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MOBILE PHONE AND HOUSEHOLDS' POVERTY: EVIDENCE FROM NIGER

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This study attempts to highlight, in the development context, the impact of mobile telephony on households' poverty in terms of welfare indicator improvement derived from the total household expenditure. By using the data from the National Survey of Household Living Conditions and Agriculture of 2011 (ECVMA-2011) in Niger, econometric regressions were performed by assuming on the one hand the exogeneity of the variable of interest and taking into account its endogeneity following the approach of the instrumental variable, on the other hand. In both cases, the impact of mobile telephony on household welfare is positive and significant but with different magnitude. Furthermore, by considering the welfare indicator derived from household food expenditure, we find that the mobile phone ownership has significant impact in reducing food poverty confirming, thus, the robustness of the findings. Therefore, the use of mobile phony can constitute a powerful mean of poverty reduction in developing countries.

Keywords: Mobile Phone, Household Poverty, Niger
JEL Classification: D1, I31

1. INTRODUCTION

During the last decade, the proportion of households owning mobile phones has increased spectacularly not only in urban areas of developing countries but also in rural ones. This mobile phone penetration rate in Africa has been higher compared to other information and communication technologies (ICTs). For example, the number of subscribers has more than doubled just between 2008 and 2011, that is, from 246 million to over 500 million or over 50% of the African population (Rao, 2011). However, with respect to Internet, in 2012, Africa represents only 7% of Internet users worldwide, with a penetration rate (percentage of users compared to the total population) of 15% (Internet World Stats, 2012). Analysts has exhibited a great hope that these mobile phones and others ICTs can foster the development of Africa. This view is based on the fact that like in many western countries which experienced the positive impact of

science and technology during the industrial revolution, ICTs would, on this basis, assist Africa to assail socio-economic problems (Obijiofor, 2009). For policy action, this view should be supported by evidences. However, in developing countries, this evidence from research on the linkages between ICTs (including mobile phones), livelihoods and poverty, is still scarce (Braun and Torero, 2006; McNamara, 2008) and two trends emerge from the literature.

The first body of literature recognizes the positive effect of mobile phone on households' welfare. Indeed, from this point of view, there are many channels from which mobile phones can contribute to reduce poverty and improve rural livelihoods. In fact, these devices can allow households to expand and strengthen their social networks; increase their ability to deal with emergencies; reduce travel costs and work efficiently. In addition, the business running cost can also be reduced by mobile phones use. Furthermore, the productivity of rural traders and farmers can increase as they can better secure markets and prices; and promptly communicate business-related information. This view is in line with many empirical findings. For example, in Tanzania and South Africa, Goodman (2005) found that mobile phones were being used to maintain social networks and provide access to information on socio-economic opportunities. In South Africa, Tanzania and Egypt (Samuel et al., 2005), it came out that mobile phones were reducing travel needs, assisting job searching, improving access to business information and contacts with families and friends. For Souter et al. (2005), in Mozambique, Tanzania and India, the impacts of telephones on people's livelihoods were more evident in emergencies, social networks, and saving costs and time. However, this study weakly correlated the use of mobile phones with reduction of income poverty. Munyegera and Matsumoto (2014) reveal that adopting mobile money services increases household per capita consumption by 72 percent, essentially through the facilitation of remittance reception. In the same vein, Labonne and Chaze (2009) found that purchasing a mobile phone has a large positive impact on the household-level growth rate of per capita consumption with estimates ranging from 11 to 17 percent. Moreover, Jensen (2007), in a study of the fisheries sector in south India, found that the adoption of mobile phones increased not only consumers' welfare but also producers' one as fishermen profits went up about 10% after the introduction of mobile phone service. Aker (2008) demonstrated that the introduction of mobile phones led to significant reduction in price dispersion among grain markets in Niger. In addition, Goyal (2008) shows that providing wholesale price information has a positive impact on the price received by producers. Klonner and Nolen (2008) show that, in South Africa, cell phone network roll-out has a positive impact on household income. Duncombe (2014) shows that, mobile phones impact upon assets, through facilitating asset substitution, enhancement, combination, exchange and forms of disembodiment. In contexts of extreme poverty, social networks are vital to survival, and mobile phones represent important tools to strengthen these networks of extended family and friends. In Botswana, the purpose of calls was recorded as predominantly to friends and family (70%), a proportion of which concerned arranging financial remittances (Duncombe, 2006). Mobile phones also

change and reinforce pre-existing economic structures, which influence poverty. In other words, adoption may then often represent part of a defensive livelihood strategy, given widespread poverty and the importance of extended family networks to survival (Rettie, 2008).

For the other trend of the literature, the significant positive impact of mobile phone on households' welfare is not clear and, more particularly, there is evidence that mobile phone may also be implicated in the production of poverty or has no effect on households' welfare. The literature on mobile phone, like other ICTs literature, focuses much more on how ICTs enable socioeconomic connection or articulation. However, the mechanism of poverty reduction is unclear. Evidence from Molony (2007) study points out that, in Tanzania, although mobile phones were creating new forms of network, they were still far from being the dominant form of network. For Molony (2008), many farmers were unable to exploit new mobile phone-based services to seek information on market prices. Some authors argue that or wander why mobile phone utilization doesn't necessarily contribute to poverty reduction. According to Tim Berners-Lee, the inventor of the World Wide Web, mobile phones can be like a "drug" in the developing world (and elsewhere), as people feel they need to spend income they sometimes cannot afford to have them. This is partly because they are "positional goods," showing social status, but they also make people feel included, rather than excluded, from processes of globalization (Hahn and Kibora, 2008). There are also instrumental reasons for their use as the maintenance and nurturing of survival networks. There are instances in Africa—in the Millennium Villages, for example—where people have chosen to spend money on mobile phone credit rather than school fees for their children (Puri et al., 2010). Consequently, mobile phones may, at times, be implicated directly in the production of poverty. In Ethiopia, among the poorest, 75% of the population who use mobile phones spend 27% of their income on them, reflecting the continued high cost of services on the continent (Gillwald and Stork, 2008). The willingness of people to pay such high proportions of their income for those services reflects the social and economic utility that these devices provide. However, it is unclear whether this utility reflects opportunity or fears of exclusion (and hence, compulsion). Mobile phones can perpetuate technological dependence and underdevelopment, as these devices and associated infrastructure are developed and imported from elsewhere (Carmody, 2012). There is also direct income depletion like in Niger where the cost of a one minute call off-network is US$0.38 per minute, representing 40 percent of a household's daily income (Aker and Mbiti, 2010). Research among university students in Tanzania found that they were spending five times more on mobile phone connectivity than they were on food (Kleine and Unwin, 2009). In common with many other studies, one in Tanzania, that surveyed several thousand households, found that while the majority of respondents felt mobile phones had strengthened their social networks, more than half did not think mobile phones had increased their household income (Sife et al., 2010). Aker and Fafchamps (2013) found that mobile phone ownership is associated with better access to market information but does not significantly change farmers' marketing and arbitrage

behavior and is not reflected in a higher price received. Using an experimental methodology, Fafchamps and Minten (2012) report similar findings for India.

Accordingly, due to this controversy, three questions should be raised. First, does mobile phone ownership impact on households' welfare in developing countries? Does the effect depend on gender and sector of activity of the household head? This study aims to provide an insightful contribution to the literature by addressing these questions in Niger, a developing country. Specifically, this paper aims to assess the impact of mobile phone ownership on poverty in Niger. The analysis is based on the Ordinary Least Square regression and Instrumental Variable (IV) approach to take into account the potential endogeneity of the mobile phone ownership variable. The particularity of our approach is the consideration of two types of indicator of welfare derived from the total household expenditure and the household food expenditure both including home consumption. By proceeding in that way, we can ensure on the robustness of our results because the total expenditure includes the mobile phone direct expenses but the food expenditure doesn't not. As in developing countries food expenditure represents a large share of household budget, the impact mobile phone on this variable can be a good indicator of the return mobile phone on household welfare. This aspect seems to be ignored in the literature and only fewer studies tried to take it into account (Labonne and Chaze, 2009). The data used are those from the National Survey of Household Living Conditions and Agriculture of 2011 (ECVM/A-2011) in Niger.

This paper is structured as follows. After this introductive section, the next one presents Niger's context. Section 3 explains the empirical approach and describes the source of data used in this analysis. Section 4 reports the descriptive statistics and the econometrics findings. Finally, the conclusions are discussed in Section 5.

2. CONTEXT OF THE STUDY

Niger is a developing country of sub-Saharan Africa facing major problems in the field of chronic, seasonal and acute food insecurity and malnutrition. The country is landlocked with a very low gross/net income per capita and level of human development. Niger depends on international and regional market for its food security. For example, the regularity and the durability of cereals flows from abroad, particularly Nigeria and Benin, permit to enhance the supply and the mitigation of price increase in local markets. Niger borders Algeria and Libya on the north, Chad on the east, Mali on the west and Burkina Faso and Benin on the southwest; it shares a long southern border with Nigeria. The Sahara Desert covers about two-thirds of Niger's land area (Geesing and Djibo, 2001). Very little rain falls in this arid region. In the south of the desert lies the pastoral belt, with slightly more rainfall, but not enough to support agriculture; here, nomad and transhumant pastoralists raise cattle, camels, sheep and goats, which they consume and trade for grain. The agro-pastoral zone in the south of the pastoral zone receives enough rainfall to permit good harvests in non-drought years, but rainfall is variable and many

households remain reliant upon livestock or on wage labor. Rainfed agriculture is most successful in a band across the southern border of the country, widest in the southwest (FEWS NET, 2011). Altogether, crop area represents around 13% of Niger's total land area.

Mobile phone service was first introduced in Niger in October 2001. However, the sector of Telecommunication has been liberalized in 2005. In 2014, four private mobile phone operators (ATLANTIQUE TELECOM NIGER SA, CELTEL NIGER SA, SAHELCOM SA. And ORANGE NIGER SA) have a license of establishment and operation of networks and telecommunications services. At the outset, mobile phone operators prioritized urban centers and proximity to international borders. The capital city and regional capitals received coverage during the first three years of mobile phone rollout, followed by a quasi-random pattern in later years. At the end of 2014, there are 6,067,141 mobile phone subscribers (ARTP, 2014) in Niger. From 2013 to 2014, the mobile growth rate is 23.27% and from 2008 to 2014 the increase rate was about 250% (ARTP, 2014). Although the telecommunications sector in Niger has evolved significantly in number of subscribers, penetration rate and turnover, the quality of service experienced a fairly significant degradation due to traffic congestion. This has led to repeated complaints from consumers and lower revenues for operators and consequently for the state. Several investments made to meet the requirements of 3G and of the flow of telephone traffic in the rules of art have remained untapped, creating dead investment for private operators and a quality of service that does not respond to the expectations of consumers.

3. METHODOLOGY

3.1. Estimation Strategy

To estimate the impact of mobile phone ownership on households poverty, let $Ln(E_i)$ be the household i's (log) of per capita total expenditure ratio ie. per capita total expenditure divided by the poverty line to convert the expenditure per capita, into real terms (Kurosaki 2015) and render comparable the welfare of different agro-ecologogical zone (Niamey, Autre ubrain, Agricole, Agropastorale et Pastoral) dwellers. We assume that this level of expenditure is determined by:

$$Ln(E_i) = c + \alpha M_i + \beta X_i + \varepsilon_i, \quad (1)$$

where α and β are the coefficient c the intercept to be estimated, M_i is a variable indicating the number of mobile phones owned by household i. X_i is a vector of common variables that vary across households and communities and is composed by three groups of variables. The first group of control variables relates to household socio-demographic characteristics such as household size, marital status of household

head, the age of the household head and its square, the different age groups of the members of households every 10 years, the proportion of members according to the educational level and the proportion of women. The second group of variables includes the activity sector of the household head and the number of non-farm enterprises owned by the household. The last group variables indicating the availability of microcredit centers in the household community of residence and access to the market in terms of distance. The rationale for the inclusion of these variables in the model is to control for some heterogeneities. For example, in community with microcredit or market, businesses are probably more flourished and this may affect welfare. Omitting these variables may create some endogeneity biases if these variables are correlated to mobile phone.

The equation can be estimated through OLS regression, but the ownership of a mobile phone might be correlated with unobservable household characteristics ε_i which would lead to biased estimates. For example, as pointed out by Fuchs and Horak (2008), unequal patterns of material access, usage capabilities, benefits, and participation concerning ICTs are also due to the asymmetric distribution of economic (money, property), political (power, social relationships), and cultural capital (skills) which can be correlated to household welfare. We deal with this problem by using instrumental variables (IV) regression. As usual, we need instruments that are correlated with the ownership of a mobile phone but uncorrelated with ε_i. We construct these instruments by exploiting the exogenous variability at community level of proportion of household heads who can read in any language, community radios, and the distance from the center of the community to the administrative center. However, it should be noted that the communities, here, do not correspond to administrative ones. It is a division done by the Institut National de la Statistique of Niger for data collection as clusters.

An instrument must satisfy two requirements: it must be both correlated with the included endogenous variable and orthogonal to the error process. For the former condition-relevance we believed that a household in an area with community radios and individuals who can read in any language are more likely to hear about and adopt new technologies such as mobile phones. Moreover, distance to the administrative center can explain the ownership of a mobile phone due to the fact that towns are more likely to receive coverage. We test whether our instrument set is weak against the alternative hypothesis that it is strong, using the test proposed by Stock and Yogo (2005). This test uses the Cragg-Donald statistics (equivalent to a first-stage F-statistic when there is only one regressor). For the latter condition-validity to hold, excluded instruments need to be orthogonal to the errors in the second-stage regression. Recall that the excluded instruments are community level variables and we believe that their correlation may be stronger with other community level variables (wage, employment opportunities or businesses) than households level variables. With the inclusion of microcredit availability and access to market variables in the model, the correlation of instruments with community level factors is probably weakened. As we had three excluded

instruments and one included endogenous regressor, we tested whether the instruments are uncorrelated with the error process. For that purpose, the Hansen J-statistic was reported.

Furthermore, in order to reduce the bias due to endogeneity, we assume that unobservable factors at regional level that might simultaneously affect mobile phone ownership and households' welfare are time invariant. So, the inclusion of regional fixed effect may allow to control the unobservable factors and reduce the bias due to omitted variables at regional level in Niger.

3.2. Data Sources

The data used come from ECVM/A-2011, a household's survey in Niger. As part of this survey, the number of sampled households is around 4000. ECVM/A took place in two passages, that is to say that each household is visited twice. The first round took place between June and August 2011 during the planting season in agricultural areas; the second passage took place between October and December 2011, during the harvest period. During the first passage, household and agriculture/livestock questionnaires were filled as well as the community questionnaire/prices. In the second passage, the household questionnaires and agriculture/livestock are filled in. In this study, we are specifically interested in households' socio-economic characteristics data.

4. RESULTS

4.1. Descriptive Analysis

The sample size of data retained for this study is about 3,592 households and the summary statistics of the variables are displayed in Table A1. In average, these households have one mobile phone. The size of the households varies from 1 to 30 with an average of 6 members. Female-headed households represent 13% of the total. With respect to marital status, 68% of households' heads are monogamous, 18% polygamous and 9% widowed. The divorced and separated are less than 3%. The households' heads age varies from 17 to 95 years, with an average of 45 years. The youngest, from 0 to 10 years old, represent the largest share of families' members with an average of 36%. The members aged from 10 to 20 years share is 19.6%. The proportion of women in households is about 51%. With respect to education level, less than 5% of household members have accomplished the primary cycle. The agricultural sector is the main employer as around 51% of the households' heads are exercising in this sector. The other most frequent activities are trade and business with about 12% and 10% of households' heads involved in. Only 4% of the households are working in the service sector. There is less than one bank or microcredit service in the communities. Finally, distance to the nearest market is about 51 km.

Figure 1 displays the proportion of households owning a mobile phone in each region. There is a large disparity between Niger regions with respect to mobile phone possession. It appears that Niamey has the largest proportion (94%), followed by Agadez (65%) and Tillabery (57%). Maradi and Zinder regions have the lowest proportions of households owning a mobile phone, with 38% and 45% respectively.

Figure 2 shows the average expenditure per capita for each region. It is Niamey, the capital, that has the highest average expenditure per capita followed by Zinder, and Tillabery. Furthermore, the correlation coefficient between the regional penetration rate and the average total expenditure per capita was calculated. Its value of 0.78 indicates the two variables are positively correlated.

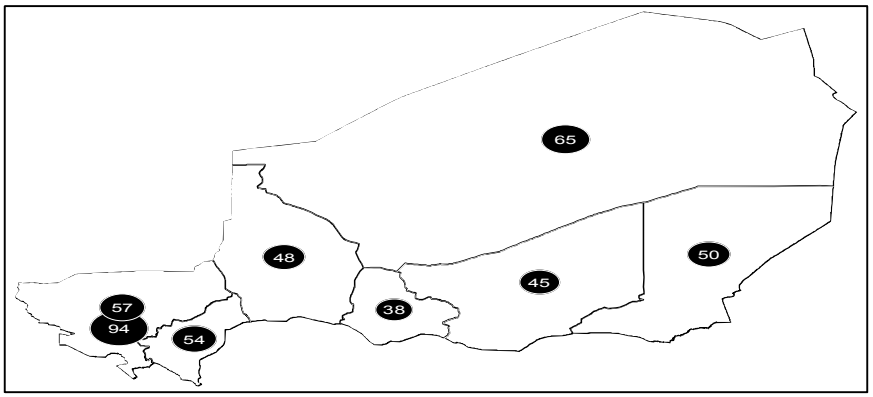

Figure 1. Proportion of Households Owning a Mobile Phone per Region (in Percentage %)

Source: Author from the ECVMA data 2011

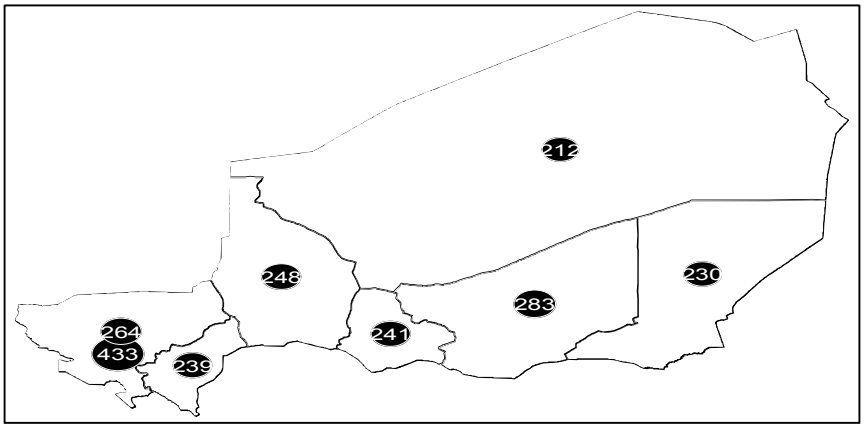

Figure 2. Regional Average Total Expenditure per Capita (in thousands of FCFA)

Source: Author from the ECVMA data 2011

4.2. Instrumental Variable

Table 1 presents the results of econometric estimates of the model equation defined above. The dependent variable is the logarithm of the ratio of total expenditure per capita (that is to say, the total expenditure per capita divided by the poverty line).

Table 1. Econometric Estimates with Total Expenditure Indicator

Variables	Model 1 (OLS)	Model 2 (IV)	Model 3 (OLS)	Model4(OLS)
Household size	-0.061(0.003)***	-0.117(0.010)***	-0.062(0.003)***	-0.112(0.008)***
Gender women	0.047(0.041)	0.026(0.058)	0.056(0.041)	0.034(0.035)
Monogamous (Never married)	0.185(0.056)***	0.044(0.099)	0.189(0.056)***	0.064(0.053)
Polygamous	0.326(0.059)***	0.241(0.102)**	0.332(0.059)***	0.263(0.056)***
Widowed	0.066(0.069)	-0.009(0.109)	0.063(0.068)	0.007(0.062)
Divorced	0.066(0.076)	-0.012(0.120)	0.062(0.076)	-0.002(0.070)
Separated	0.102(0.171)	0.335(0.177)*	0.092(0.173)	0.331(0.135)**
Head aged(/100)	-0.937(0.409)**	-2.140(0.618)***	-0.941(0.410)**	-2.281(0.414)***
Head aged(/100) Square	0.677(0.411)*	1.818(0.623)***	0.683(0.412)*	1.971(0.419)***
Age0_10	-0.073(0.081)	0.134(0.112)	-0.079(0.081)	0.110(0.075)
Age10_20	-0.174(0.082)**	-0.342(0.110)***	-0.177(0.082)**	-0.347(0.072)***
Age20_30	-0.037(0.085)	-0.571(0.142)***	-0.044(0.086)	-0.557(0.091)***
Age30_40	0.031(0.090)	-0.132(0.122)	0.023(0.091)	-0.121(0.085)
Age40_50	-0.041(0.104)	-0.201(0.137)	-0.053(0.105)	-0.176(0.102)*
Age50_60	-0.044(0.096)	-0.056(0.128)	-0.042(0.096)	-0.048(0.088)
Share secondary 1 cycle (Primary)	0.322(0.063)***	-0.003(0.108)	0.321(0.064)***	0.003(0.064)
Share secondary 2 cycle	0.634(0.126)***	0.053(0.191)	0.636(0.127)***	0.073(0.136)
Share superior	0.895(0.135)***	0.571(0.159)***	0.923(0.136)***	0.643(0.165)***
Mobile phone number	0.083(0.007)***	0.542(0.068)***	0.061(0.018)***	0.495(0.060)***
Women share	0.103(0.038)***	0.098(0.051)*	0.047(0.046)	0.073(0.054)
Women share _Mobile phone number			0.055(0.030)*	0.032(0.050)
Livestock/Silvi/Fishing(Farming)	0.069(0.030)**	0.107(0.040)***	0.080(0.032)**	0.107(0.032)***
Industry	0.100(0.029)***	-0.041(0.044)	0.056(0.037)	-0.079(0.052)
Trade	0.229(0.027)***	0.034(0.049)	0.248(0.035)***	0.008(0.057)
Transport	0.228(0.047)***	0.114(0.062)*	0.210(0.068)***	0.168(0.102)*
Education/Health	0.331(0.038)***	0.042(0.073)	0.367(0.059)***	0.059(0.093)
Pers. Services /domestic work	-0.018(0.041)	-0.118(0.060)**	0.002(0.048)	-0.204(0.090)**
Administration/télécom/fin/aut.	0.214(0.032)***	-0.059(0.063)	0.239(0.044)***	-0.123(0.093)
Mobile_Livestock/Silvi/Fishing(Farming)			-0.031(0.032)	-0.011(0.050)
Mobiel_Industry			0.024(0.018)	0.053(0.033)
Trade			-0.013(0.016)	0.036(0.036)
Mobile_Transport			0.007(0.028)	-0.016(0.059)
Mobile_Education/Health			-0.020(0.022)	0.006(0.046)
Mobile_Pers. Services /domestic work			-0.013(0.020)	0.073(0.059)
Mobile_Administration/télécom/fin/aut.			-0.014(0.017)	0.050(0.047)
Number of non farm enterprise	0.019(0.007)***	0.008(0.011)	0.019(0.007)***	0.006(0.007)
Number of Bank and microcredit	0.033(0.009)***	0.016(0.014)	0.033(0.009)***	0.013(0.009)
Distance to market (/100)	-0.039(0.020)*	-0.021(0.030)	-0.040(0.020)**	-0.021(0.022)
Constant	1.165(0.135)***	1.457(0.198)***	1.193(0.136)***	1.496(0.118)***
Regional fixe effects	Yes	Yes	Yes	Yes
Number of Observations	3,339	3,272	3,339	3,339
R-squared	0.577	0.155	0.579	0.574

Note: Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

Two types of estimation were carried out: The first assumes that the variable of interest is exogenous while the second releases this assumption and adopts the approach of the instrumental variable regression to correct the endogeneity. Four models were estimated: the first model assumes that the variable of interest is exogenous. For this purpose, The OLS regression is performed (model1). Then, a model taking into account the endogeneity of the number of mobile phone owned by the household is estimated (model2) and its first stage regression results are in Table A2. The third (model3) includes the interaction of the mobile phone variable with the proportion of women in the household and the employment sector of the head of household under the assumption of exogeneity. The last model is similar to the third but it is the prediction of the variable of interest that is used which led us to perform a bootstrap to get an approximation of the standard deviation of the mobile phone variable (model 4).

There is a significant difference in magnitude of the coefficient of the variable of interest between the two types of estimates. Indeed, under the assumption of exogeneity, the effect of owning a mobile phone on welfare is low. This failure to take into account the endogeneity of this variable could therefore explain the lack of effect of mobile phones on the bargaining power of producers found in Niger (Aker, 2008). In addition, it should be emphasized that the statistics (Hansen J test and Cragg-Donald Wald F in Table A3) clearly confirm the validity and strength of our instruments. Therefore, interpretations will focus on estimates with instrumented variable.

4.3. Main Results

The results of the model estimation show that the number of mobile phones has a positive impact on the well-being. Particularly, the possession of a mobile phone in households increases by 8.3% the ratio of household expenditure per capita. By cons, taking into account the endogeneity, the acquisition of a mobile phone increases of approximately 54.2% the ratio of household consumption per capita. These results are consistent with previous findings that highlight the impact of owning a mobile phone on household consumption such as the findings of Munyegera and Matsumoto (2014) which show that the adoption of mobile money increases Household consumption per capita by 72% or those of Labonne and Chaze (2009) which indicate that buying a mobile phone causes a growth ranging from 11% to 17% of household consumption per capita. We can also mention the study of Jensen (2007), which reveals an increase of more than 10% of the profits of fishermen as a result of the introduction of mobile telephony.

The high increase of welfare is explained by the presence of several channels through which the mobile phone can impact on households' welfare. One can, for example, mention the fact that mobile telephony can reduce price dispersion between agricultural markets (Aker, 2008) which is of paramount importance in the Nigerien context due the fact that agriculture is the main activity of most households. Another channel is that of remittances (Munyegera and Matsumoto, 2014). Indeed, mobile

phones can play an important role in the reception of remittances in Niger. As in most developing countries, these transfers represent a large share of household consumption in this country (BCEAO, 2013). Furthermore, the reduction of lost time due to the traveling to acquire information can also enable households to devote more time to work. In other words, the gain in working time is also an important channel for improving household welfare.

4.4. Analysis by Gender and Sector of Activity

The second question the study sought to answer is whether the influence of possession of mobile phones on the welfare varies by household composition in terms of gender or sector of activity of the household head. Models 3 and 4 are used to answer this question. Recall that model 3 is based on the assumption of exogeneity of the variable of interest while, in Model 4, it is the prediction of the endogenous variable that is used. The introduction of these interactions has varied the magnitude of the coefficients of the variable of interest by reducing it from 0.083 to 0.061 under the assumption of exogeneity and from 0.542 to 0.495 in Model 4 that uses prediction of the endogenous variable. Despite this variation of effects, it does not seem to be a specific effect of mobile phone possession on household consumption related to the household head sector of activity. However, concerning the proportion of women in the household, there is a positive effect of the interaction with the mobile phone if it is assumed that the variable is exogenous. But, there is no specific effect of gender in relation to the possession of mobile phones on household consumption when endogeneity is taken into account.

4.5. Robustness Check

We furthered the analysis about the specific effect of mobile phone in relation to the sector of activity of the households' heads. These later were classified into two groups, farmers and non-farmers, and regressions were conducted (not reported here) separately for each group using the prediction of mobile phone variable. The findings reveal that the effect of mobile phone is significant and positive at 5% but the coefficient of Mobile phone variable is higher in farmers regression (0.543) than in non-farmers one (0.417). However, the difference is not statistically significant.

In addition, model 1 has been estimated first with the variable "at least mobile phone" in the household and then with "additional number of mobile phone" as explanatory variable only (the regressions results were not reported here). The coefficient of the variable at least one mobile phone (0.147) is significant and higher than the coefficient of the variable number of mobile phone (0.083). This may be explained by the fact that the binary variable (at least one mobile phone) is more exogenous (therefore less biased) than the number of mobile phone variable which is more plausible to be correlated to unobserved effect despite it captures more the degree

to which the household has access to information. This result confirms again the endogeneity of mobile phone number. The regression with additional number of mobile phone variable shows that additional mobile phones are also important as the variable is significant and positive (0.078) but with a less effect than the first mobile (0.147).

Table 2. Econometric Estimates with Food Expenditure Indicator

Variables	Model 1 (OLS)	Model 2 (IV)	Model 3 (OLS)	Model4(OLS)
Household size	-0.058(0.003)***	-0.099(0.009)***	-0.058(0.003)***	-0.096(0,007)**
Gender women	0.037(0.038)	0.023(0.050)	0.044(0.039)	0.026(0,039)
Monogamous (never married)	0.184(0.056)***	0.081(0.084)	0.183(0.057)***	0.090(0,065)
Polygamous	0.311(0.059)***	0.250(0.086)***	0.312(0.060)***	0.262(0,065)**
Widowed	0.044(0.067)	-0.010(0.093)	0.040(0.068)	-0.001(0,080)
Divorced	0.048(0.076)	-0.008(0.101)	0.044(0.076)	-0.005(0,084)
Separated	0.105(0.145)	0.309(0.151)**	0.095(0.150)	0.279(0,141)*
Head aged(/100)	-0.681(0.393)*	-1.568(0.531)***	-0.698(0.392)*	-1.710(0,428)**
Head aged(/100) square	0.542(0.393)	1.384(0.532)***	0.561(0.392)	1.528(0,424)**
Age0_10	0.019(0.079)	0.176(0.097)*	0.017(0.079)	0.159(0,086)*
Age10_20	-0.201(0.080)**	-0.325(0.096)***	-0.200(0.080)**	-0.332(0,081)**
Age20_30	-0.155(0.083)*	-0.555(0.124)***	-0.160(0.084)*	-0.558(0,086)**
Age30_40	-0.157(0.090)*	-0.279(0.108)***	-0.160(0.090)*	-0.277(0,090)**
Age40_50	-0.097(0.097)	-0.219(0.115)*	-0.106(0.098)	-0.202(0,091)*
Age50_60	-0.122(0.102)	-0.131(0.118)	-0.125(0.103)	-0.130(0,110)
Share secondary 1 cycle (primary)	0.148(0.060)**	-0.100(0.091)	0.149(0.060)**	-0.092(0,076)
Share secondary 2 cycle	0.377(0.128)***	-0.064(0.176)	0.371(0.130)***	-0.048(0,125)
Share superior	0.301(0.185)	0.041(0.184)	0.308(0.191)	0.103(0,217)
Mobile phone number	0.051(0.006)***	0.397(0.060)***	0.021(0.017)	0.355(0,056)**
Women share	0.107(0.038)***	0.104(0.045)**	0.059(0.045)	0.084(0,051)
Women share _mobile phone number			0.046(0.026)*	0.025(0,038)
Livestock/silvi/fishing(farming)	0.121(0.028)***	0.150(0.035)***	0.136(0.031)***	0.146(0,034)**
Industry	0.080(0.030)***	-0.028(0.040)	0.029(0.037)	-0.091(0,044)*
Trade	0.170(0.027)***	0.025(0.042)	0.180(0.033)***	-0.003(0,042)
Transport	0.145(0.044)***	0.058(0.054)	0.120(0.062)*	0.135(0,116)
Education/health	0.291(0.038)***	0.073(0.063)	0.304(0.058)***	0.121(0,091)
Pers. Services /domestic work	-0.055(0.043)	-0.130(0.052)**	-0.076(0.052)	-0.232(0,073)*
Administration/telecom/fin/aut.	0.134(0.031)***	-0.078(0.055)	0.119(0.042)***	-0.122(0,085)
Mobile_livestock/silvi/fishing(farming)			-0.045(0.029)	-0.006(0,039)
Mobiel_industry			0.035(0.018)**	0.068(0,035)*
Trade			-0.000(0.015)	0.035(0,027)
Mobile_transport			0.017(0.023)	-0.029(0,063)
Mobile_education/health			0.000(0.024)	-0.007(0,053)
Mobile_pers. Services /domestic work			0.019(0.022)	0.085(0,052)
Mobile_administration/telecom/fin/aut.			0.012(0.016)	0.044(0,039)
Number of non-farm enterprise	0.019(0.007)***	0.010(0.010)	0.019(0.007)***	0.009(0,008)
Number of bank and microcredit	0.027(0.009)***	0.015(0.012)	0.026(0.009)***	0.012(0,008)
Distance to market (/100)	-0.016(0.020)	-0.002(0.026)	-0.017(0.020)	-0.001(0,019)
Constant	1.081(0.129)***	1.289(0.170)***	1.125(0.130)***	1.346(0,133)**
Regional fixe effects	Yes	Yes	Yes	Yes
Number of observations	3,339	3,272	3,339	3,339
R-squared	0.315	-0.062	0.317	0.32

Note: Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

As indicated above, we could not focus on the total expenditure indicator only as this later may include the mobile expenses. Accordingly, we conducted econometric analysis by considering the food expenditure indicator as the dependent variable. We followed the same process as above in the estimation of the total expenditure indicator.

For the first two models where there is no interaction with mobile phone and women share in the household and the type of activity of the household head, there are decreases in the magnitude of the coefficients compared to the first cases where the dependent variable is the total expenditure indicator ratio. While in the cases where the dependent variable is the total expenditure indicator the coefficients of the mobile phone are 0.083 (model 1) and 0.542 (model 2) they are 0.051 (model 1) and 0.397 (model 2) in cases where the dependent variable is the food expenditure indicator. The reduction of magnitudes of coefficients are about 38.5% and 26.7% for model 1 and model 2 respectively. Although there is a reduction in the coefficient magnitude, the fact that the coefficients of the variables of interest are positive and significant indicates that there is a positive return of mobile phone in nigerien households. Hence, using a mobile phone may contribute to the reduction of food poverty. This result, contradict some finding in the literature that support the pauperization of the population due to mobile phone use (Gillwald and Stork, 2008). However, even if there a positive net effect of mobile phone possession on household welfare, there is urgent need to reduce the cost of mobile phone call in Niger. In fact, there is a direct income depletion due to mobile phone use as the cost of a one minute call is US$0.38, representing 40% of a household's daily income in this poor country (Aker and Mbiti 2010).

In sum, the findings of th,is study highlight the importance of expanding telecommunications infrastructure coverage to facilitate the use of mobile telephony for rural households. The positive impact of mobile phones on household well-being highlighted in this study indicates that it would be possible to accelerate the progress of poverty reduction in Niger if the Nigerien households benefit from the opportunities of this New Communication Technology. However, it is important to note that this study has limitations because the different channels through which mobile phones impact on welfare have not been clearly identified. This is of crucial importance for policy formulation.

5. CONCLUSION

Although there is abundant literature on the impact of mobile telephony on households' welfare, empirical evidence seems rare in developing countries. This study attempts to fill this gap in the Nigerien context, which is a good illustration of developing countries. The study was structured around issues relating to the impact of owning a mobile phone on welfare. To this end, by mobilizing the data of ECVM/A-2011 in Niger, econometric regressions were carried out. The analysis shows that the mobile phone plays a crucial role in households' life. Indeed, the mobile phone

has a positive impact on households' welfare in Niger under the assumption of exogeneity of the variable of interest. By taking into account the endogeneity, the positive effect of this variable of interest also persists with a higher magnitude. Then, it appears from this study that there is not a specific effect of mobile telephony related to household composition by gender or sector of activity of the household head. Furthermore, the results are robust to different indicators of welfare. Particularly, mobile phone ownership contributes significantly to the reduction of food poverty in Niger. These evidences support the view that ICTs would assist Africa to assail socio-economic problems.

APPENDIX

Table A1. Summary Statistics of Variables

Variable	Obs	Mean	Std. Dev	Min	Max
Welfare	3592	0.489	0.565	-0.79	2.00
Number of mobile phone	3592	1.197	1.548	0	16
Household size	3592	6.399	3.363	1	30
Head gender (female)	3592	0.133	0.340	0	1
Monogamous	3592	0.680	0.466	0	1
Polygamous	3592	0.180	0.385	0	1
Widowed	3592	0.095	0.293	0	1
Divorced	3592	0.023	0.151	0	1
Separated	3592	0.004	0.062	0	1
Head age(/100)	3592	0.454	0.145	0.17	0.95
Age0_10	3592	0.357	0.215	0	0.83
Age10_20	3592	0.196	0.186	0	1
Age20_30	3592	0.160	0.180	0	1
Age30_40	3592	0.109	0.139	0	1
Age40_50	3592	0.064	0.103	0	1
Age50_60	3592	0.053	0.111	0	1
Share secondary 1 cycle	3592	0.046	0.122	0	1
Share secondary 2 cycle	3592	0.009	0.050	0	1
Share superior	3592	0.009	0.063	0	1
Women	3592	0.507	0.192	0	1
Livestock/silvi/fishing(farming)	3339	0.089	0.284	0	1
Industry	3339	0.083	0.276	0	1
Trade	3339	0.116	0.320	0	1
Transport	3339	0.030	0.171	0	1
Education/health	3339	0.033	0.179	0	1
Pers. Services /domestic work	3339	0.037	0.188	0	1
Administration/telecom/fin/aut.	3339	0.087	0.282	0	1
Number of non-farm enterprise	3592	0.963	1.023	0	6
Number of Bank and microcredit	3592	0.337	0.865	0	6
Distance to market (/100)	3592	0.512	0.480	0.001	1.98

Table A2. First Stage Regression Results

Mobile Phone Number	Coefficients	Coefficients
Household size	0.122(0.008)***	0,122(0,008)***
Head gender (female)	0.045(0.089)	0,045(0,089)
Monogamous	0.287(0.154)*	0,287(0,154)*
Polygamous	0.167(0.163)	0,167(0,163)
Widowed	0.132(0.182)	0,132(0,182)
Divorced	0.112(0.191)	0,112(0,191)
Separated	-0.441(0.229)*	-0,441(0,229)*
Head age(/100)	2.489(0.854)***	2,489(0,854)***
Head age(/100) square	-2.347(0.872)***	-2,347(0,872)***
Age0_10	-0.461(0.156)***	-0,461(0,156)***
Age10_20	0.312(0.159)**	0,312(0,159)**
Age20_30	1.199(0.176)***	1,199(0,176)***
Age30_40	0.302(0.181)*	0,302(0,181)*
Age40_50	0.284(0.193)	0,284(0,193)
Age50_60	0.064(0.174)	0,064(0,174)
Share secondary 1 cycle	0.574(0.160)***	0,574(0,160)***
Share secondary 2 cycle	1.224(0.344)***	1,224(0,344)***
Share superior	0.438(0.306)	0,438(0,306)
Women	0.014(0.079)	0,014(0,079)
Livestock/silvi/fishing(farming)	-0.012(0.055)	-0,012(0,055)
Industry	0.253(0.066)***	0,253(0,066)***
Trade	0.384(0.063)***	0,384(0,063)***
Transport	0.252(0.093)***	0,252(0,093)***
Education/health	0.588(0.102)	0,588(0,102)***
Pers. Services /domestic work	0.220(0.098)**	0,220(0,098)**
Administration/telecom/fin/aut.	0.535(0.082)***	0,535(0,082)***
Number of non-farm enterprise	0.033(0.018)*	0,033(0,018)*
Number of Bank and microcredit	0.004(0.025)	0,004(0,025)
Distance to market (/100)	0.042(0.049)	0,042(0,049)
Read in any language	1.415(0.171)***	1,415(0,171)***
Distance_admin_center	0.000(0.000)	0,000(0,000)
Community radio	0.080(0.054)	0,080(0,054)
Constant	-1.311(0.298)***	-1,311(0,298)***
Regional fixed effects	yes	yes
Number of obs	3272	3272
F(56, 3215)	57.680	57.680
Centered R2	0.504	0.504
Uncentered R2	0.718	0.718

Note: Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

Table A3. Endogeneity Tests.

Underidentification test (Kleibergen-Paap rk LM statistic):	72.557	72.557
Weak identification test (Cragg-Donald Wald F statistic):	30.892	30.892
(Kleibergen-Paap rk Wald F statistic):	26.883	26.883
10% maximal IV size	22.30	22.30
15% maximal IV size	12.83	12.83
20% maximal IV size	9.54	9.54
25% maximal IV size	7.80	7.80
Hansen J statistic (overidentification test of all instruments):	1.618	1.618

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