

# The Determinants of Internet Adoption among Urban Heads of Household in Burkina, Faso

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**Abstract:** *The ultimate goal of this paper was to examine the determinants of Internet use among urban household heads in Burkina based on data from Burkina Faso's last Household Socio-Economic Survey conducted in 2014. Logistic regression model shows that the factors that positively influence internet use are : being young, owning a clean energy source at home, owning electronic or communication devices and educational level. On the other hand, the gender and the socio-professional categories of the individual are not significant for the model while the use of the Internet is neutral in regard of the income.*

**Keywords:** internet use, determinants, household head, logistic

## 1. Introduction

Since the beginning of the 2000s marked by the liberalization of the telecommunications sector in Burkina Faso, there has been a boom in the penetration of information and communication technologies (ICT). As a result, the number of mobile subscriptions increased from 76186 in 2001 to 17,95 million in 2014 while the proportion of individuals using the Internet increased from 0.08% in 2000 to 9,4% in 2014. These tools have disrupted socio-economic activity in many sectors and are attracting the attention of governments not only in Burkina Faso but elsewhere in Africa. Also, in implementing the Sustainable Development Goals (SDG), the United Nations has identified ICT as tools to accelerate the achievement of development targets.

Several African countries like Burkina have adopted national ICT development strategies that aim to accelerate the dissemination of these tools, particularly the Internet, in order to use it as a catalyst for progress. With this in mind, efforts have been made to provide the country with a regulatory framework conducive to the emergence of a digital economy and a quality basic infrastructure.

Unfortunately, these investments and reforms have not been accompanied by progress in the use of Internet up to expectations. Indeed, Burkina Faso is still lagging behind West African countries like Côte d'Ivoire or Senegal according to the statistics of the International Telecommunication Union (ITU). In 2014, the proportion of individuals who used the Internet during 2014 was 9,4% in Burkina Faso against 17,7% in Senegal and 19,7% in Côte d'Ivoire. This is why it is necessary to find the factors that favor the use of the Internet. Moreover, the internet is a technology whose diffusion is fostered by network effects: many use it because people around them do so. This is why knowing the determinants of Internet use among household heads will help to better target them first in initiatives of Internet use promotion but also to reach other household members via the effects of network. In fact, 97,4% of Burkinabe households have at least 2 persons.

Indeed, the adoption of the Internet by a household head can positively influence its diffusion within his household

because the head of household is the key decision-maker in a household and his authority recognized by other members of the household.

For this study, the hypotheses are: (i) education, income, possession of electronic tools, possession of a clean source of energy positively influence the use of the Internet (ii) the fact of being a woman negatively influences the use of the internet.

## 2. Literature Review

In a study conducted in 2005 by Fabrice Le Guel and al. on the theme: "the adoption and commercial use of the Internet: an econometric study on Breton data", it appears that the main determinants of the existence of a home connection are among others the age, the level of study, socio-professional category (CSP) and lifestyle. Lifestyle is determined by owning equipment such as a digital camera, a DVD player, a mobile phone or PDA;

In 2012, Thierry PENARD & al, in a study on "Use of the Internet and the mobile phone in Africa: a comparison of the determinants of adoption on Gabonese data" sought to compare the determinants of the use of the Internet and mobile telephony. In this research, they reveal that the determinants of Internet adoption are the level of education and computer skills while the factors explaining the use of mobile telephony are the age, the CSP and the level of education.

Thus, Katz and Rice (2003) showed that in the United States, non-mobile users did not have the same profile as non-Internet users. In the first case, the cleavage was in relation to socio-economic factors, the probability of having a mobile phone increasing with age and income. In the second case, the probability of using the Internet decreases with age and level of education.

The household income, the education level of the head of the family and the presence of children play positively (Chaudhuri, Flamm and Horrihan, 2005, Drouard, 2011, Grazzi and Vergara, 2010). Other studies examine the determinants of the different uses of the Internet (Goldfarb and Prince, 2008, Drouard, 2010, Coneus and Schleife,

2010). These studies emphasize that socio-economic factors (age, income) play an important role in the decision to use the Internet, but no longer intervene in the choice of uses (email, social networks, online games, banks online, ...).

A study conducted by William Adanle in Benin in 2009 on the determinants of Internet adoption by individuals showed that the level of education, the area of residence, possession of computer, mobile phone and fixed, as well as access to electricity and being a student positively influence the probability of adopting the Internet. On the other hand, the age, the feminine gender or the women's organisation membership have a negative influence on the probability of using the Internet.

In the paper "Determinants of Internet Use in Iraq", firas h. Al-hammadany & al found that education level is the most important factor that explains Internet use. Moreover, variables such as age, and utilization rate proved to be significant factors in Internet adoption as well. But cost level (affordability) has no strong effect on Internet adoption because the Internet is widely available to the public sector in Iraq.

Internet use is mainly associated with education, age, occupation, employment in service sector, nationality, urban areas and regional GDP per capita in a study conducted in 2009 by Fernando Lera-López& al in Spain.

A research undertaken on the determinants of Internet access by Anindya Chaudhuri & al in 2005 showed that income and education do have a great influence on this technology access in the United States.

### 3. Methodology

#### 3.1 Data description

The dataset used come from the last Living Standards Measurement Survey (LSMS) conducted in Burkina Faso by the National Institute of Statistics and Demography in 2014. This survey addressed topics such as: household characteristics, agricultural expenditures, goods and services consumed by the household, non-food expenditures, household durables, etc. The sample was chosen to be representative of the country's population and the results are robust for the thirteen administrative regions of the country. Thus 10411 households were concerned and the LSMS spanned in four phases during 2014 with one phase per term. For this study, we will focus on the urban areas of the country because in 2014, the Internet coverage did not reach certain rural areas and we have no information to identify the latter.

$$Usage\_internet = \begin{cases} 0 & \text{if the household head has not used the Internet during the last 12 months} \\ 1 & \text{otherwise} \end{cases}$$

Only households in cities were considered to compensate for the lack of coverage of the territory in infrastructure access to the Internet.

After the file was cleaned, a total of 3334 head of households were selected. The explanatory variables selected are:

- *socio-demographic variables*: age groups with the clusters "15-34 years"; "35-44 years" "45-54 years"; "over 54 years";
- *gender* which has two categories that are "masculine" and "feminine";
- the *indicator of welfare* which is a quantitative variable. It is a proxy for household income;
- the *socio-professional category* with the following categories: "urban agriculture", "industry / construction", "trade / urban service", "unemployed / urban";
- *energy*: a qualitative variable with two values which are: "access to energy" for the case where the individual is head of a household that has access to a clean source of energy(*grid electricity, generators or solar energy*) and "no access to energy" for any other form of energy;
- a *lifestyle variable*: which is a composite indicator of possession of electronic and communication equipment such as TV set, VCR / DVD, radio, Hi-Fi system, computer, computer antenna with decoder, mobile phone and landline phone. The underlying assumption is that possession of these tools can create an incentive for the internet as a "novelty". The variables on ownership of this equipment are as follows:

Variables	values
television_sum	{1 if the households owns a television set 0 otherwise
magne_sum	{1 if the household owns a video recorder 1 otherwise
radio_sum	{1 if the households owns a radio set 1 otherwise
ordi_sum	{1 if the household owns a personal computer 0 sinon
antede_sum	{1 if the household owns an antenna with decoder 0 otherwise
telm_sum	{1 if the household owns a mobile phone 0 otherwise
fixehifi	{1 if the household owns a fixed telephone or a Hi - Fi 0 otherwise

From the 7 binary variables in the table above, we constructed a composite indicator as follows: (i) we applied a Multiple Correspondence Analysis (MCA) to these variables to construct factors that are a linear combinations of the dummies of the initial variables (ii) the first factor obtained is considered as a synthetic variable of the possession of these tools.

The explained variable of the model is "usage\_internet" and is defined as such:

#### 3.2 Logistic model

In order to assess the factors that determine the use of Internet, one can use the logistic model or the probit one. In fact, these models are used to model a dichotomous dependent variable as in this case where we want to explain

the reasons people use Internet or not. We have chosen the logistic model because it tends to produce similar results with the probit model and had been widely utilized in comparable studies.

Ordinary logistic regression or binary logistic regression is intended to explain a binary interest variable (ie, "yes / no" or "true / false"). The explanatory variables that will be introduced into the model can be quantitative or qualitative.

$$y_i^* = \sum_{i=1}^n \alpha_i X_i + \varepsilon_i \quad \text{with } i \text{ a given person}$$

$y^*$  is a latent variable, that is, it is not observed and  $X_i$  is the explanatory variable  $i$ ;  $\varepsilon$  corresponds to the residual term which can contain the explanatory variables omitted, the errors of measurement of the variables, ...

The use of the internet or not brings a level of utility to the individual that we will note  $y^*$ . However, it is latent (unobservable or hidden). Let  $y$  be a binary variable that is 1 if the individual used the internet and 0 otherwise. We establish the link between  $y$  and  $y^*$  as follows:

$$\begin{cases} y = 1 & \Leftrightarrow y^* > S_0 \\ y = 0 & \text{si } y^* < S_0 \end{cases}$$

We will consider that:  $y_i^* = \sum_{i=1}^n \alpha_i X_i + \varepsilon_i$  with  $X_i$  the explanatory variables of  $y^*$ .

In the case of this model, we consider that  $\varepsilon$  follows a so-called logistic probability law and that there exists an independence between  $X_i$  et  $\varepsilon_i$

Finally, failing to observe  $y^*$ , we refer to the variable  $y$ , which is observed.

The estimation of the model is based on the maximization of log-likelihood. The likelihood function is written:

$$L(x, y, \alpha) = \prod_{i=1}^N \frac{1}{1 + \exp(x_i \alpha)}^{1-y_i} \frac{\exp(x_i \alpha)}{1 + (x_i \alpha)}^{y_i}$$

By linearizing, we get:

$$\ln L(x, y, \alpha) = -\sum_{i=1}^N \ln(1 + x_i \alpha) - y_i x_i \alpha$$

The internet usage variable (use\_internet) variable can be modeled as follows:

$$\begin{aligned} \text{usage\_internet} = & \alpha_0 + \alpha_1 \text{heduc}_1 + \alpha_2 \text{heduc}_2 \\ & + \alpha_3 \text{heduc}_3 + \alpha_4 \text{hggender}(1) + \alpha_5 \text{pcexp} \\ & + \alpha_6 \text{cl}_{\text{age}}(1) + \alpha_7 \text{cl}_{\text{age}}(2) + \alpha_8 \text{cl}_{\text{age}}(3) \\ & + \alpha_9 \text{energie}(1) + \alpha_{10} \text{hgse}(1) \\ & + \alpha_{11} \text{hgse}(2) + \alpha_{12} \text{hgse}(3) + \alpha_{13} F1 \end{aligned}$$

### 3.3 Quality of the model

These are tests to ensure that the chosen model fits the data provided.

Let us consider the following test :

$$\begin{cases} H_0: \text{all the coefficients } \alpha_i \text{ are nuls all together} \\ H_1: \text{It exists at least a non nul coefficient } \alpha_i \end{cases}$$

The results found shows that we can reject  $H_0$  at the threshold of 5%.

In addition, the model provides a response rate of 90%, which is an excellent discrimination.

### 3.4 Results of the study and discussion

The significant variables at 5% are the education level of the household head, household income level (pcexp), age group,

energy, possession of electronic equipment or communication. The non-significant variables are gender and socio-economic category.

For the education level variable of the head of household, the results are:

- When we move from the "higher" reference category to the "secondary level" category, the proportion of those who have not used the Internet over those who have used the Internet is multiplied by 3,632. In other words, the proportion of Internet users is almost 3.5 times lower among those with a secondary level than among those with a higher level;
- When we go from the "higher" reference category to the "primary level" category, the proportion of those who did not use the internet on those who used the Internet is multiplied by 24,775. In other words, the proportion of Internet users is almost 25 times lower for those with primary education than for those with a higher level;
- When we go from the "higher" reference category to the "without level" modality, the proportion of those who did not use the internet on those who used the Internet is multiplied by 83,693. In other words, the proportion of Internet users is almost 84 times lower among those with no level than among those with a higher level;

Overall, we note that education is a factor that positively influences the use of the Internet. Indeed, using the Internet implies a certain mastery (reading, writing) of international languages such as French or English that are acquired through education combined with the virtual absence of local content. Moreover, educated people are more open to the world and the internet is a gateway to the world.

The variable pcexp which is a proxy of the income level of the household to which the leader belongs is neutral for the influence of the internet. This could be explained by the fact that by the fact that this factor alone may not be enough to be connected to internet but should go along with other factors.

With regard to the variable energy, we note that the proportion of Internet users is almost 1.5 times higher for those who have energy than those who do not. This is consistent with the fact that having network or solar power or a generator is a prerequisite to use a computer or charge a mobile phone / smartphone or even have an internet connection at home.

In relation to age, we note that (all things being equal):

- When we move from the reference category "over 54" to "15-34", the proportion of those who used the Internet on those who used the Internet is multiplied by 3,632. In other words, the proportion of Internet users is almost 5 times higher among young people (15-34 years old) than among those over 54;
- Also, the probability of being a Internet user is 3.7 higher among 35- to 44-year-olds than over 54-year-old Internet users is almost 3.7 times higher for those with a primary level than those who have a higher level;
- Finally, an individual whose age is between 45 and 54 years old is 3 times more likely to be a surfer than an individual over 54 years old.

In summary, being young has a positive effect on internet use. This is because young people are more open to change. Moreover, the youth is a period favorable to the search for opportunities or quest for knowledge. In fact, a study<sup>1</sup> conducted within university by the Ministry in charge of ICT development in Burkina Faso showed that 85.8% of the surveyed students used the internet to deepen their training. The possession of electronic or communication equipment has a positive influence on the use of the internet. This is in line with William Adanle's study conducted in Benin. Indeed, the possession of these tools can create an incentive to use the internet as a "new technology".

Variables such as gender (being male or female) and socio-professional are not significant unlike similar studies mentioned above. This may be due to the quality or nature of the data used for the estimations. Further research will help to understand better this result.

#### **4. Conclusion**

The study reveals that the factors that contribute positively to the diffusion of the Internet among the heads of households are the age, the level of education, the access to clean energy. However, the study has some limits among which the cross-section type of the data used which does not allow to understand the process of internet adoption by the heads of households of the Internet over time.

In any case, the fact that income is not a determining factor in the diffusion of this technology suggests that even the poor are ready to make sacrifices to access it. With this in mind, the policymakers could target household heads by encouraging the development of local content. In addition, the profile of heads of household that must be targeted firstly are those with a clean energy or the ones who are young.

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