



Enhancing ICT for inclusive human development in Sub-Saharan Africa[☆]



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ABSTRACT

This study assesses if increasing information and communication technology (ICT) enhances inclusive human development in a sample of 49 countries in Sub-Saharan Africa for the period 2000–2012. The empirical evidence present in this study, is based on instrumental variable Tobit regressions, in order to account for simultaneity and the limited range in the dependent variable. In the interest of increasing room for policy implications and controlling for the unobserved heterogeneity, the analysis is decomposed into the fundamental characteristics that human development is based on: income levels, legal origins, religious dominations, political stability, landlockedness and resource-wealth. Our findings show that policies designed to boost ICT (mobile phone, internet, telephone) penetration will increase inclusive development in the post-2015 sustainable development agenda. The degree of positive responsiveness of inclusive development to ICT varies across fundamental characteristics of human development and ICT dynamics. This study finds evidence of synergy in mobile phone penetration and such synergy is driven by non-oil exporting countries. The study has substantial policy relevance because the adoption and/or penetration rate of ICT can be influenced by policy to achieve inclusive development outcomes. Further policy implications are also discussed.

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1. Introduction

This study investigates whether increasing information and communication technology (ICT) adoption affects inclusive human development in Sub-Saharan Africa (SSA). The academic and policy importance of the study is fourfold: the relevance of the knowledge economy for economic development in the 21st century and Africa's lagging position as a knowledge economy; the comparatively high potential for ICT penetration in Africa; growing exclusive development in SSA and the increasing relevance of ICT in inclusive development¹.

There is a strong consensus in the existing literature that the knowledge economy is central to economic and human developments in the 21st century (see Tchamyou, 2016; Kuada, 2015). According to the narrative, knowledge-based societies are more likely to successfully confront the challenges that globalisation poses to development. Globalisation has become an ineluctable phenomenon, which if neglected can endanger the prosperity of nations at both the macro

and micro levels. Among the four components of the World Bank's knowledge economy index, ICT is most likely to exert the highest effects on economic and human development landscapes because of its potential for penetration².

Recent literature has shown that compared to other regions of the world where the penetration of ICT has reached saturation levels, there is still great room for its accommodation in Africa (see Penard et al., 2012; Asongu, 2015a). While some emerging economies (e.g. in Asia and Latin America) and developed nations are currently witnessing stability in ICT penetration, Africa still has great potential for its adoption. The policy relevance of this fact becomes clear when one considers that on the one hand, the SSA region has increasingly been experiencing non-inclusive development, while elsewhere, ICT has been documented to play a substantial role in promoting inclusive development (Alkemade and Surrs, 2012; Ojo et al., 2013; Mishra and Bisht, 2013). Extreme poverty has been decreasing in almost all regions of the world, however, within the region of SSA, there has been growing exclusive development and increasing poverty.

This has recently been further substantiated by a 2015 World Bank report on Millennium Development Goals (MDGs), which has revealed

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¹ It is important to note that the relevance of knowledge economy in development also depends on the status of the so-called "pre-knowledge" economy.

² The other three components of the knowledge economy index are: (i) economic incentives and institutional regime, (ii) innovation and (iii) education. While the first-two are progressing at a slower rate than ICT, the third is already reaching the maximum limit or a saturation point of 100% academic enrolment.

that extreme poverty has been progressing in Africa (see [World Bank, 2015](#)). The worrisome statistics showed that almost half of the countries in SSA were considerably off-track from achieving the MDG extreme poverty target, and this was apparent during an époque when the sub-region enjoyed a growth resurgence that began in the mid-1990s. It logically follows that the fruits of economic prosperity have not been trickling down to the poorest stratas of the population.

An interesting strand of literature documents the inclusive development outcomes of ICT, notably, in terms of: gender empowerment ([Maurer, 2008](#); [Ojo et al., 2013](#)); access to health care from the population in the low socio-economic strata (see [Kliner et al., 2013](#)); boosting of financial inclusion ([Kirui et al., 2013](#); [Singh, 2012](#)); mitigation of the development divide between urban and rural areas ([Qiang et al., 2011](#); [Chan and Jia, 2011](#)); purging of agricultural wastes as well as demand- and supply-side constraints/mismatches (see [Muto and Yamano, 2009](#); [Aker and Fafchamps, 2010](#)); efficiency in the management of households ([Al Surikhi, 2012](#)) and enhancement of business avenues, especially for small and medium sized corporations ([Asongu, 2015b](#); [Ondiege, 2010](#); [Mishra and Bisht, 2013](#)). In essence, besides easing business operations ([Kuo and Yub, 2006](#); [Jin and von Zedtwitz, 2008](#); [Kumar and Zahn, 2003](#); [Lee et al., 2010](#)), the ICT revolution has also substantially contributed to promoting non-exclusive development.

Noticeably, the existing literature has not engaged the positive effects that increasing ICT can have on inclusive human development in SSA. This inquiry seeks to fill the corresponding research gap in the existing literature. In essence, this study incorporates the four strands discussed above, by assessing how an increase in ICT levels would affect inclusive human development. The connection of the inquiry to the four underlying strands can be summarised in a single sentence: due to the increasing relevance of knowledge economy in 21st century development, the established role of ICT in inclusive development, the comparatively high potential for ICT penetration in SSA and evidence of exclusive development in the sub-region, this study investigates how increasing ICT adoption/penetration affects inclusive human development in SSA. The study has substantial policy relevance because the adoption and/or penetration rate of ICT can be influenced by policy to achieve inclusive development outcomes.

In order to increase the set-space for policy implications, the analysis is further classified by the fundamental characteristics of human development, based on: legal origins (French civil law versus (vs.) English common law); income levels (low income vs. middle income); religious domination (Islam-oriented vs. Christian-dominated); openness to sea (un-landlocked vs. landlocked); conflicts (political stability vs. political instability) and resource-wealth (non-petroleum vs. petroleum exporting) countries. The fundamental characteristics chosen are consistent with the recent literature on inclusive human development ([Asongu and Nwachukwu, 2016a](#)). Further justification for the choice of the fundamental characteristics is provided in [Section 4.2](#).

2. Theory and empirical evidence

The importance of knowledge in general and ICT in particular in economic development have substantially been documented in the literature on economic and management sciences ([Asongu et al., 2016](#)). There exists a consensus on a two-way causality flow between knowledge and economic development. As opposed to neo-classical models of economic development that consider knowledge and technology as public commodities that are completely exogenous to the economic system, new economic development is founded on both endogenous interpretations and neo-Schumpeterian perspectives of economic development ([Howells, 2005](#)). In line with new growth models, advancement in technology is the outcome of direct engagement/investment by citizens through the mobilization of critical resources that are linked with human capital (see [Romer, 1990](#)).

In the light of above, the new theory of growth conceives technology within the perspective of private goods (i.e., as an excludable

commodity)³. Moreover, the generation of knowledge which is potentially associated with creating new intellectual property as well as other forms of rewards for technology can also be considered a private good ([Solow, 1994](#)). While the private features of technology (e.g. patents and monopolistic power) have been articulated in some models of economic development, there are some scholarly positions substantiating the thesis that rents resulting from monopoly are for the most part, temporary ([Uzawa, 1965](#)). According to [Romer \(1990\)](#), progress in technology can both be simultaneously exogenous (or driven by external factors) and endogenous (or driven by internal factors), in that certain technological characteristics predispose the technology to become a public good and/or service with the passage of time. [Romer \(1990\)](#) further substantiates that due to cross-country technology spillovers, the benefits from technology enjoyed by countries are heterogeneous (or varying). It follows that technological development could lead to disequilibrium in economic and human development processes that elicit cross-country differences in economic development (see [Verspagen, 1992](#)). [Rosenberg \(1972\)](#) subscribed to the view that the propensity of employing novel technologies for productive purposes is critical to explaining economic development. It thereby follows that output from technology can be leveraged for inclusive development purposes.

Outputs from ICT denote important determinants of sustainable and inclusive development, both from national and business perspectives. This is essentially because they are affected by a multitude of characteristics which entail among others, further advances in ICT. Accordingly, an essential factor for ICT advancement is human capital which [Coleman \(1988\)](#) defines as an individual's knowledge, expertise and abilities that lead to economic development. This economic development could be inclusive or non-inclusive, which is fundamentally the purpose of the present study.

By engaging in this inquiry, we also contribute to clarifying cautious positions in the literature suggesting that ICT should not be considered as a silver bullet of economic development unless the relationship is substantiated by empirical studies ([Mpogole et al., 2008](#), p. 71). In contributing to the macroeconomic literature on technology management for inclusive development outcomes, the study deviates from mainstream corporate and microeconomic technological innovation literature on technology management for business purposes. Accordingly, some of the recent themes have included: opportunity creation and discovery within the framework of disruptive innovation ([Wan et al., 2015](#); [Hang et al., 2015](#)); opportunity identification by scientific entrepreneurs ([Maine et al., 2015](#)); growing ecosystems (see [Overholm, 2015](#)); engagement of entrepreneurial innovators that leverage on evolving financial skills and resources ([Best, 2015](#)); business opportunities from an ageing population ([Kohlbacher et al., 2015](#)) and technological innovation for novel avenues as a consequence of road-mapping in patents ([Jeong and Yoon, 2015](#)).

Our study complements an evolving strand of literature on distribution externalities (see [Cozzens, 2011](#)). Under this canopy, our study is closest to a growing stream of literature on the importance of ICT for development outcomes and social change ([Islama and Meadeb, 2012](#); [Brouwer and Brito, 2012](#); [Mira and Dangersfield, 2012](#)). While the existing literature concentrates on both developed (see [Thakar, 2012](#)) and developing ([Sonne, 2012](#); [Gupta and Jain, 2012](#)) countries, the policy syndrome of non-inclusive development is more striking in developing nations like those in SSA: a sub-region that has increasingly been experiencing extreme poverty, despite having enjoyed more than two decades of resurgence in economic growth ([Fosu, 2015a](#), p. 44).

³ The key characteristic of an excludable commodity is that consumers that have not paid for it, cannot have access to it or gain any utility from its existence. In contrast, a non-excludable commodity is one which once provided, accrues equal benefits to all irrespective of whether they have paid to access it. Thus, a non-excludable commodity can be consumed by many consumers at the same time without depleting the commodity.

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