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LAREM

IMPLICATIONS OF DIGITALIZATION ON INDIVIDUAL'S WELLBEING IN CAMEROON

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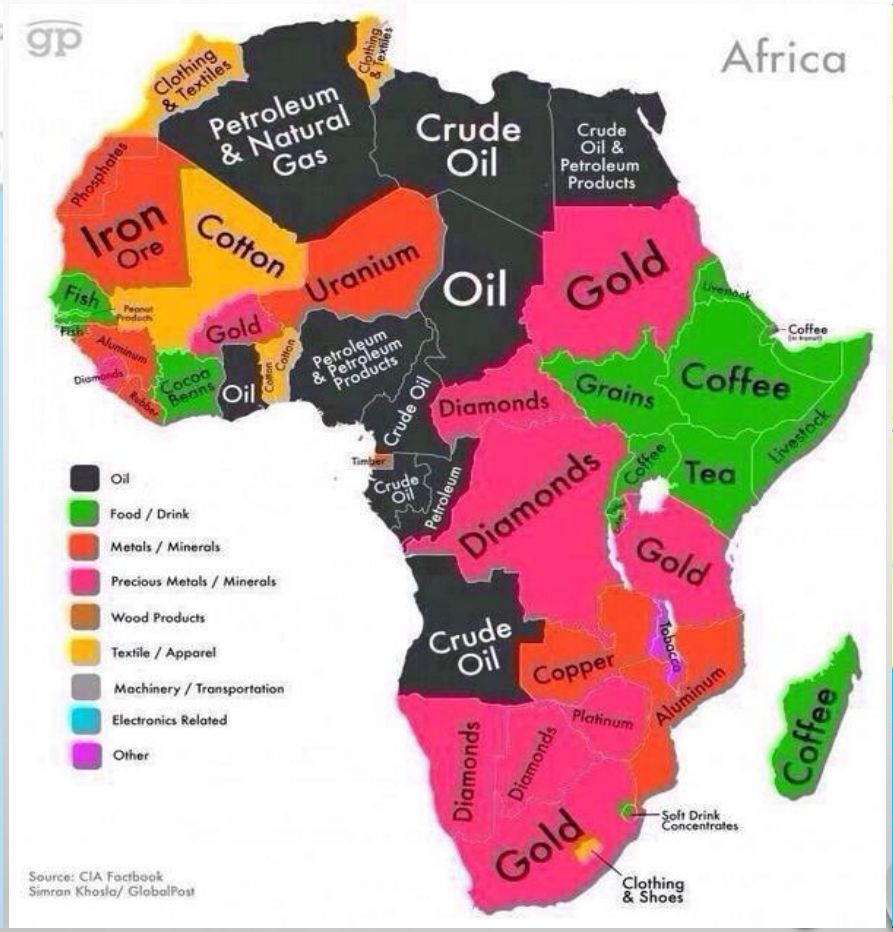
GEOGRAPHICAL LOCATION OF THE STUDY

AFRICA

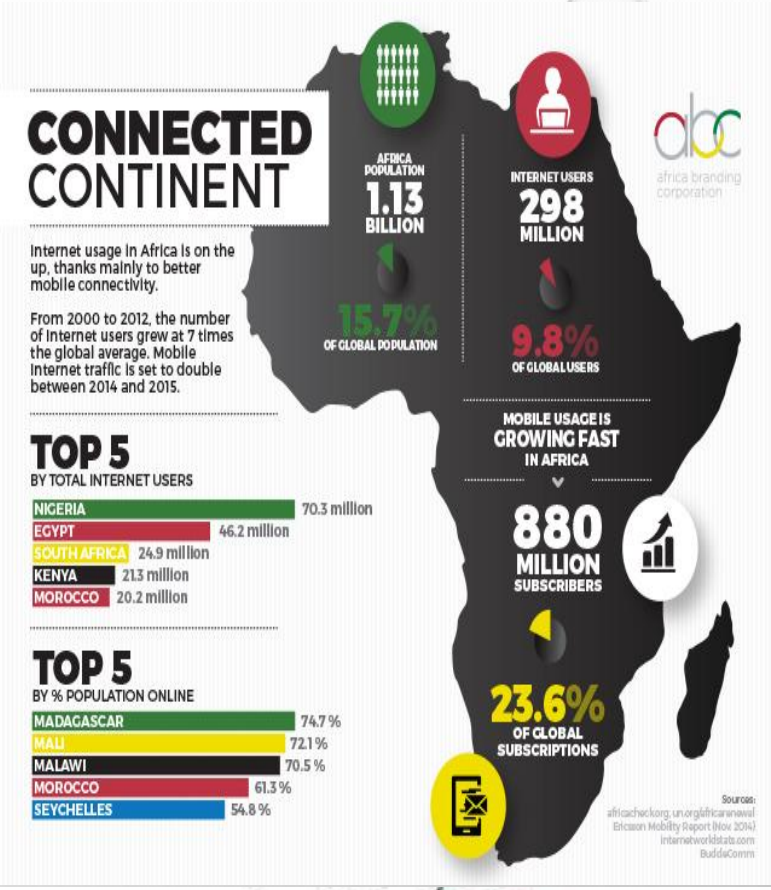


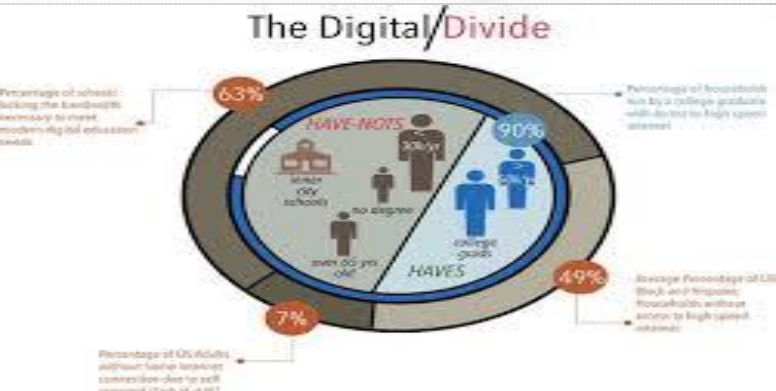
CAMEROON

BACKGROUND OF THE STUDY (1/2)

- Over the last decade, the development of the digital economy has created unprecedented opportunities for growth and inclusiveness within and between countries.
- An increasingly interconnected world with social medias, new end-user devices (mobile phones, smartphones, tablets, netbooks, laptops, 3D printers), new digital models (cloud computing, digital platforms, digital services) and datafication (big data, data analytics, algorithmic decision-making, automation and robotics technology).
- 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 through the emergence of new economic processes.
- Digital economy represents around 5% of the global GDP and 3% of global employment.
- According to Bukht and Heeks (2017), the global North has the lion's share of the digital economy but growth rates are fastest in the global South (more than 6% of GDP).
- The 2020 connect agenda "internet access for all", the UN 2030 agenda, the AU 2063 agenda and the Growth and Employment Strategy Paper in Cameroon.

BACKGROUND OF THE STUDY (2/2)





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JUSTIFICATION OF THE STUDY

- The emerging digital Media, Entertainment and Information Industries (MEII) outcomes
- 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 laptop computers and smartphones than they do in other 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.
- Such a study could help stakeholders/policy markers to know more about economic effects of digitalization and to look how they can regulate it in the track of achieving the 2020 connect agenda “internet access for all”, in the context the post-2015 development agenda.

LITERATURE (1/2)

- 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.
- Share of 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 GDP increase more than twice from less than 2% in 1970 to more than 6% in 2014.
- Digital technologies promote social inclusion by creating better access to quality education and offering new opportunities for skills development and learning experience, (Hepp et al., 2004; Yusuf,2005; Jhurree, 2005; OECD, 2014a.)

LITERATURE (2/2)

- Digital technologies improve healthcare, access to education, the monitoring of the environmental quality, and give consumers the possibility of interacting more fluidly with business and governments (Atkinson and Mckay ,2007).
- 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 (Caceres B. 2007, in Peru).
- 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.
- Kanbur (2017) paid attention to the digital revolution and targeting public expenditure for poverty reduction (impact of the digital revolution of three dimensions that are information costs, high implicit marginal tax rate and political economy).
- In this paper we pay attention to wellbeing in terms of additional income /wage through ICTs and digitalization
- ICTs related services took into account in relation to wellbeing are essentially connectivity, information, communication, and technology.

RECENT TRENDS OF DIGITAL ECONOMY IN CAMEROON (1/6)

- 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.
- The rapid increasing number on subscriptions to mobile cellular from 103, 279 in 2000 to 16,806,894 in 2015 compared to the subscribers to fix telephone during the same period.

Figure 1: Access to fix telephone in Cameroon

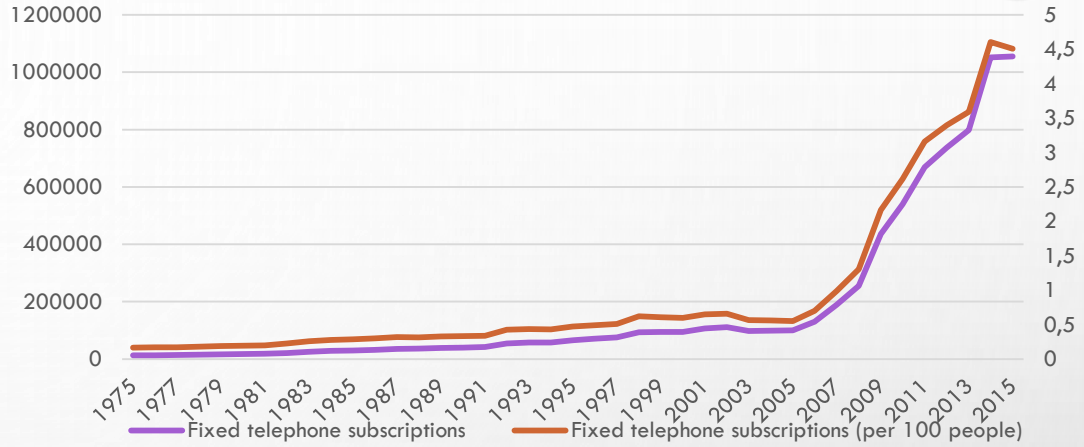
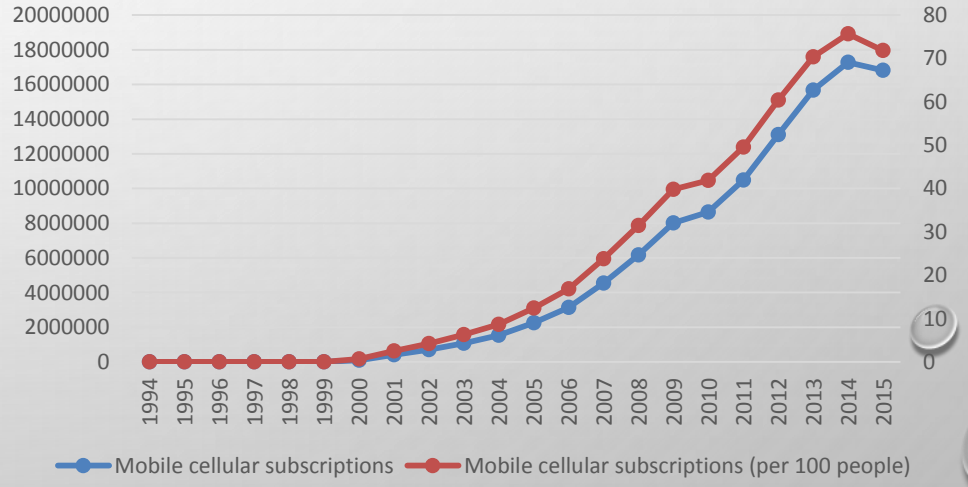


Figure 2: Access to mobile cellular in Cameroon



RECENT TRENDS OF DIGITAL ECONOMY IN CAMEROON (2/6)

- in 1997, less than 1% of the population had 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.

Figure 3:Individuals using the Internet (% of population)

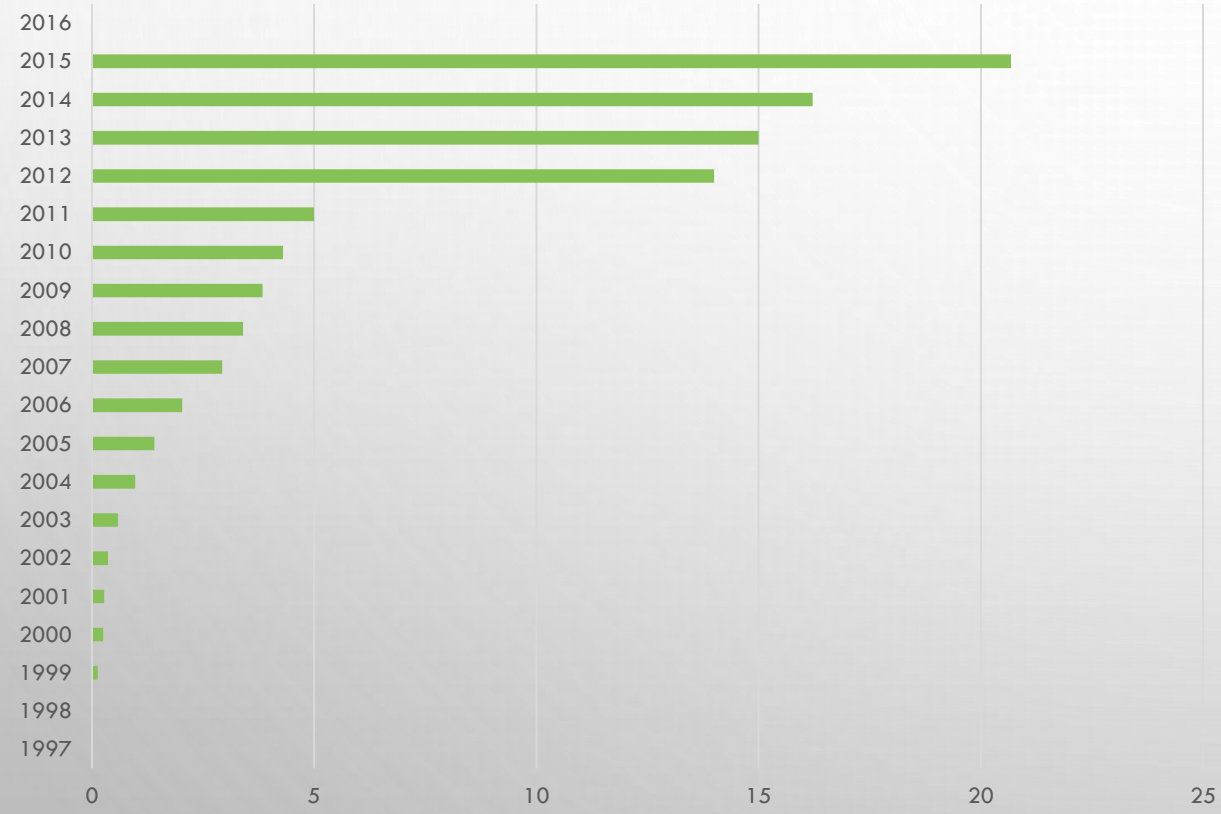
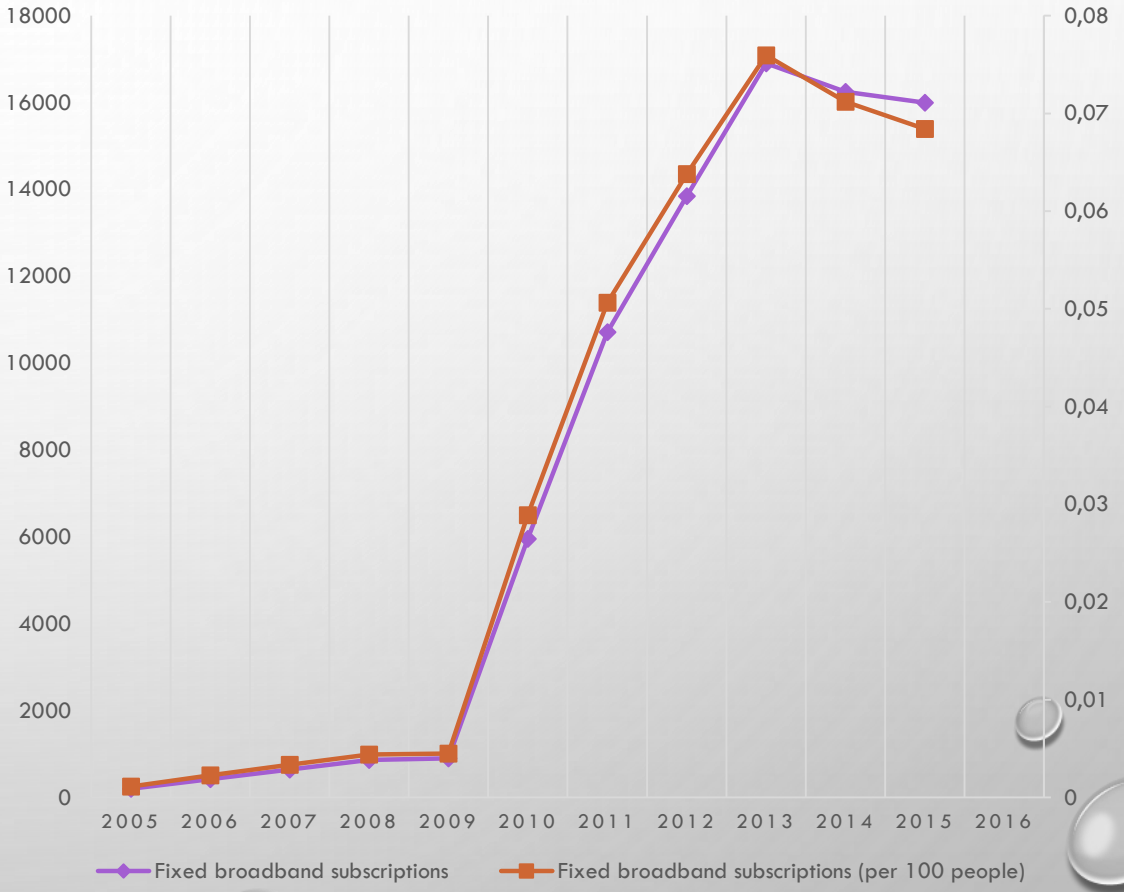


Figure 4: Fixed broadband subscriptions



RECENT TRENDS OF DIGITAL ECONOMY IN CAMEROON (3/6)

- 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%

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%

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%

RECENT TRENDS OF DIGITAL ECONOMY IN CAMEROON (4/6)

- 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, while the number of people using a mobile account is increasing.

Figure 5: People having an account at a financial institution

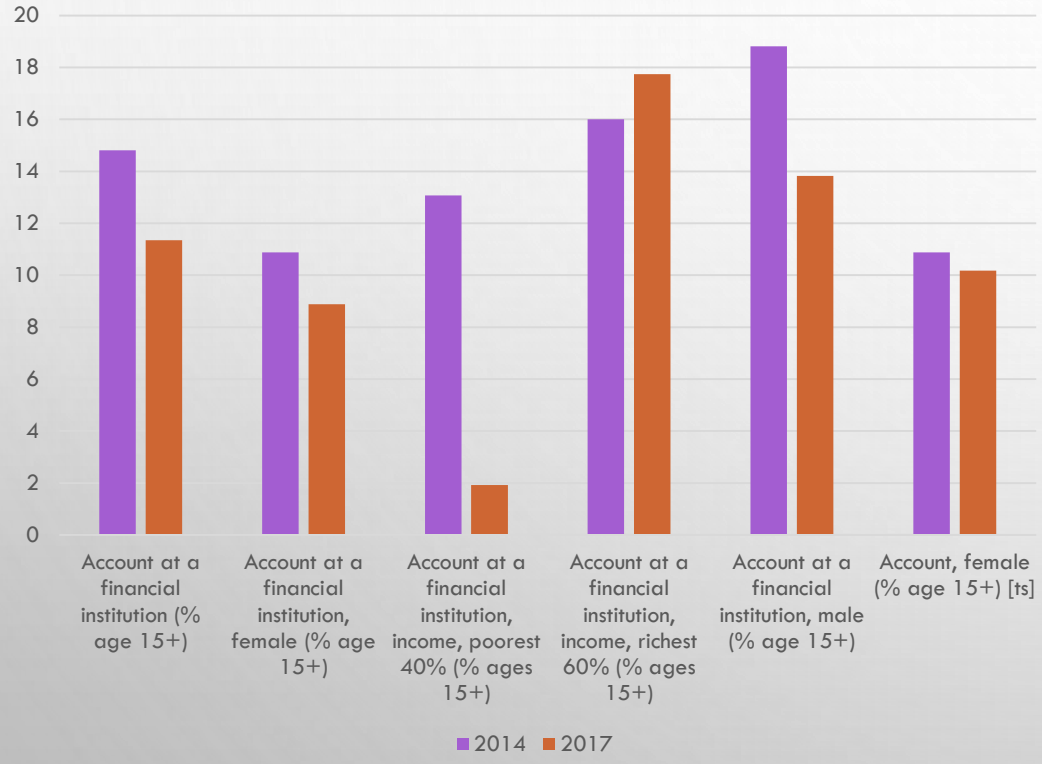
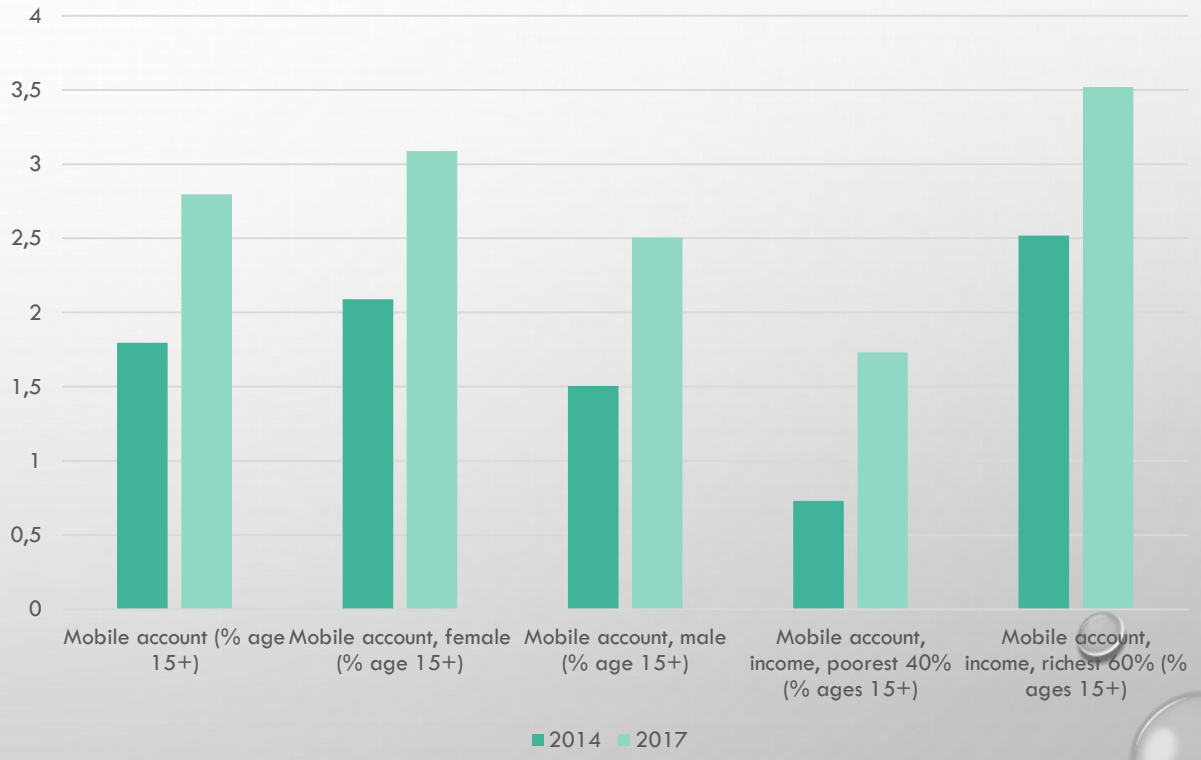


Figure 6: People having a mobile account



RECENT TRENDS OF DIGITAL ECONOMY IN CAMEROON (5/6)

- Regarding communication and computer services the introduction of new ICTs 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: Communications and Computer services

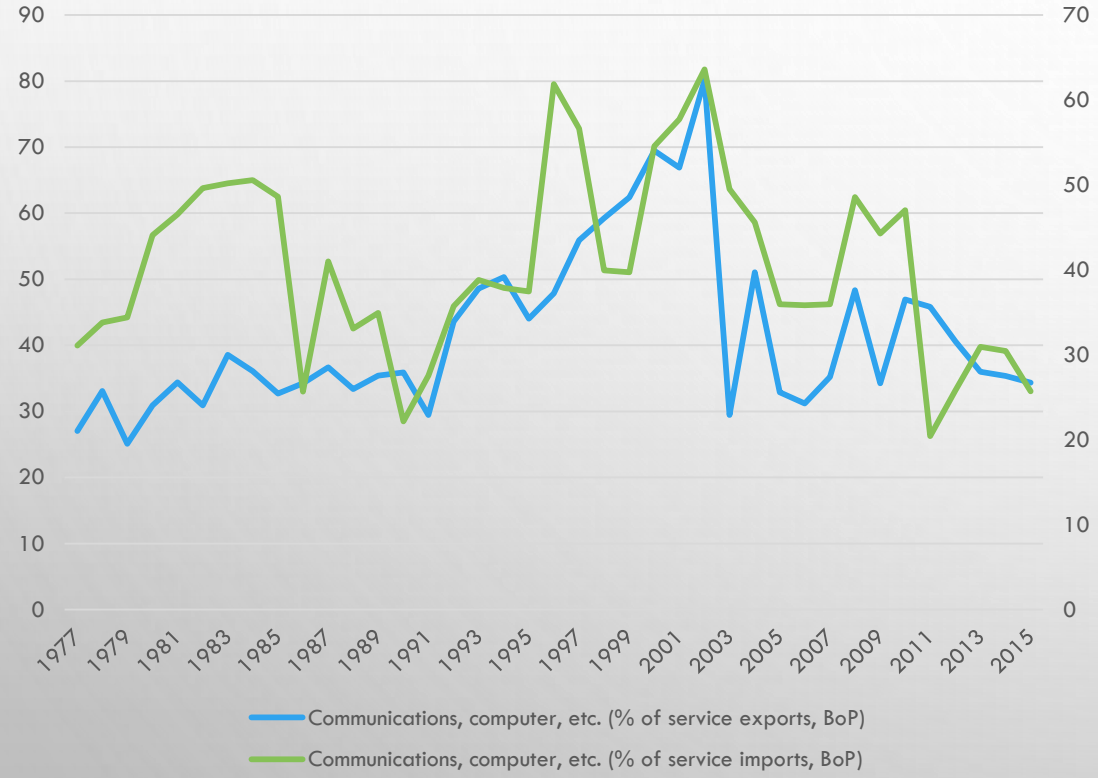
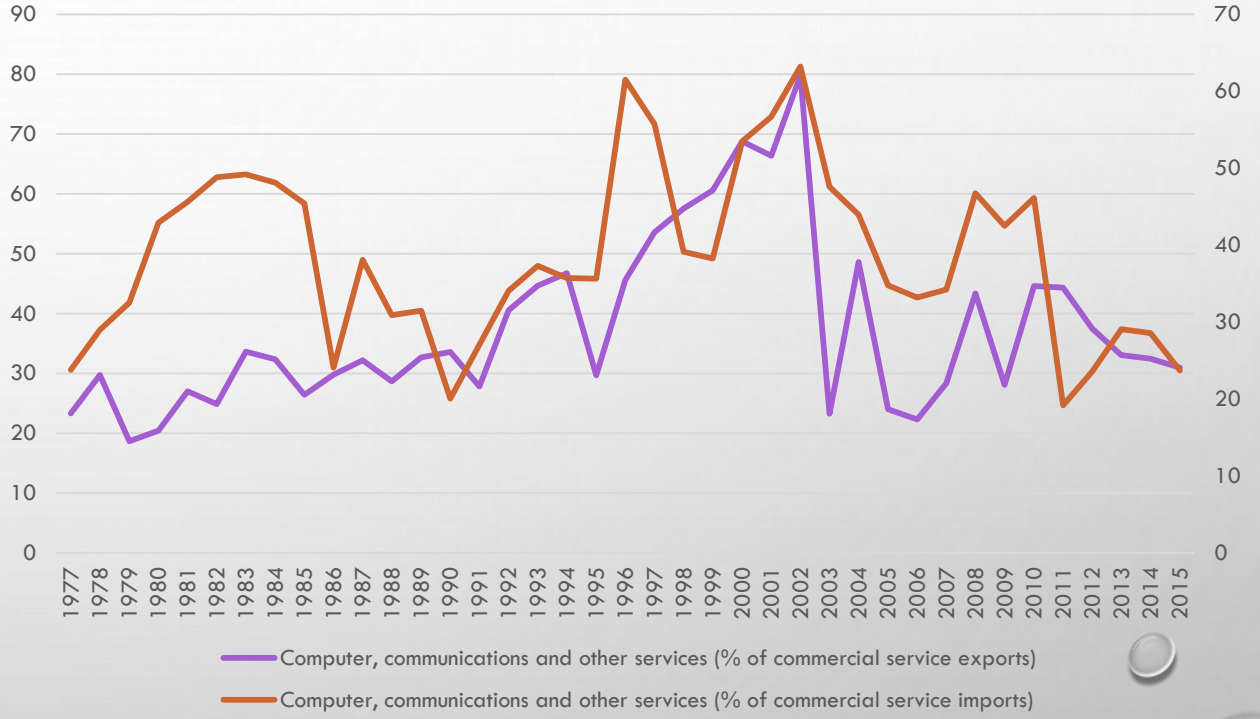


Figure 8: Communications and Computer commercial services



RECENT TRENDS OF DIGITAL ECONOMY IN CAMEROON (6/6)

Figure 9: ICT goods imports/exports in Cameroon

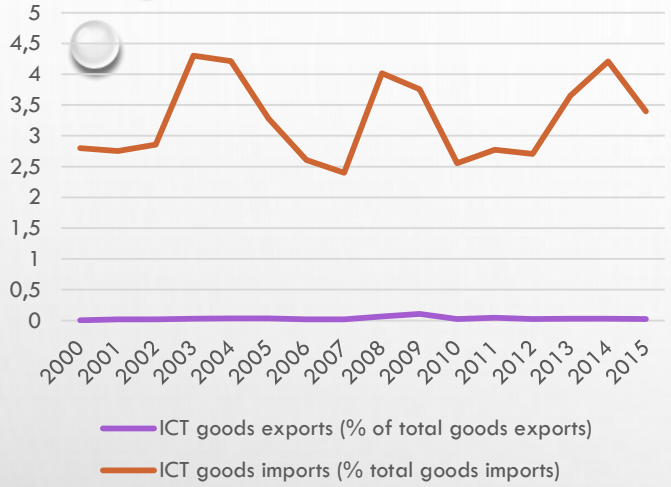


Figure 10: ICT services exports in Cameroon

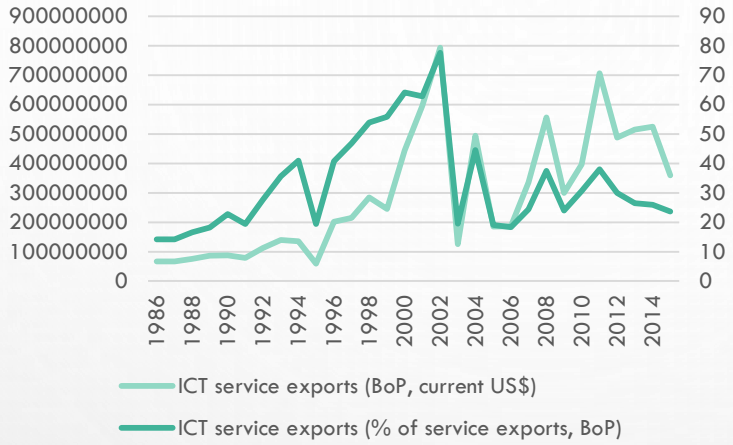


Figure 13: Services added-value in Cameroon

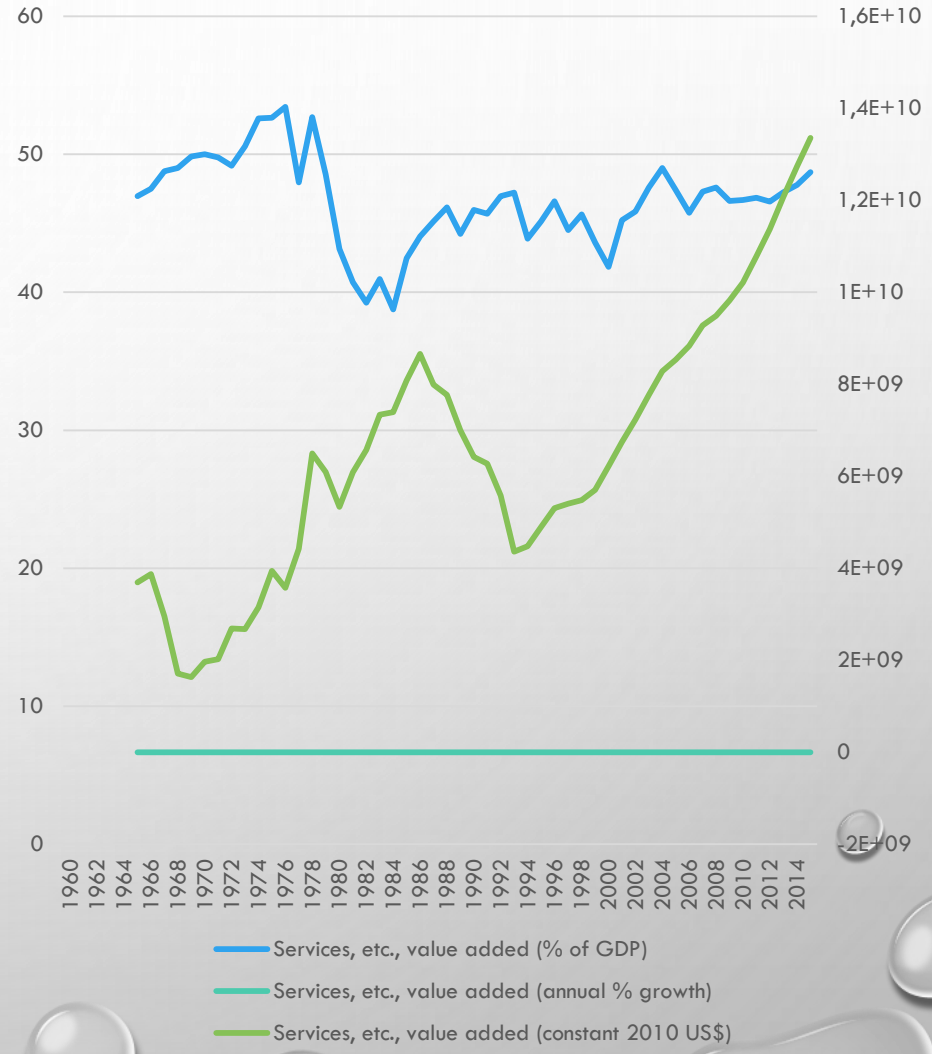


Figure 1 1: High-technology exports (% of manufactured exports)

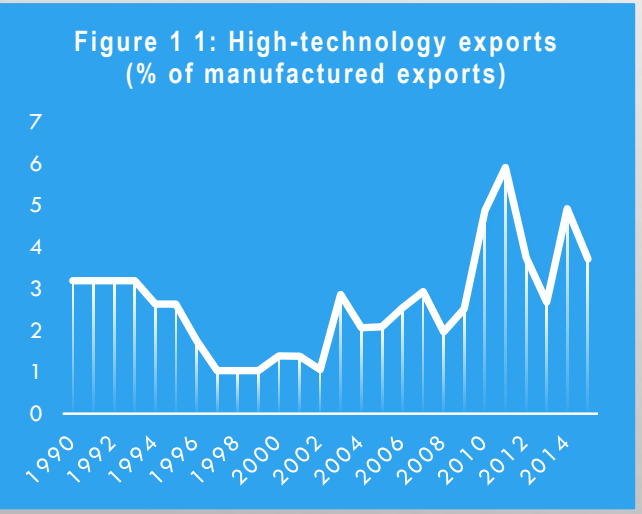
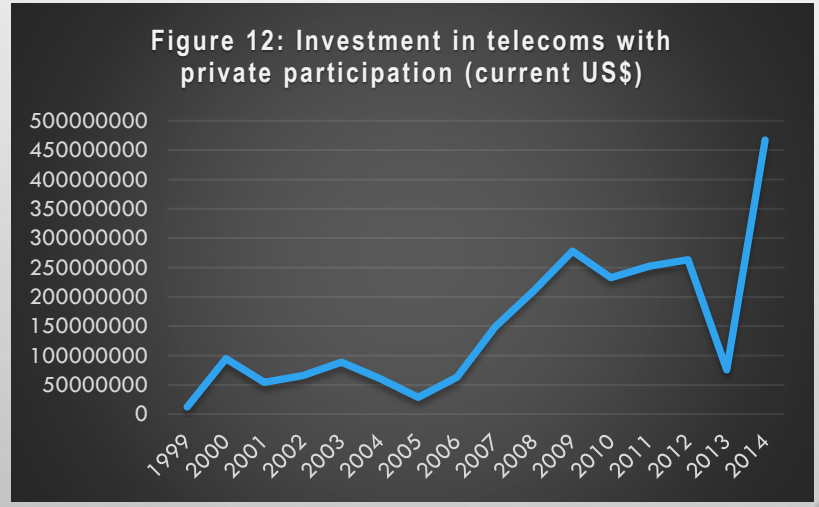


Figure 12: Investment in telecoms with private participation (current US$)



WELLBEING TREND IN CAMEROON

Figure 14: Gross Domestic Product Per Capita

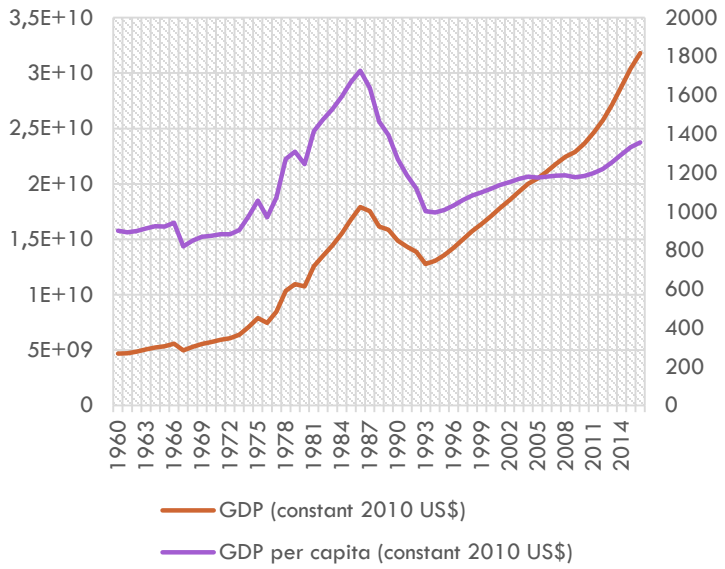


Figure 15:Health expenditure per capita, PPP (constant 2011 international $)

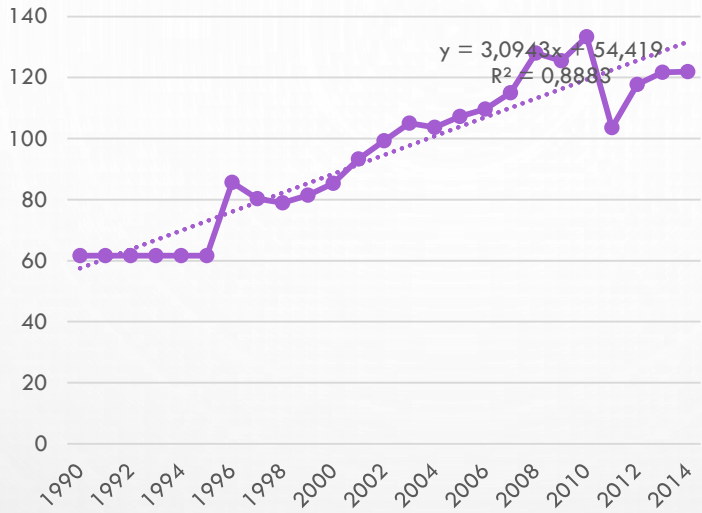
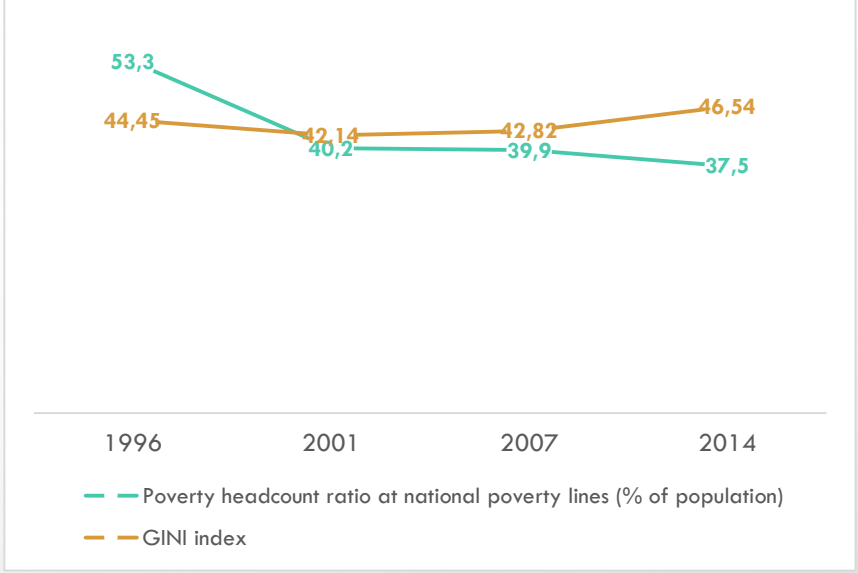


Figure 16: Poverty and inequality trend



- Household's head extremely digitally poor people undertake agricultural or farming activities, while wealthy people undertake service. Unemployed people prevail among the digitally poor individuals, while heads of the households who undertake service activities prevail among the connected people. 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.

CHALLENGES TO DIGITAL ECONOMY IN CAMEROON

Figure 17: Access to electricity in Cameroon

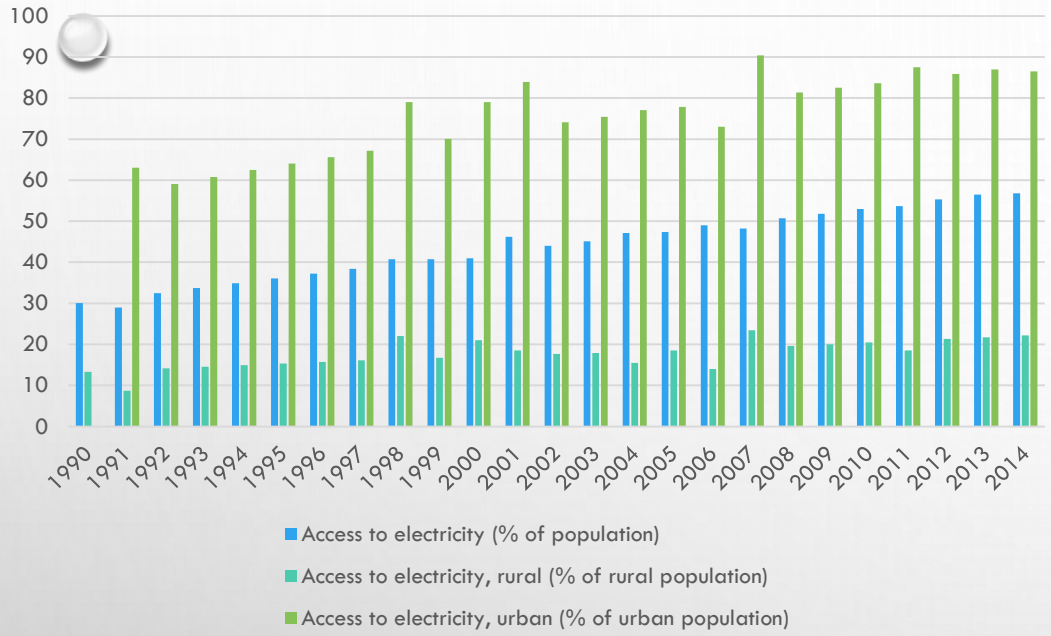
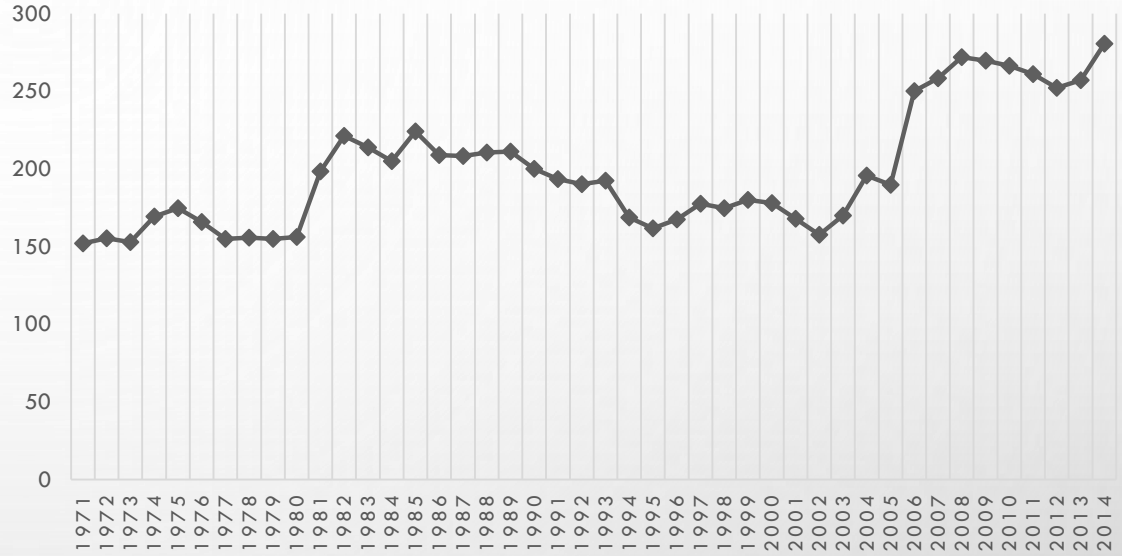


Figure 18: Electric power consumption (kwh per capita)



- There are 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 ICTs and their applications. 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.

METHOD (1/4)

- We develop a model of optimal sequences of decision putting on evidence the expected utility as one the main determinant of engaging in digital technologies. We model individual decisions to use digital technologies as an additional utility search problem.
- Some assumptions are made on labor force, wage, the production function ,….
- 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 is the best offer available in that position. The marginal utility of income is constant and individual can borrow and lend without restriction at a given interest rate to pay access digital technologies.
- 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.

METHOD (2/4)

- 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:
- $VF(s,\gamma) = Max\left[V(s,p)+\gamma_p\right]$,
- 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.

METHOD (3/4)

- 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 $V\ and\ \beta$.
- 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 $l = (l^0, l^1, \ldots \ldots l^{Q-1})$ 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
- $u_h(s, p) = \lambda_0 W(l^0, \omega) + \sum_{k=1}^{K} \lambda_k Y_k(l^0) + \lambda^H \chi(l^0 = h) + \zeta(l^0, \omega) - \delta_{\tau(s,p)}$

METHOD (4/4)

- 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 $\delta_\tau(s, p)$:
- $\delta_\tau(s,p) = \left[\varphi_{0\tau} + \varphi_1 D(l^0,p) - \varphi_2 \chi\left(p \in \mathbb{A}(l^0)\right) - \varphi_3 \chi(p = l^1) + \varphi_4 a - \varphi_5 n_p\right]\chi(p \neq l^0)$
- Transition probability: 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. $Pr(s'|s,p) =$

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

- We also 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: $\lambda(\theta) = \sum_{i=1}^{N} \log[\sum_{\tau=1}^{K} \phi_\tau L_i(\theta_\tau)]$.
- In this paper, for empirical implementation, we set $\alpha = 0.8$, $t = 3$ and $Q = 2$.

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.
- 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.
- We also use data of the 2017 World Development Indicators (WDI) from the World Bank.

FINDINGS AND DISCUSSION (1/2)

Table 4: Inter-regional/position movements

	$\hat{\theta}$	$\hat{\sigma}_\theta$		$\hat{\theta}$	$\hat{\sigma}_\theta$
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

Table 5: Estimated moving cost

φ_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

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 (MO) 9.78	High (MD) 2.29

FINDINGS AND DISCUSSION (2/2)

- 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.

THANK YOU FOR PAYING ATTENTION/*ME'EH LAPTE'EH*
WELCOME TO YOUR REMARKS AND SUGGESTIONS