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IMPLICATIONS OF DIGITALIZATION ON INDIVIDUAL'S WELLBEING IN CAMEROON

Eric Patrick FEUBI PAMEN*
[armeric_63@yahoo.com / feubieric@yahoo.com, Ph: (+237) 242 708 911/ +237 699190362 / (+221) 776 848 736, Laboratory of Analysis and Research in Mathematical Economics (LAREM, University of Yaounde 2-Soa) and CEDIMES (France)]
And
Carele Guilaine DJOFANG YEPNDO*
[E-mail: carelguilan@yahoo.fr, Phone: +237 674 288 252/ (+237) 696 107 324, Sub Regional Institute of Statistics and Applied Economics (ISSEA-CEMAC) and University of Dschang]

*Po Box: 562, Yaounde - Cameroon.

ABSTRACT

In this study, we use a tractable econometric model focusing of individual wellbeing captured through expected income in a given location, as the main economic determinant of the use of digital technologies in Cameroon. The model is estimated using panel date from the National Institute of Statistics on individuals who achieved at least the post-secondary education level, aged above 25 years old and heading a household. Our main findings is that using digital technology is substantially influenced by income prospects. We see that, distance between main cities from the previous position, characteristics/standards of house, place of living (rural/urban), marital status and household's size are significant as per regard to the decision of an individual to change his current position through moving to digital technologies as the required condition. Individual's age, level of education (more than post-secondary achieved), and current status in employment (wage/grade /year of experience) are also significant. Controlling for these parameters, moving decision to digital technologies and changing the current position are significantly affected by expect wage/grade in the new position. The elasticity of the relationship between wage and digital technologies use is closed to 0.75. Such results stand like an optimal search of the best wage matching with the position of an individual in a given place. Workers receiving their expected income in the current position have a great probability to stay without being tempted to use digital technologies to move to another position. Achieving the 2020 connect agenda "internet access for all", in Cameroon could be suitable for individuals to really improve of their wellbeing. We suggest to policy makers development of ICTs infrastructure all over the country. That may lead to an inclusive approach of promoting economic growth and share prosperity.

Keys words: Digitalization, wellbeing, discrete choice model, Cameroon.
JEL Classification: C, D, I.

I. INTRODUCTION

Over the last decade, the development of the digital economy has created unprecedented opportunities for growth and inclusiveness within and between countries, regardless the continent. In this increasingly interconnected world, digitalization stands like a driver for social and economic inclusion. It gives people and organizations of any size access to a global marketplace and repository of information. To the benefit of all economic sectors and consumers, it deepens and broadens trading patterns, takes productivity to a higher level, and scales up services. It allows customizing production, facilitates new forms of collaboration, accelerates access to knowledge, inspires innovation and entrepreneurship, and fosters competition. According to the World Bank (2016), digital economy represents around 5% of the global Gross Domestic Product (GDP) and 3% of global employment. Bukht and Heeks (2017), add that the global North has the lion's share of the digital economy but growth rates are fastest in the global South with more than 6% of GDP. It is for all those reasons that stakeholders are on the track of achieving the 2020 connect agenda "internet access for all".

The emerging digital Media, Entertainment and Information Industries (MEII) offerings are for example the main driver to smartphones, tablets, laptops, 3D printers, netbooks and others connected device adoption, as well as to our changing relationship with many other elements of daily life, such as health, consumer products and mobility. Between 2000 and 2017 in Cameroon, the number of internet users rose from 20,000 to 4,909,178. This is an increase of about 99.59% in just more than a decade. As around the world, people in Cameroon now spend more time using laptops, computers and smartphones than they do in others daily activities, and the time they spend connected is rising. This hyper-connectivity affects how individuals interact with one other, how they learn and work, in ways that are both profound and impactful.

The economics literature also establishes a positive relationship between digital technologies, productivity, growth and wellbeing. New digital technologies are particularly important to better connect disadvantaged groups (OECD, 2016b). For example, mobile connectivity in Cameroon helps reaching remote populations as well as those with lower incomes, due to its low costs. Pantea and Martens (2014) find that low-income users spend even more time on the internet than the average, browsing websites that deal with education, career opportunities, health and nutrition themes and online sales platforms. Potential benefits for low-income groups also relate to improved access to free or very low-cost knowledge and information; services that allow consumers to negotiate better prices for products (as well as identify better quality products); as well new consumption opportunities offered by Internet-based platforms.

Technological innovations in the financial and health sectors can also promote social inclusion. Digital lending innovations and innovative financing like peer-to-peer lending and crowdfunding platforms have the potential to fill a bank lending gap and improve access to finance for both households and small enterprises, allowing for the participation of small investors. Financial innovations will, however, require an appropriate regulatory and legal framework ensuring transparency and accountability. Tailored financial education programmes can enable individuals and small businesses to make use of these new opportunities and help them make informed choices. In the health sector, a study by Deloitte (2015) also finds that digital technologies enable patients and healthcare professionals to access data and information more easily and improve the quality of outcomes of both health and social care.

What then are the implications of digitalization on individual's wellbeing in Cameroon? The objective of this paper is to capture the effects of digitalization on individual's wellbeing in Cameroon, since the introduction of internet in the countries in 2000.

The interest of such a study for stakeholder is to know more about economic effects of digitalization and to look how they can regulate it. Since they are on the track of achieving the 2020 connect agenda: "internet access for all", in the current context the post-2015 development agenda.

II. LITERATURE REVIEW

A long-held tenet classical economic literature presents industrialization as the main growth's driver for emerging and low-income countries. Kaldor (1967) argues for example that the manufacturing sector promotes broad economic growth. According to Baumol (1967), the services sector is resistant to improvements in productivity. He assumed that the provision of services such as restaurant meals, haircuts or medical checkups, required face-to-face transactions. Since these services did not lend themselves easily to standardization and trade, the source of growth in productivity and hence incomes. With the industrial revolution in 1900s followed by the spread of the use of Information and Communication News Technologies (ICTs) more recently in 2000s, the ability to trade services has increased significantly. The share or services exports in total world exports of services and good increased from 8% in 1970s to about 19% in 2014, and the share of services export in world Gross Domestic Product (GDP) increase more than twice from less than 2% in 1970 to more than 6% in 2014[1]. According to Prakash et al (2017), the ability to trade services has increased significantly thanks to technology and service exports now account for almost a quarter of total exports. Service exports have also come to play a central role in global production networks and value chains. The main reason for the increased tradability of services is the revolution in ICTs and a declining trend in communications and telecommunications costs in many countries. That led to an increasing internet adoption around the world, coupled with a rapid proliferation of broadband internet services that have made arm's length delivery of services possible within and across borders on countries an continent. For example, if a haircut still requires moving to the nearest haircutter or barbershop, many other services no longer require the provider to be close to the customer. Mailing

[1] Prakash et al (2017).

services and even financial services are global and many consulting services, such as architectural designs, can be delivered from anywhere. Prakash et al (2017), also show that, thanks to ICTs progress, more and more manufacturing industries services are now tradable across countries. Trade is increasingly shifting away from manufactures into services with many added values in term of productivity at the macroeconomic level, with implications at the level of individuals or households.

The digital economy also has huge potential to enhance social wellbeing. Inequality, by definition, means that people do not have the same access to scarce resources, and that some do not have any access. New technologies in some cases can eliminate that scarcity. For example, new technologies can leverage human brain capacities and cognitive skills in similar ways to earlier breakthrough technologies, such as steam power and electricity, which magnified human physical strength. This holds the promise of similar or even greater increases in living standards, considering that digitized information can be reproduced at low cost and used simultaneously thus being far less subject to scarcity. Digital technologies can also promote social inclusion by creating better access to quality education and offering new opportunities for skills development (OECD, 2014a). Digital learning environments can enhance education in multiple ways, for example by expanding access to content to people from low-income backgrounds or disadvantaged areas, supporting new pedagogies with learners as active participants, fostering collaboration between educators and between students, and enabling faster and more detailed feedback on the learning process. Similarly, several authors argue that digital technologies have enormous potential to innovate and improve the quality of teaching, and more in general the learning experience (Yusuf, 2005; Jhurree, 2005; Hepp et al., 2004).

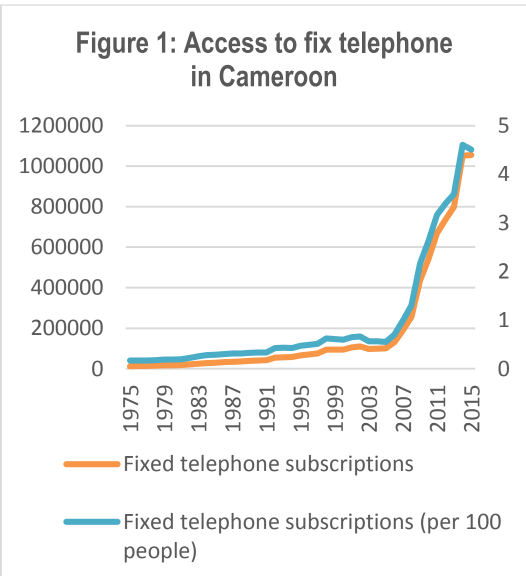
Some other scholars moved to study how digital technologies can affect wellbeing. For example, Atkinson and McKay (2007) argue that digital technologies are improving healthcare, access to education, the monitoring of the environmental quality, and that they are giving consumers the possibility of interacting more fluidly with business and governments. In fact, a sort of new industrial revolution is upon us, coupled to the social digital transformation carried by the Media, Entertainment and Information Industries (MEII). Since they provide the digital tools, services, applications and content we engage with, increasingly anytime and anywhere. Caceres B. (2007) focused on digital poverty in Peru and found that almost 70% of households are extremely digitally poor. They have no access to the internet, mobile and fixed phone, and receive information on through television and radio set. She argued that digital poverty does not exactly match economic poverty, digital poverty cuts along economic lines and there is more digitally poor households than economically poor ones. Moreover, main variables explaining digital poverty are electricity supply that determine the level of connectivity attained, income and education level achieved. More recently, Kanbur (2017) paid attention to the digital revolution and targeting public expenditure for poverty reduction. He revisits the fundamental of the theory of targeting to pinpoint the possible impact of the digital revolution of three dimensions that are information costs, high implicit marginal tax rate and political economy. He show that, digital revolution does not necessarily address all these issues in reducing poverty and may worsen the tradeoffs in certain situations, namely in terms of information cost in the absence of detailed income, consumption and living conditions data at the individual or household level.

In this paper ICTs related services took into account in relation to wellbeing are essentially connectivity, information, communication, and technology. Connectivity is seen through a means of communication that include end-user equipment, fixed or wireless network. Connectivity needs can be met with having access to and using radio receivers, television devices, fixed or mobile telephone services, and /or computers. Regarding information, it is having access to it through any means enabling creation, storage, diffusion, exchange and consumption. Communication is related to the type of means used to be connected. Technology is linked with Research and Development to improving the service quality.

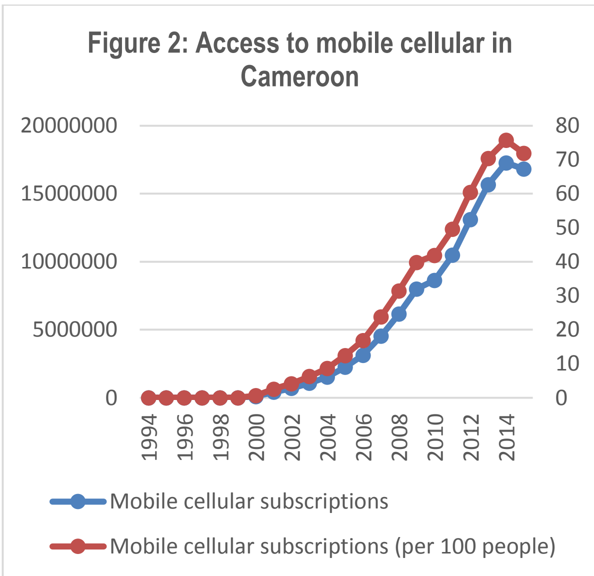
III. RECENT TRENDS OF DIGITAL ECONOMY IN CAMEROON

In the recent past, Information and knowledge have emerged as major sources of wealth in Cameroon. There is a digital revolution and it has impact and influence on the consumers, producers, investors, exporters, importers, public policy makers, academics, students, consultants, administrators, lawmakers and all others actors directly or indirectly involved in various processes of the new economy called digital economy. Some stylized facts of the digital revolution in Cameroon are showned below.

We can notice the rapid increasing number on subscriptions to mobile cellular from 103, 279 in 2000 to 16,806,894 in 2015 (figure 2), compared to the subscribers to fix telephone during the same period (figure 1).

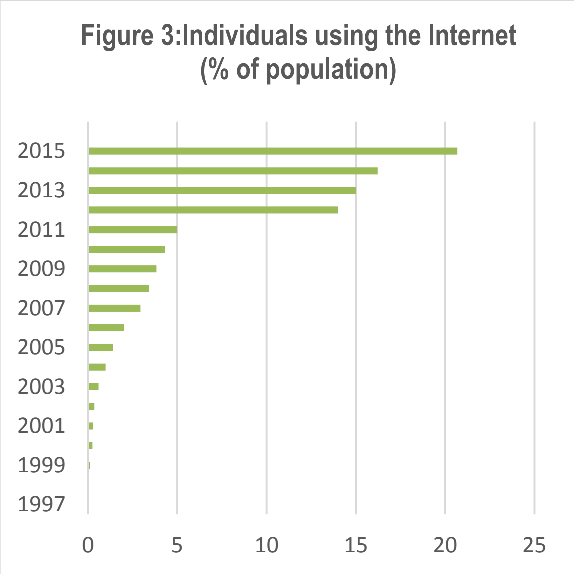


Source: Authors with NIS data



Source: Authors with NIS data

In 1997, less than 1% of the population has access to internet, today they are more than 20% using internet facilities, coupled with an increase of fixed broadband subscription per 100 people from zero to 8% during the last decade.



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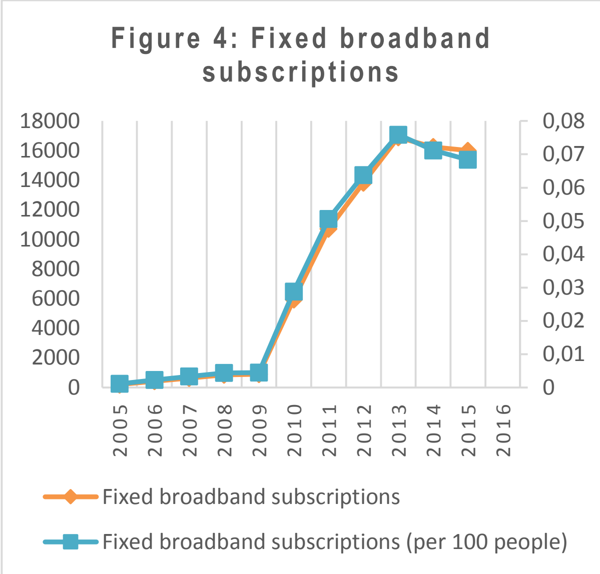

Source: Authors with NIS data

Another fact of the digital revolution is the use of social media. In Cameroon we notice about 2,100,000 facebook's subscribers in 2017(they are 146,637,000 in Africa), with facebook standing like the most used social media in Cameroon (92,11%) as it is also the case in Africa (86.75%) and worldwide (80.31%). According Global Web Index 2017 statistics, Whatsapp is the most frequently used social platform with 58% of its users online more than once a day.

Table 1: Social Media Statistics in Cameroon - September 2017

Facebook	92.11%
WhatsApp	62%
Pinterest	5.46%
Viber	40%
Snapchat	1%
YouTube	0.68%
Twitter	1.36%
Instagram	30%
LinkedIn	0.12%
Google+	0.1%

Source: Authors with Stat Counter, Global Stats and Miniwatts Marketing Group data

Table 2: Social Media Statistics in Africa - September 2017

Facebook	86.75%
WhatsApp	60%
Pinterest	4.55%
Viber	41%
Snapchat	3%
YouTube	4.02%
Twitter	3.62%
Instagram	0.21%
LinkedIn	6%
Google+	0.18%

Source: Authors with Stat Counter, Global Stats and Miniwatts Marketing Group data

Table 3: Social Media Statistics Worldwide - September 2017

Facebook	80.31%
WhatsApp	70%
Pinterest	8.39%
Viber	45%
Snapchat	10%
YouTube	1.82%
Twitter	6.01%
Instagram	1.07%
LinkedIn	16%
Google	0.83%

Source: Authors with Stat Counter, Global Stats and Miniwatts Marketing Group data

Financial services are also influenced by digitalization in Cameroon. Between 2014 and 2017, we notice the decreasing number of people having an account in financial institution (figure 5), while the number of people using a mobile account is increasing (figure 6).

Figure 5: People having an account at a financial institution

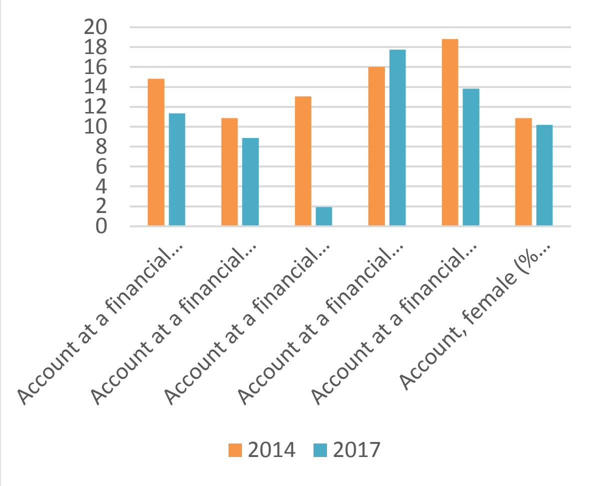

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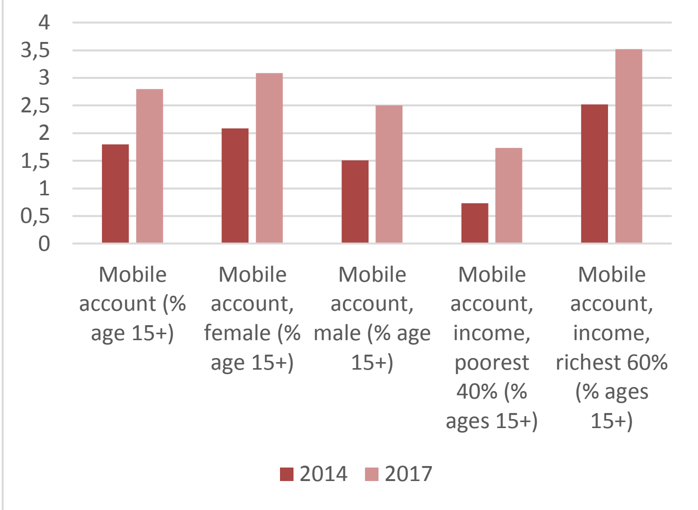
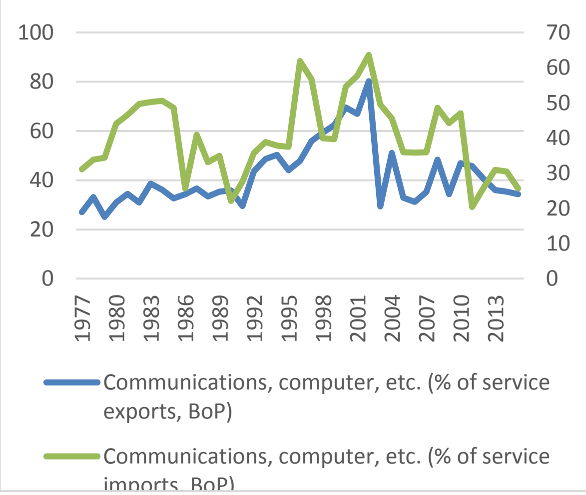
Figure 6: People having a mobile account



Source: Authors with NIS data

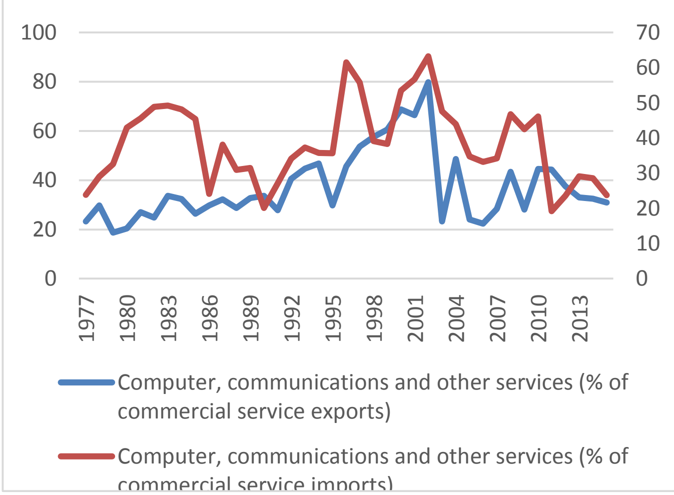
Regarding communication and computer services the introduction of new ICT in Cameroon in 2000 led to the simultaneous increase of services and commercial imports and exports, but with an higher level of imports (figure 7 et 8)

Figure 7: Communications and Computer services



Source: Authors with NIS data

Figure 8: Communications and Computer commercial services



Source: Authors with NIS data

As far as international trade is concern, ICT goods imports have an increasing trend on the last decade (figure 9) while ICT services export is also increasing but rather slowly (figure 10)

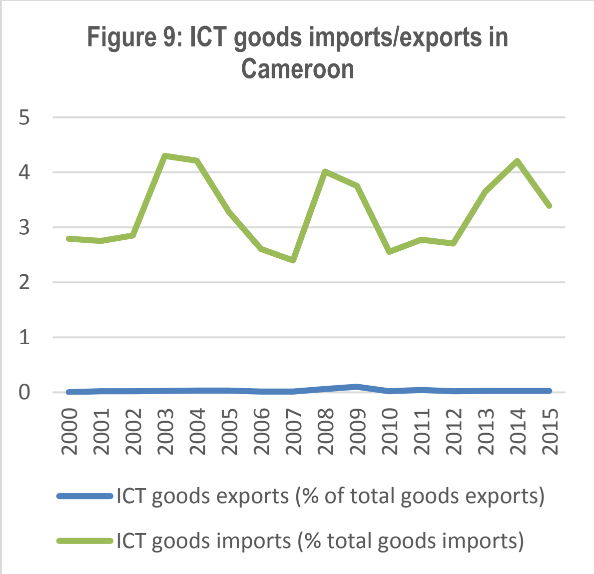


Figure 9: ICT goods imports/exports in Cameroon

Source: Authors with NIS data

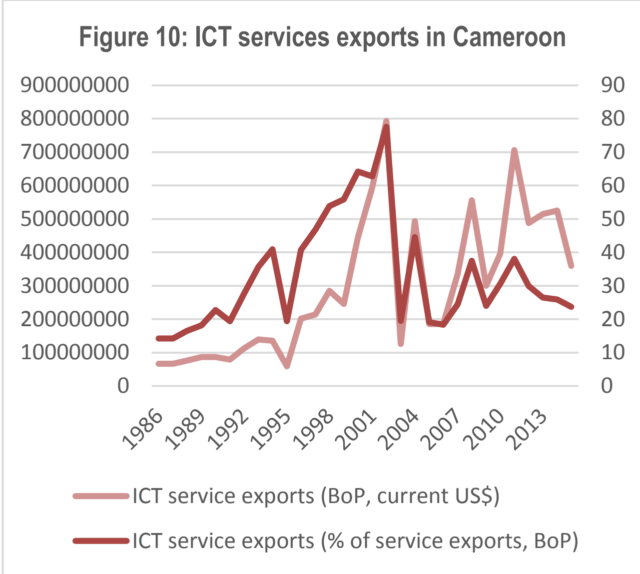


Figure 10: ICT services exports in Cameroon

Source: Authors with NIS data

In the meantime, due to digitalization we also notice the increase of high technology exports in Cameroon (from 3.187% in 1990 to more than 5% in 2010 for example) as shown on figure 11, couple with the growing investment in telecoms with private participation, despite negative effects of crisis (economics, financial, budgetary, security, …) in 2010s.

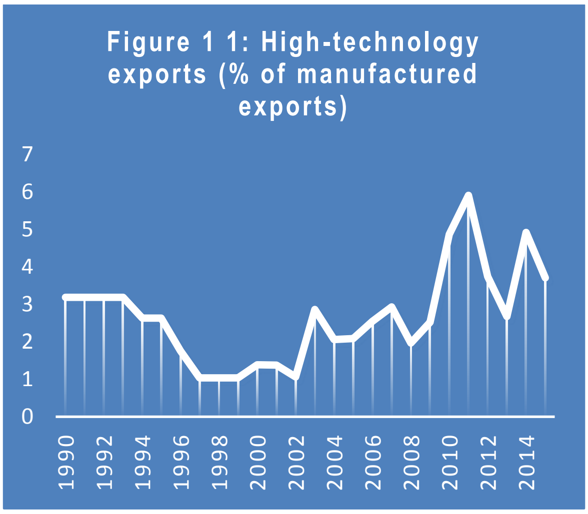


Figure 1 1: High-technology exports (% of manufactured exports)

Source: Authors with NIS data

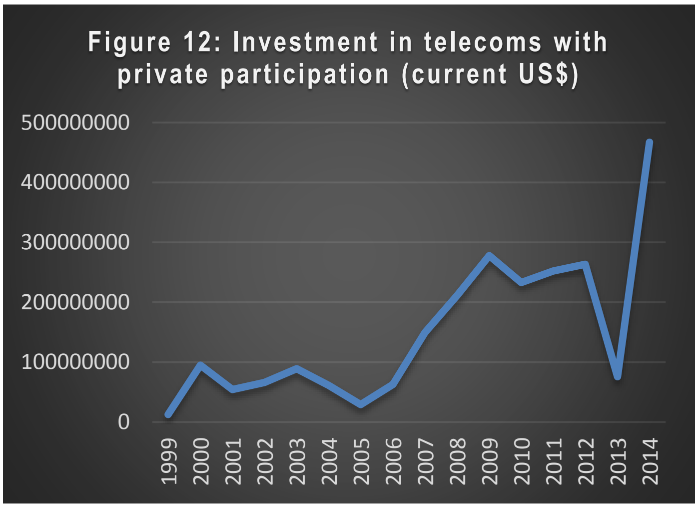
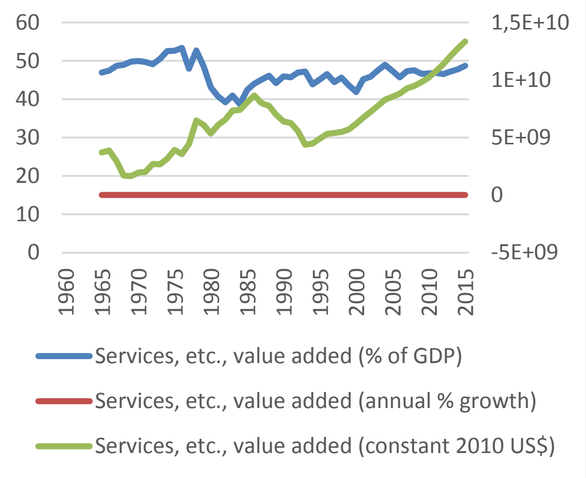


Figure 12: Investment in telecoms with private participation (current US$)

Source: Authors with NIS data

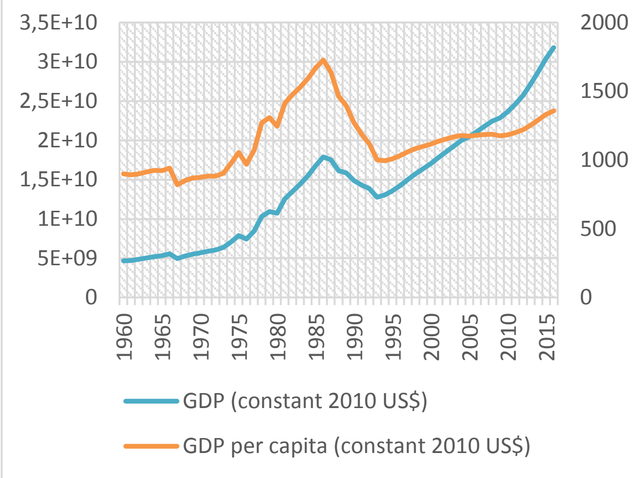
All those facts coupled to the increase of the services added value (figure 13) within the digitalizing economy system, lead to an improvement of wellbeing at the individual level in Cameroon that can be seen through the continuous growth of Gross Domestic Per Capita (GDPPC) since 2000 that represents the introduction periods of news ICTs in Cameroon. Or even through the positive trend of Health Expenditure Per Capita (HEPC) from less than USD 100 in 1990s to more than USD 121 in 2015 and the decreasing poverty rate from 53.3% in 1996 to 37.5% in 2014 (NIS, 2014)

Figure 13: Services added-value in Cameroon



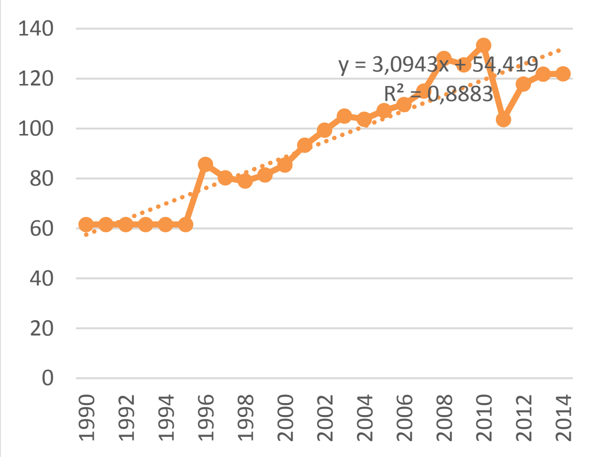
Source: Authors with NIS data

Figure 14: Gross Domestic Product Per Capita



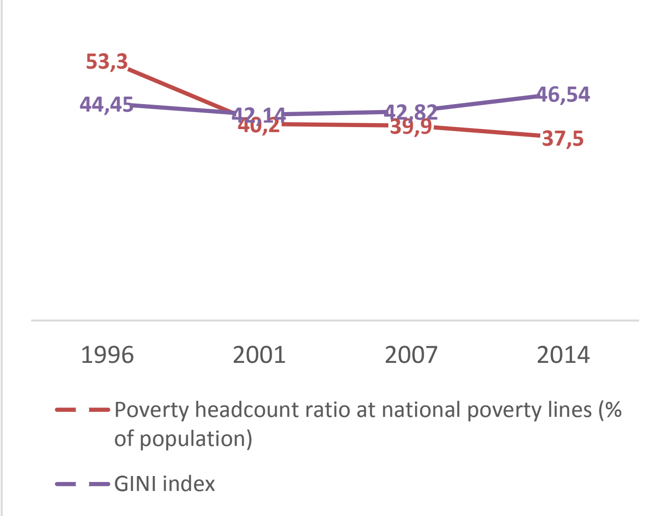
Source: Authors with NIS data

Figure 15:Health expenditure per capita, PPP (constant 2011 international $)



Source: Authors with NIS data

Figure 16: Poverty and inequality trend



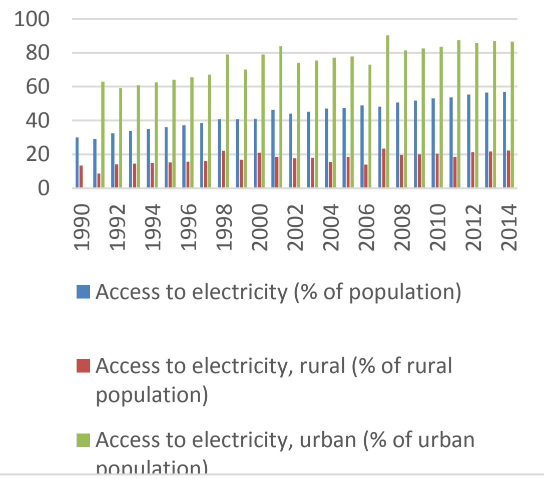
Source: Authors with NIS data

According to the results of the last Cameroonian Households Consumption Surveys (CHCS4 in 2014) concerning the main activity of household's head, extremely digitally poor people undertake agricultural or farming activities, while wealthy people undertake service activities (NIS, 2015). It is important to note that unemployed people prevail among the digitally poor individuals, while heads of the households who undertake service activities prevail among the connected people. In addition, among connected people there is a large number of households where the head of the household is unemployed. Regarding labor market information, since having a job can help moving out of poverty, the level of access to job market information in general is quite limited among the extremely digitally poor people. The connected people are better in average than the digitally poor people, while the digitally wealthy people have total access to all job market information.

There are also huge challenges for all goods and services based on ICTs that determine their response to the fast moving societal changes, additions and modifications in the Information, Communication, Technologies (ICTs) and their applications. Since 2009, the Cameroonian government is implementing its Growth and Employment Strategy Paper (GESP), with an emphasis in the sector of Information Technology and Communication (ICT) that has implications in others sectors strategies.

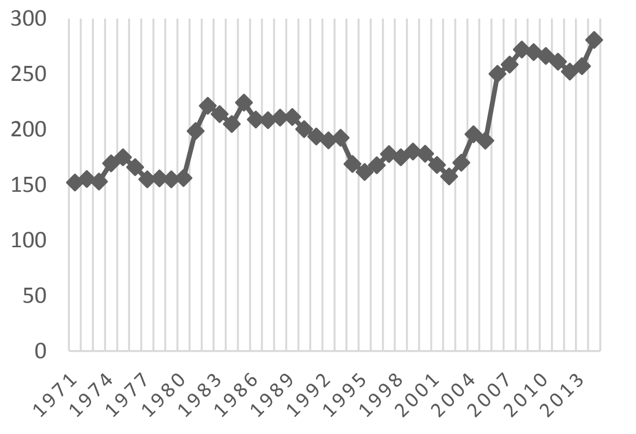
The first challenge is access to electricity. In Cameroun only about 56.8% of the entire population has access to electricity among which most them are settled in urban area where about 86.51% of the urban population has access to electricity (figure 17).

Figure 17: Access to electricity in Cameroon



Source: Authors with NIS data

Figure 18: Electric power consumption (kwh per capita)



Source: Authors with NIS data

As digitalization moving in Cameroon, the electricity demand is rapidly increasing with an electricity power consumption per capita that grew for more than 40% between 1990s and 2000s, from about 200.166 Kwh to more than 280 Kwh as we can see on figure 18. Let us know discuss the effects of digitalization on wellbeing.

IV. METHODOLOGY

Concerning the methodological framework, our paper intends to develop a model of optimal sequences of decision putting on evidence the expected utility as one the main determinant of engaging in digital technologies. More specifically, we model individual decisions to use digital technologies as an additional utility search problem. We assume an economy with a labor force of size comprising low-skilled, average or middle skilled and high skilled workers and earning a specified wage. The production within the economy is based on a Constant Elasticity Substitution (CES) function. Another basic assumption is that wages are local prices of individual's skill bundles. Individuals know their utility in their current position.

To determine the utility in another position, it is necessary to move to digital technologies. This move is subject to a cost for the individual so that he may be more productive in some positions than in others, due for example to Media, Entertainment and Information Industries, working conditions, residential conditions, local amenities, etc… The utility gained in each position may be interpreted as the best offer available in that position. We assume that the marginal utility of income is constant and that individual can borrow and lend without restriction at a given interest rate to pay access digital technologies. In this view, expected utility maximization reduces to maximization of expected lifetime income, net of digital technologies cost, with the understanding that the value of amenities is included in income and that both amenities values and moving costs are measured in consumption units. Let set a state vector s of our value function VF of an individual which includes wage and preference information, current location and age). The utility flow for someone who choose to move to the position p is specified as $U(s,p) + \gamma_p$, where γ_p is a random variable that we assumed to be independent and identically distributed across position destination of individuals and across year, and independent of our above-mentioned state vector. Our decision problem is formalized as follow:

$VF(s,\gamma) = Max\ [V(s,p) + \gamma_p]$,

where $V(s,p) = U(s,p) + \alpha \sum_{x'} Pr(x'|x,p)\bar{V}(x')$,

and $\bar{V}\ (s) = \ E_\gamma VF(s,\gamma)$.

α can be define as the discount factor and E_γ refers to the expectation with respect to the distribution of the $p - vector\ \gamma$ with component γ_p. We then compute the value function, take into account age as a state variable and thank to successive iteration and discrete dynamic programming we put on evidence decisions of individuals to use digital technologies.

V. DATA

Our data are form the National Institute of Statistics (NIS) of Cameroon. They are microeconomic data from Cameroonian Households Consumption Surveys (CHCS). They are official surveys of the NSI making data available for 1996, 2001, 2007 and 2014.We also use data of the 2017 World Development Indicators (WDI) from the World Bank.

The location of each individual is recorded at the date of the survey. In order to obtain a relatively homogeneous sample of the economic active population, we only considered individual who in term of educational attainment completed at least post-secondary. Our analysis sample contain 811 individuals and each of them is a household head.

VI. COMPUTATION AND EMPIRICAL IMPLEMENTATION

Cameroon is made-up of $P = 10$ regions. Let us consider each of them like a position or location of the individual or a labor market, so that we have ten labors markets. A given individual choose in any position knows about the value of human capital and wage in that location but knows less or not about them in another location. We assume that it not possible to fully know about utility to be gain, wage, human capital or any other components of VF in all the 10 locations. We suppose that the number of wage observations cannot exceed a number Q $(Q < P)$. If the distribution of location match utility and others preference components in each of the $P = 10$ regions have for example r points of support, the number of states s for an individual seen in Q locations is then $P(Pr^2)^Q$. If for example, $P = 10, r = 4$ and $Q = 2$, the number of state for each individual at a given age (age is taken as from 25) is then 256,000. As done by Kennan et al. (2011), we use this approximation to reduce the number of states in a most obvious way as someone having all the information available in the big state space is simply reassigned to the lesser information state. Kennan et al. (2011) as per regard with income expected and individual migrations decisions argued that it is not enough to keep tract of the best wage found so far, since the payoff shocks may favor a location that has been previously abandoned. And it is necessary to know the wage at that location so as to decide whether to go back there, even if it is known that there is a higher wage at another location.

The wage W of a given individual i in a position p at age a in the year t is given by the following relation

$W_{ip} = \pi_p + V_{ip} + G(s_i, a, t) + \beta_i + \delta_{ip}(a)$

π_p is the average wage in the position p, V is the permanent matching effect in the current position and the linear time effect and the effects of observed individuals characteristics in captured by $G(s_i, a, t)$. β_i show an individual effect fixed across various positions and $\delta_{ip}(a)$ is the transient effect. In this paper, $V, \beta \; and \; \delta$ are assumed to be independent random variables, identically distributed across our 811 individuals and 10 positions. And any individual has the information about the outcome of $V \; and \; \beta$.

The shape of the functional form or the relationship between wage level and the decision for an individual to move to digital technologies is determined by the difference between the quality of the match he is able to make in his present position captured by $\pi_p + V_{ip}$, and the expectation of obtaining a better matching in another position b measured by $\pi_b + V_{ib}$. We assume that other component of wage are not directly related to the decision of moving or not to digital technologies. Therefor an individual know about his final utility $VF(s, \gamma)$ in his current position, but the one in others positions is simply a random variable. Decision to use digital technologies or not is subject to the difference between the expected utility than can continuously be obtained in the present location and the expected utility obtained in another position through moving to the use of digital technologies.

Let $l = (l^0, l^1, \dots \dots . l^{Q-1})$ be a Q vector containing a sequence of recent position for an individual, beginning with his current position. Let W be a Q vector recording wage and utility information at these locations. The state vector s consist of $l, W \; and \; the \; individual's \; age$. The flow payoffs for someone whose home position is h is modeled as follow:

$\tilde{u}_h = u_h(s,p) + \gamma_p$, where

$$u_h(s,p) = \lambda_0 W(l^0,\omega) + \sum_{k=1}^{K} \lambda_k Y_k(l^0) + \lambda^H \chi(l^0 = h) + \zeta(l^0,\omega) - \Delta_{\tau(s,p)}$$

In this equation, the first term refers to wage income in the current position, $Y_k(l^0)$ is a nonpecuniary variable representing amenties values, λ^H is a premium allowing each individual to have a preference for his native position, χ denotes an indicator meaning that A is true, and ζ is the random component.

For a given individual of type τ to move from position l^0 to position l^p, he needs to cover a certain distance $D(l^0,p)$ between the two positions and support the related cost denoted by $\Delta_\tau(s,p)$:

$$\Delta_\tau(s,p) = \left[\varphi_{0\tau} + \varphi_1 D(l^0,p) - \varphi_2 \chi\left(p \in \mathbb{A}(l^0)\right) - \varphi_3 \chi(p = l^1) + \varphi_4 a - \varphi_5 n_p\right] \chi(p \neq l^0)$$

Where, n_p is the size of the population in the region or position p and $\mathbb{A}(l^0)$ represents the set of positions adjacent to l^0. We assume that moving to an adjacent position is always costless, but not moving back to a previous position. In fact and as far as its shape is concerned, the moving cost is an affine function of the distance.

Regarding the transition probability from a position to another, let us consider a state vector $s = (\tilde{s}, a)$ with $\tilde{s} = \left(l^0, l^1, s_v^0, s_v^1, s_\zeta^0, s_\zeta^1\right)$, and where s_v^o is the index of the realization of the position match component of wages in the current position and similarly for others components. Finally, the transition probabilities is computed as follow

$$Pr(s'|s,p) = \begin{cases} 1 & if\ \ p = l^0, \tilde{s}' = \tilde{s}, a' = a+1 \\ 1\ if\ p = l^1, \tilde{s}' = \left(l^1, \right. & \left. l^0, s_v^1, s_v^0, s_\zeta^1, s_\zeta^0, a' = a+1\right) \\ \dfrac{1}{n^2}\ \ if\ p \notin\ \ \{l^0, l^1\}, & \tilde{s}' = \left(p, l^0, x_v, s_v^0, x_\zeta, s_\zeta^0\right), \\ \quad (1,1) \leq \left(x_v, x_\zeta\right) \leq \left(n_v, n_\zeta\right), & a' = a+1, \\ 0 & otherwise \end{cases}$$

According to this formula,

-If no move to another position occurs in the current period, the state s remains the same but the age component can varies.

-If there is a move from the use of digital technology (new position) to a previous position (no use of digital technology), the two positions are interchanged.

-If is there is a move to a new position, the current position becomes the previous one and the new position match components are drawn at random.

Let us mention that in all possible situations, the variable age is incremented by one period.

We should also be cautious with homogeneity of our microeconomic data. Since if even our sample is quite homogeneous, measured income in household consumption surveys are variable across the time and from one individual to another. We then specify a wage components model that is flexible enough to fit the nature of our data. It enable us drawing reasonable inferences about the shape of the relationship between measured income and realized values of position match component. There are then a fixed effects and transient wage component to take into account. Regarding the fixed effect (β), we use an uniform discrete distribution symmetric around zero. For the above-mentioned transient component (δ), we use a continuous distribution that allow to incorporate the variability of income. According to us, the best suited way is to draw δ from a normal distribution with its parameters $(0, \sigma_\delta)$.

It is also important to take into account observed information or history of each individual as mixture of heterogeneous component. For this purpose, for and individual i, we use a likelihood function $L_i(\theta_\tau)$ where for somebody of type τ the parameter vector is θ_τ and the probability is ϕ_τ . The sample log likelihood is given by the following

$\Lambda(\theta) = \sum_{i=1}^{N} \log[\sum_{\tau=1}^{K} \phi_\tau L_i(\theta_\tau)]$.

Let us add that at each period of an individual i history, two piece of information contribute to $L_i(\theta_\tau)$, they are the observed earning and the position choice. Each piece involves a mixture over the possible realizations of the various unobserved components. In fact; in each position, there is a draw from the distribution of position match wage components which is modeled as an uniform distribution over a finite set $\Psi = \{v(1), v(2), \dots \dots \dots v(n_v)\}$. This set is index by w_v with $w_v(p)$ representing the match component in position p, where $1 \leq w_v(p) \leq n_v$

In this paper, for empirical implementation, we set $\alpha = 0.8$, $t = 3$ and $Q = 2$.

VII. RESULTS AND CONCLUDING REMARKS

Our main findings (tables 4, 5 and 6) show two versions of our model with coefficients and standards errors. We see that, distance between main cities (regional capital) from the previous position, characteristics/standards of house, place of living (rural/urban), marital status and households size are significant as per regard to the decision of an individual (who is the household head as stated before) to change his current position through moving to digital technologies. Individual's age, level of education (more than post-secondary achieved), and current status in employment (wage/grade /year of experience) are also significant. Controlling for these parameters, moving decision to digital technologies and changing the current position are significantly affected by expect wage/grade in the new position. The elasticity of the relationship between wage and digital technologies use is closed to 0.75. Such results stand like an optimal search of the best wage matching with the position of an individual in a given place. Since workers receiving their expected income in the current position have a great probability to stay without being tempted to use digital technologies to move to another position. We suggest to policy makers development of ICTs infrastructure all over the country. That may lead to an inclusive approach of promoting economic growth and share prosperity.

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ANNEX

Table 4: Inter-regional/position movements

	$\hat{\boldsymbol{\theta}}$	$\hat{\boldsymbol{\sigma}}_{\boldsymbol{\theta}}$	$\hat{\boldsymbol{\theta}}$	$\hat{\boldsymbol{\sigma}}_{\boldsymbol{\theta}}$
Utility and cost				
Disutility of moving (φ_0)	2.51	0.33	2.46	0.37
Distance between regions (φ_1)	0.85	0.46	0.89	0.5
Adjacent position (φ_2)	1.21	0.22	1.24	0.29
Premium position (λ^H)	0.91	0.012	0.84	0.013
Previous position (φ_3)	1.26	0.23	1.23	0.21
Age (φ_4)	0.15	0.20	0.16	0.19
Population size (φ_5)	0.27	0.17	0.23	0.16
Probability to stay	0.24	0.54	0.238	0.53
Income (λ_0)	0.33	0.16	0.28	0.19
Household size(λ_1)	0.14	0.01	0.148	0.011
Marital Status (λ_2)	0.19	0.5	0.18	0.48
Location match preference(ζ_τ)	0.168	0.028	0.19	0.035
Wage				
Wage intercept	-2.14	0.25	-2.15	0.27
Time trend	-0.03	0.001	-0.03	0.001
Age effect(linear)	3.58	0.18	3.59	0.19
Age effect(quadratic)	-1.2	0.06	-1.22	0.067
Grade	0.014	0.05	0.014	0.052
Years of experience	0.011	0.04	0.012	0.039
Place of living	0.12	0.01	0.15	0.03
Interaction (age, years of experience)	0.15	0.029	0.16	0.028
Transient s;d 1	0.0345	0.09	0.0346	0.08
Transient s;d 2	0.0456	0.07	0.0457	0.06
Fixed effect 1	0.126	0.04	0.127	0.039
Fixed effect 2	0.2	0.01	0.28	0.012
Wage match(τ_v)	0.23	0.03	0.24	0.032
Log likelihood	-2.36		-2.34	
Exclude income$\chi^2(1)$	-	6.98	-	5.7
Exclude match preference$\chi^2(1)$	-	0.69	-	0.67

Source: Authors

Table 5: Estimated moving cost

$\boldsymbol{\varphi_0}$		λ_0	Age	Distance	Adjacent	Population	Previous	Cost
θ	7.9	0.22	0.06	0.18	0.54	0.4	4.7	-
Youngest mover		-	25	1	1	1	0	XAF 437,523
Older mover		-	48	0.49	0.33	0.68	0.28	XAF 784,125

Source: Authors

Table 6: Wage parameter estimates (in 2010 XAF)

	Years of experience percentile		
	25	50	75
Average wage			
Age 25 in 2001	10.27	12.3	15.14
Age 25 in 2007	16.47	19.11	25.56
Age 25 in 2014	50.14	58.15	60.1
	Low	**Middle**	**High**
Location match	-3.66	0	3.66
Fixed effect support	-4.11	0	4.11
Position means	Low (WV) 3.69	Median (MD) 9.78	High (MD) 2.29

Source: Authors