusive development increases by 1.1% for every one percent increase in growth related to KE from doing business.

The key control variables have the expected signs. Asongu (2013a) has established that in the

African literature on inclusive growth, low and stable inflation is pro-poor. His results are consistent with the findings of Albanesi (2007) on the disequalizing income-distribution effect of high inflation on the one hand and the results of Bulir (1998) and Lopez (2004) on the equalizing income distribution effect of low inflation, on the other hand[10]. The negative effect of foreign direct investment on inclusive development is consistent with a recent study on quality of growth in developing countries (Mlachila et al., 2014) or IHDI in African countries (Asongu, 2014a). The positive effect of investment (public and private) on IHDI is consistent with intuition and the predictions of economic theory. Interestingly, moreover, also public investment appear to exert a stronger effect on inclusive development than private investment.

[10] It should be noted that, the mean inflation of 57.55% is largely due to Zimbabwe's outlier, the median inflation is only 5.33%. As opposed to high inflation, low inflation is better for the poor because it exerts a lower depreciation in their purchasing power, relative to income.

Table 8: Inclusive development from Growth related to KE from starting and doing business (Third stage):

Dependent variable: Inequality adjusted Human Development Index (IHDI)

Panel A: KE from starting business

	Education		ICT		STJA		Economic Incentives		Institutional Regime		Knowledge Economy	
Constant	**0.493*** (0.000)**	**0.534*** (0.000)**	**0.499*** (0.000)**	**0.531*** (0.000)**	**0.449*** (0.000)**	**0.490*** (0.000)**	**0.545*** (0.000)**	**0.527*** (0.000)**	**0.494*** (0.000)**	**0.531*** (0.000)**	**0.486*** (0.000)**	**0.484*** (0.000)**
IVGrEduSB	**0.012*** (0.000)**	**0.005** (0.013)**	---	---	---	---	---	---	---	---	---	---
IVGrICTSB	---	---	**0.006** (0.014)**	-0.0002 (0.893)	---	---	---	---	---	---	---	---
IVGrSTJASB	---	---	---	---	**0.010** (0.046)**	**0.007*** (0.000)**	---	---	---	---	---	---
IVGrCredSB	---	---	---	---	---	---	-0.004 (0.442)	0.003 (0.201)	---	---	---	---
IVGrInstSB	---	---	---	---	---	---	---	---	**0.005* (0.055)**	-0.0006 (0.619)	---	---
IVGrKESB	---	---	---	---	---	---	---	---	---	---	**0.003* (0.055)**	**0.005*** (0.003)**
NODA	**-0.002** (0.020)**	-0.0008 (0.196)	**-0.002*** (0.000)**	**-0.001** (0.011)**	**-0.002*** (0.000)**	**-0.0007** (0.032)**	**-0.002*** (0.000)**	**-0.001*** (0.000)**	**-0.002*** (0.000)**	**-0.001*** (0.000)**	**-0.003** (0.010)**	**-0.003*** (0.000)**
Inflation	**0.0007*** (0.000)**	**0.0003*** (0.000)**	**0.0005*** (0.000)**	**0.0004*** (0.000)**	**0.0006*** (0.000)**	**0.0003*** (0.000)**	**0.0008*** (0.000)**	**0.0007*** (0.000)**	**0.0006*** (0.000)**	**0.0004*** (0.000)**	**0.001*** (0.000)**	**0.001*** (0.000)**
Private Invt.	---	---	0.0004 (0.190)	-0.0002 (0.258)	0.0005 (0.174)	**-0.0004* (0.096)**	**0.0004* (0.087)**	-0.0001 (0.592)	0.0005 (0.147)	-0.0002 (0.269)	**0.0005*** (0.002)**	**0.001*** (0.005)**
Public Invt.	---	---	**0.001* (0.065)**	0.0005 (0.302)	**0.001* (0.079)**	0.00006 (0.876)	**0.0008** (0.035)**	0.0003 (0.419)	**0.001* (0.059)**	0.0005 (0.300)	0.0009 (0.216)	**0.001* (0.082)**
Time effects	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Adjusted R^2	0.551	0.848	0.635	0.853	0.599	0.881	0.688	0.890	0.619	0.854	0.842	0.865
Fisher	**554.17***	**1148.7***	**720.27***	**1275.7***	**671.64***	**1618.8***	**951.26***	**1712.4***	**707.81***	**1320.6***	**785.61***	**682.19***
Observations	61	61	68	68	69	69	47	47	69	69	28	28
Countries	17	17	14	14	14	14	10	10	14	14	9	9

Panel B: KE from doing business

	Education		**ICT**		**STJA**		**Economic Incentives**		**Institutional Regime**		**Knowledge Economy**	
Constant	**0.479*** (0.000)**	**0.563*** (0.000)**	**0.493*** (0.000)**	**0.508*** (0.000)**	**0.436*** (0.000)**	**0.513*** (0.000)**	**0.548*** (0.000)**	**0.553*** (0.000)**	**0.503*** (0.000)**	**0.507*** (0.000)**	**0.558*** (0.000)**	**0.400*** (0.004)**
IVGrEduSB	0.004 (0.152)	**0.003*** (0.000)**	---	---	---	---	---	---	---	---	---	---
IVGrICTSB	---	---	-0.001 (0.723)	-0.001 (0.376)	---	---	---	---	---	---	---	---
IVGrSTJASB	---	---	---	---	**0.008*** (0.003)**	-0.0009 (0.334)	---	---	---	---	---	---
IVGrCredSB	---	---	---	---	---	---	**0.003** (0.049)**	-0.0002 (0.581)	---	---	---	---
IVGrInstSB	---	---	---	---	---	---	---	---	**0.007** (0.011)**	0.0007 (0.541)	---	---

IVGrKESB	---	---	---	---	---	---	---	---	---	---	-0.0008	**0.011****
											(0.807)	**(0.058)**
NODA	0.001	**-0.002****	0.0002	**-0.0005*****	0.0001	**-0.0005*****	0.0001	-0.0005	0.000	**-0.0005*****	0.0005	-0.001
	(0.271)	**(0.033)**	(0.600)	**(0.009)**	(0.801)	**(0.007)**	(0.866)	(0.134)	(0.846)	**(0.000)**	(0.290)	(0.235)
Inflation	**0.0005*****	0.0001	**0.0003****	**0.0001***	**0.0002****	**0.0001****	**0.0005***	**0.0003***	0.0002	**0.0001***	**0.0009*****	**0.0009****
	(0.000)	(0.139)	**(0.021)**	**(0.054)**	**(0.027)**	**(0.039)**	**(0.054)**	**(0.060)**	(0.033)	**(0.068)**	**(0.000)**	**(0.015)**
Private Invt.	**0.002*****	-0.0005	**0.001*****	0.000	**0.0009*****	0.000	**0.0008****	0.0001	**0.0009*****	0.000	**0.001*****	**0.001***
	(0.000)	(0.178)	**(0.005)**	(0.712)	**(0.009)**	(0.707)	**(0.026)**	(0.180)	**(0.005)**	(0.740)	**(0.002)**	**(0.082)**
Public Invt.	**0.003*****	0.0009	**0.001*****	**0.0004****	**0.001****	**0.0005****	**0.001***	**0.0005****	**0.001****	**0.0005****	**0.002****	**0.003*****
	(0.000)	(0.110)	**(0.007)**	**(0.028)**	**(0.017)**	**(0.026)**	**(0.069)**	**(0.016)**	**(0.010)**	**(0.027)**	**(0.021)**	**(0.008)**
Time effects	No	Yes	No	Yes	No	No	No	Yes	No	Yes	No	Yes
Adjusted R^2	0.446	0.937	0.255	0.856	0.333	0.857	0.496	0.878	0.344	0.858	0.930	0.964
Fisher	**301.33*****	**1610.2*****	**543.68*****	**2238.3*****	**625.27*****	**2330.7*****	**703.81*****	**1955.1*****	**636.17*****	**2335.08*****	**1465.2*****	**1281.7*****
Observations	37	37	71	71	73	73	41	41	73	73	21	21
Countries	17	17	22	22	22	22	14	14	22	22	11	11

*,**,***: significance levels of 10%, 5% and 1% respectively. NODA: Net Official Development Assistance. FDI: Foreign Direct Investment. Priv. Invt: Private Investment. Pub. Invt: Public Investment. IVGrEduSB: Growth related to Education from Starting Business. IVGrICTSB: Growth related to ICT from Starting Business. IVGrSJTASB: Growth related to STJA from Starting Business. IVGrCredSB: Growth related to Economic Incentives from Starting Business. IVGrInstSB: Growth related to Institutional regime from Starting Business. IVGrKESB: Growth related to KE from Starting Business. IVGrEduDB: Growth related to Education from Doing Business. IVGrICTDB: Growth related to ICT from Doing Business. IVGrSJTADB: Growth related to STJA from Doing Business. IVGrCredDB: Growth related to Economic Incentives from Doing Business. IVGrInstDB: Growth related to Institutional regime from Doing Business. IVGrKEDB: Growth related to KE from Doing Business.

5 Concluding Implications

The main purpose of this paper is study the relationships (a) between the business environment and KE, (b) between KE so determined and economic growth, and consequently (c) between economic growth and inclusive development in a number of African countries. We represent the business environment with the dynamics of starting and doing business in those countries. Economic growth is measured conventionally as the growth rate of real GDP and inclusive development is inequality-adjusted HDI. As indicated by the adjusted R-squares and exact F statistic, the explanatory power of the regression of KE on starting and doing business dynamics is reasonable, i.e., the effects of business dynamics on KE are both nonzero and strong. Thus, contrary to popular pronouncements, the African business environment may not be perfect for the rapid development of KE, but the results reveal that the dynamics of starting and doing business in these countries are certainly not hostile to KE.

At the second stage of the estimation, the results indicate a weak link between the KE as determined in the first stage and economic growth. Both adjusted R-squares and F-statistic are low. One reasonable explanation is that the weakness could be due to the synergic effect from combined dimensions of KE enhancing growth. It should be noted that, relative to individual KE components, the growth-enhancing effect from KE is quite substantial. This is not new conjecture, because the KE literature demonstrates convincingly that, South Korea's growth-enhancing benefits from KE have been based on a strategy that incorporates all the dimensions of KE (Suh & Chen, 2007; Lee, 2009). Another plausible explanation is that the low adjusted R-squares simply indicate missing relevant variables, which is not unreasonable given the large constant terms. Such an explanation is also likely because parameter signs are generally consistent with economic tuition and intuition. For instance, if KE is taken to be a technology, then its weak effect on growth is consistent with the so-called "Africa dummy" found to be either low or negative in growth regressions (cf. Temple, 1999; Temple & Johnson, 1998). If KE is an output, the results reflect the fact that in this group of countries KE is a tiny fraction of the general economy. Hence, whereas the econometrician purist would be troubled by the low level of statistical significance, we insist that the results are indicative of economic significance and relevance of the situation, and recommend further research. Such research could focus on the

possibility of specification bias (wrong functional forms), miss-specification (wrong variables included or correct variables excluded), or on the estimation techniques. One possible suspect of miss-specification in this respect is the dynamics of closing business, which we excluded from the regressions due to inadequate data. But even without that effort, it is the case that low adjusted R-squares and F-statistic are not zero, and hence the coefficients of included variables are not simultaneously equal zero.

Regarding the third-stage estimation results, the hypotheses we set out to investigate have been overwhelmingly validated. For example: *Education* from starting and doing business is associated with growth, which in turn influences the quality of development (*Hypothesis 1*); *ICT* from starting and doing business is associated with growth which influences the quality of development (*Hypothesis 2*); *Innovation* from starting and doing business is associated with growth which influences the quality of development (*Hypothesis 3*); *Economic incentives* from starting and doing business is associated with growth which influences the quality of development (*Hypothesis 4*); and *Institutional regime* from starting and doing business is associated with growth which influences the quality of development (*Hypothesis 5*). Obviously not all associations are statistically significant, but that does not bother us greatly, because, given the small number of observations we had to work with, we are comfortable taking a minimalistic approach by not placing too much emphasis on the magnitude of estimated coefficients, relative to their signs. We understand that the low magnitude of parameter is due to the varying degrees of adjusted (linearized) coefficients of determinants across various stages of the empirical analysis. Econometrically speaking, linearity in the parameters is not the same thing as linearity in the variables. Even so, a key policy conclusion one can draw from the results so far is that they dispute categorical statements that the African business environment is bad for inclusive development, worse for economic growth, and crippling (worst) for KE. In what follows below we stress the results in detail in respect of specific hypotheses.

First, we have found that the African business environment influences the quality of education which logically has growth enhancing benefits that ultimately improve inclusive human development. This finding is consistent with the African entrepreneurship literature as it relates to general education. Greater business exposure – including exposure to entrepreneurial studies –

boosts students' entrepreneurial acumen, sharpness, propensity, and even youth entrepreneurship, resulting in needed financial literacy (Singh, et. al., 2011; Gerba, 2012; Oseifuah, 2010; Ita et al., 2014). From that viewpoint inclusive human development is in line with Mensah & Benedict's (2010) study on the positive impact of starting and doing business on poverty reduction. Two other related perspectives hold that the production value of knowledge (education), and positive human capital externalities from learning in the African continent, which are increasingly and strongly influenced by the positive business environment, also have growth-enhancing effects on inclusive human development (Amavilah, 2009; Wantchekon, et. al., 2014).

The following policy implications are relevant to boosting the education dimension of KE: improving of the knowledge infrastructure, fighting brain drain, improving the nexus between technological science and industry, updating the academic curricula of sampled countries and greater support for Research & Development (R&D). These all would enable the continent to reap the educational benefits accruing from an increasingly vibrant business environment. Reinvigoration of learning should not be restricted to general formal education. In addition to vocational & technical training, governments should adopt lifelong learning strategies like 'work place trainings' in order to keep workers abreast with the challenges of the business environment. Again, this is not a realization; whereas the general economy depends on factors of production and the current state of technology, KE depends on technological change, which is a function of human capital accumulation.

Second, the confirmed hypothesis on ICTs is in line with the recent literature. The ICT and African business have been related over the past decade. Asongu (2013b), for instance, shows that the positive correlation of ICT with the informal financial sector has led to substantial growth-enhancing benefits of inclusive development, especially in terms of mitigating poverty, for a previously marginalized portion of the population (Demombynes & Thegeya, 2012; Jonathan & Camilo, 2008; Asongu, 2015).

As a policy implication, substantial investment in ICT infrastructure would go a long way toward improving both growth and inclusive development. While business constraints are already

pushing most African governments into the direction of adopting such an initiative, pro-poor growth investment priorities in the implementation would still be critical to overall policy success. Like Tchamyou (2014a), we recommend that the ICT-friendly measures be implemented in collaboration with other soundly integrated policies that take into account policies such as a policy of industrialization, a regulatory & competitive policy, and a vibrant computing-literacy, and numeracy policy. Since, there is already a growing consensus that liberalization of the ICT sector in Africa has had considerable pro-poor benefits (Asongu, 2015), the liberalization policy could consolidate the insights from Korea's success story. According to Suh & Chen (2007), in Korea policies favoring ICTs have been motivated along three main axes: an industrial policy requiring sound R&D and venture capital; a 'competitive & regulatory' policy entailing privatization and market liberalization, and an 'active policy of information' requiring the setting-up of electronic governance mechanisms and building of advanced infrastructure.

Third, the positive effect of business activities on innovation in terms of STJA provides interesting insights on the need to invest more in the production of scientific publications in African countries that is presently lagging behind that of other regions of the world. Chavula (2010, p. 20) has found an insignificant positive relationship between STJA and growth in Africa. Hence, by introducing business dynamics and inclusive development dimensions into Chavula's analysis, we have provided new and clarifying insights into these interrelationships. STJA could be enhanced through less tight Intellectual Property Rights (IPRs) regimes on determinants of scientific publications like software (Asongu, 2014b) that have been established to be pro-poor in Africa (Asongu, 2014c).

As a policy implication, bold initiatives are essential to boosting science & technology in institutions of higher learning. This would require among others, an innovation policy that is consistent with Africa's level of development, and in this sense policies favouring reverse engineering may be worthwhile, because the technology in the sampled countries is more imitative and adaptive than anything else. This line of policy recommendation is in accordance with the underlying factors of the East Asian Miracle (Andrés et al., 2014). However, it is still worth noting that, following Romer (1993) and Lewis (1955), Amavilah (2005) has added that

the technology that matters to long-run economic growth is not only a function of resources alone; it is also determined by the *interactions* and *intra-actions* among resources. For example, huge investments in educational (school) and/or research structures, physical or virtual, along with mediocre investments in teachers, students, and researchers, are likely less productive than small investments is both "objects" and "ideas", to use Romer's lingo (Amavilah, 2005). This perspective is consistent with Schultz's (1981) call for 'investment in people', and Lucas's (1993) conclusion that the Asian growth miracle was really just a man-made miracle. This is similar to Lewis (1955[1965]) take that "E*conomic growth depends on upon technological knowledge about things and living creatures, and also upon social knowledge about man and his relations with his fellowmen. The former is often emphasized in this context, but the latter is just as important since growth depends as much upon such matters as learning how to administer large scale organizations, or creating institutions which favor economizing effort, as it does upon breeding new seeds or learning how to build bigger dams*" (p. 164, added stress).

Fourth, it is natural to expect an improving business environment (like the one currently unfolding in Africa) to stimulate economic incentives by means of credit facilities which ultimately engender growth and inclusive human development. However, documented surplus liquidity issues severely constrain financial allocation efficiency in Africa, and the resulting inefficiency is not a good channel to inequality mitigation (Saxegaard, 2006; Asongu, 2013a). As a policy implication, capital requirements in Small & Medium Size Enterprises (SMEs) should be adequately addressed, because, relative to multinational companies (MNCs), pro-poor externalities from SMEs are likely larger than those from MNCs.

Fifth, the finding related to the hypothesis on the institutional regime pillar of KE clearly articulates the imperative of good institutions in growth, which extends to inclusive development. This also supports a clarification by Amavilah et al. (2014) of Andrés et al. (2014) on the positive role of institutions in KE-related development when more factors are taken into account. Among other studies on institutions, Oluwatobi et al. (2014) have recently established that government effectiveness and regulation quality are the most relevant for growth enhancing innovations. Again, this is in line with the critical dimension of institutions for the emergence of Africa stressed in Fosu (2013ab) and Musila & Sigue (2010, 2011), and inclusive development

discussed by Mlachila et al. (2014). Improvement of the institutional regime component should be in conjunction with other economic policies already discussed.

Sixth, we will be remiss if we did not point out that incidental to the main purpose of this study, the results also reveal other interesting insights as well as important implications associated with the control and other variables of the study. Among these foreign aid (proxied by NODA) is inversely related to inclusive development. Such a result is familiar to the aid-growth debate and we stay away from that debate in this paper, except mention that foreign aid to many African countries has often been crisis-driven as the current effort on Ebola in three West African countries demonstrates. More the most part, such aid has been helpful only insofar as it might keep the recent alive, but less effective in promoting growth, least reducing poverty – obviously a normative statement on our part.

In addition to foreign aid, and inflation discussed already, the net effects on inclusive development of investment are positive. However, it turns out private investment is generally less effective as a means of promoting inclusive development than public investment. In fact, while the effects of public investment on inclusive development are positive, those of private investment are negative, especially with respect to ICT, STJA, Creditex and Instireg. It would seem reasonable to conclude that public policy in these African countries overstresses foreign aid and FDI even though greater benefits lie in supporting the local business environment. Having said a mouthful, we pause to admit that this paper does not offer definitive answers, but it does indeed provide enough fodder for further research, and a firm foundation for improving policymaking in this group of countries. How demonstrable this analysis to policy in other countries represents future research opportunities.

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