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Educational quality thresholds in the diffusion of knowledge with mobile phones for inclusive human development in sub-Saharan Africa

Simplice A. Asongu[a,*], Jacinta C. Nwachukwu[b]

[a] Development Finance Centre, Graduate School of Business, University of Cape Town, Cape Town, South Africa
[b] School of Economics, Finance and Accounting, Faculty of Business and Law, Coventry University Priory Street, Coventry CV1 5FB, UK

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ABSTRACT

The study investigates critical masses or thresholds of educational quality at which the diffusion of information with mobile phones enhances inclusive human development. The empirical evidence is based on simultaneity-robust Fixed Effects regressions with data from 49 Sub-Saharan African countries for the period 2000–2012. The following findings are established: (1) There are positive marginal and net effects on inclusive development from the interaction between mobile phones and educational quality, (2) Between 10 and 27 pupils per teacher is needed in primary education in order for mobile phones to enhance inclusive human development, (3) From a comparative dimension: (i) English Common law countries enjoy higher net effects compared to their French Civil law counterparts, (ii) positive net effects are more obvious in politically stable (vis-à-vis politically unstable) countries, (iii) positive net impacts are also more apparent in resource-poor (vis-à-vis resource-rich) countries, (iv) low income (vis-à-vis higher income) countries have a higher net effect on inclusive development, (v) landlocked (vis-à-vis unlandlocked) countries experience higher net effects and (iv) Islam-dominated countries have a slightly higher net impact compared to their Christian-oriented counterparts.

1. Introduction

This study investigates thresholds of educational quality at which the diffusion of information with mobile phones improves inclusive human development in Sub-Saharan Africa (SSA). The academic and policy relevance of the inquiry are at least threefold, notably: (i) increasing levels of extreme poverty in the sub-region, (ii) the high potential for mobile phone penetration in Africa vis-à-vis other world regions and (iii) the growing relevance of a knowledge economy in 21st century development.

First, extreme poverty levels are staggering in SSA because as a recent World Bank report on the attainment of Millennium Development Goals (MDGs) has shown, extreme poverty has been decreasing in all regions of the world with the exception of SSA where about 45% of countries in the sub-region have been experiencing increasing extreme poverty levels (Asongu and Kodila-Tedika, 2017; World Bank, 2015).[1]

Second, compared to other regions of the world, there is a great potential for mobile phone penetration in Africa.[2] According to Penard et al. (2012) and Asongu (2017a), whereas some emerging countries (e.g. in Latin America and Asia) and developed countries are experiencing stabilisation in the penetration of information and communication technology (ICT), there is still a healthy room for leveraging mobile phones for development purposes in Africa. ICT has been established to contribute to inclusive and sustainable development (Alkemade and Surrs, 2012).

Third, educational quality has been documented to be valuable at enhancing inclusive development in developing countries (Dakhi and de Clereq, 2007; Dunlap-Hinkler et al., 2010). Beside the relevance of an excellent educational system, the post-2015 sustainable development agenda is centred on 'knowledge economy'-driven policies. According to Tchamyou (2016), a knowledge economy is indispensable in

* Corresponding author.
E-mail addresses: asongus@afridev.org (S.A. Asongu), jacinta.nwachukwu@coventry.ac.uk (J.C. Nwachukwu).

[1] According to Ravallion et al. (2008), extreme poverty which was originally defined by the United Nations in 1995 is an economic condition that is characterised by substantial deprivation in basic human needs, notably: health, education, shelter, safe drinkable water, food and information. While in 2008 the international poverty line was 1.25US$ per day (in 2005 prices), up from 1.00 US$ per day in 1996; in 2017 it is 1.90US$ per day. The number of people living in extreme poverty has been increasing in Sub-Saharan Africa, probably because the benefits of over two decades of economic growth resurgence have not been distributed equitably across the population.

[2] The terms, 'mobile phone penetration', 'mobile telephony', 'mobile' and 'mobile phones' are used interchangeably throughout this paper. It is important to note that "mobile phone" and "mobile telephony" respectively relate to hardware and service provision.

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addressing contemporary development challenges.[3]

This investigation incorporates the three strands above by using educational quality as a policy variable in the role of mobile phones for inclusive development. In theory, the above justifications are connected with the present inquiry because the educational quality and the growth potential of the mobile phone can be successfully harnessed to tackle the policy syndrome of non-inclusive development in SSA. Furthermore, there have been increasing requests for more research on the development outcomes of mobile phones, partly because caution has been expressed in scholarly circles for the mobile phone not to be considered as a silver bullet for development (Mpogole et al., 2008, p. 71).

The positioning of this paper contributes to the extant literature on the importance of mobile phones in inclusive human development. Most specifically, (i) empowerment of the female gender (Maurer, 2008; Ojo et al., 2012); (ii) improvement of health services for the underprivileged (Kliner et al., 2013); (iii) enhancement of financial inclusion (Kirui et al., 2013; Singh, 2012); (iv) reduction of the rural–urban poverty gap (Chan and Jia, 2011; Qiang et al., 2011); (v) elimination of demand–supply divergences, (vi) reduction of agricultural wastes from demand−/supply-side constraints (Aker and Fafchamps, 2010; Muto and Yamano, 2009); (vii) social change and development (Afutu-Kotey et al., 2017; Amankwah-Amoah, 2015, 2016; Amankwah-Amoah and Sarpong, 2016; Gupta and Jain, 2014, 2015); (viii) inequality adjusted human development (Asongu and Le Roux, 2017); (ix) household management efficiency (Al Surikhi, 2012) and (x) consolidation of opportunities in business (Asongu, 2015; Mishra and Bisht, 2013; Ondiege, 2010). Accordingly, in addition to facilitating the doing of business (Jin and von Zedtwitz, 2008; Kumar and Zahn, 2003; Kuoa and Yub, 2006; Lee et al., 2010), the revolution in mobile phone usage has led to substantial positive externalities in inclusive human development.

This study extends the aforementioned stream of literature by investigating policy thresholds at which educational quality can complement mobile phones in order to promote inclusive human development in SSA. In other words, we seek to investigate the role of educational quality in modulating the effect of mobile phones on inclusive human development. Educational quality which is measured in terms of the number of pupils per qualified teacher in primary schools is an input variable. The notion of threshold represents the minimum requirements in educational excellence needed to achieve inclusive human development with mobile phones. In order to enhance the opportunity for policy implications, the analysis is further decomposed into fundamental characteristics of human development based on income levels (upper middle income, middle income versus low income); legal origins (English common law vs. and French civil law); religious domination (Christian-oriented vs. Islam-dominated); openness to sea (landlocked vs. coastal); mineral resource-rich (petroleum vs. non-petroleum exporting); conflict (politically stable vs. unstable) countries.

By contributing to the macroeconomic literature on the management of technology for non-exclusive outcomes, this study steers clear of mainstream microeconomic and corporate technological innovation literature on the management of technology for business opportunities. To be sure, some of the categories in the bulk of corporate technological innovation literature have included: opportunity discovery and opportunity creation within the setting of disruptive innovation (Hang et al., 2015; Wan et al., 2015); governance for entrepreneurship (Asongu et al., 2017b); identification of opportunities by scientific entrepreneurs (Maine et al., 2015); emerging ecosystems (Overholm, 2015); targeting of entrepreneurial innovators who are innovating continuously because of evolving financial resources and skills (Best, 2015); entrepreneurial avenues for the ageing (Kohlbacher et al., 2015) and innovation in technology for road-mapping new opportunities in patents (Jeong and Yoon, 2015).[4]

In the light of the above, this study complements the aspects of studies on distributional externalities (Cozzens, 2011). Within this framework, our study is closest to the growing stream of inquiries on the importance of mobile phones in social change and development outcomes (Brouwer and Brito, 2012; Islama and Meadeb, 2012; Mira and Dangersfield, 2012). Whereas, the underlying literature has been documented on both developing (Gupta and Jain, 2012; Sonne, 2012) and developed (Thakar, 2012) countries, the policy challenges are more apparent in developing countries, especially in SSA. This region is experiencing limited development outcomes, despite enjoying more than two decades of growth resurgence (Fosu, 2015a, p.44).

The rest of the study is structured as follows. Theoretical underpinnings are engaged in Section 2 while the data and empirical methodology are covered in Section 3. Section 4 presents and discusses the findings whereas Section 5 concludes with future research directions.

2. Theoretical background

2.1. Innovation and growth

Consistent with Asongu et al. (2016), the relevance of ICT and knowledge in economic prosperity has long been documented in the management and economics literature. In general, these writers, acknowledged a two-way causality between economic activity and knowledge. Contrary to early neo-classical frameworks which conceived technology and knowledge as a kind of public commodity and exclusively exogenous to the economic system, novel models of economic prosperity are based on both neo-Schumpeterian and endogenous interpretations of economic development (Howells, 2005). In accordance with new models of growth, progress in technology is the result of direct investment and actions by people via the mobilisation of fundamental resources associated with human capital (see Romer, 1990).

Within the above context, the theory of new growth considers technology in terms of a knowledge generation and private commodities which can be rewarded with intellectual property rights, as well as other forms of returns in innovation (Solow, 1994). Whereas the private characteristics of technology (e.g. monopolistic power and patents) have been confirmed in economic models, some scholars believe that monopolistic rents in technology are temporary and incomplete (Uzawa, 1965). The postulation that technological progress and innovation can both be endogenous and exogenous to an economic system has been supported by Romer (1990) who argued that certain features in technology predispose it to become a public commodity as time unfolds. According to Romer, because of cross-country spillovers in technology and innovation, countries experience heterogeneous benefits from innovations in technology. Hence, innovation could result in a disequilibrium in processes of human and economic developments, which explains cross-country variations in economic prosperity (Verspagen, 1992). This narrative accords with Rosenberg (1972) who earlier authenticated that the degree by which novel technologies are employed for productive processes are fundamental in explaining economic development. Therefore innovation outputs can be harnessed for inclusive development.

2.2. Innovation outputs and inclusive development

Innovation outputs represent important drivers of inclusive and sustainable development at corporate and national levels because they

[3] Education, knowledge and access to accurate and timely information are also important to avoid the failure of investments in African business and development projects (Hashim, 2014; Ika and Saint-Macary, 2014; Joseph et al., 2014; Ofori, 2014).

[4] This paragraph aims to position the study within the context of recent information technology and technology management literature.