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Patterns of Mobile Phone Use in Developing Countries: Evidence from Africa

Jeffrey James

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Abstract According to traditional welfare economics welfare occurs at the point where a good is purchased and some amount of utility is assumed to derive therefrom. According to Sen and others however one needs to look in addition to what use is made of the good after purchase. This paper throws new light on this process by means of a large new data-set that examines use patterns of mobile phones in 11 African countries. The main hypothesis is that this technology will be most widely used in countries lacking in viable alternatives to the use of mobile phones e.g. where public transport is weak or roads are poor. The results tend to support this view though there remains much to be explained.

Keywords Well-being · Consumer theory · East Africa

1 Introduction

In an article on mobile phones published in 2007, James and Versteeg (2007) pointed out that from a welfare point of view what matters is the use of this technology and the benefits it conveys thereby. Yet, as these authors also made clear, the evidence on this topic tends to be concerned with owners and subscribers and it is not helpful to answering questions about how many people benefit from the use of mobile phones and in which specific ways. It is true that there are a few limited studies on this question, such as by Goodman (2005) and Camner et al. (nd) on the economic and social benefits of mobiles in a select few African countries. Not until quite recently however has a far more extensive set of survey data been collected, which covers a relatively large number of welfare-enhancing mechanisms and as many as 11 comparable African countries.¹ It is fair to say that the data-set

¹ I am grateful to Research ICT Africa for making the data available to me. The underlying methodology is contained in Research ICT Africa. net. 'Household, Small Business and Public Institutional e-Access and Usage Survey 2011'. The results are available on request.

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as a whole comprises the most comprehensive collection of evidence on mobile phone use now available in developing countries. The purpose of what follows is to examine the said data and especially the welfare patterns that underlie them.

For this purpose I first divide the data on mechanisms of use into four categories, dealing, respectively, with economics, health, social capital and safety. Each of the categories is analyzed initially in the form of a table, which exhibits the countries as columns and the mechanisms as rows. Some countries will of course do better than others and certain mechanisms will contribute more to welfare than others in a table. Ideally, I would be able to explain all the patterns that emerge but more realistically many of them will remain as questions for future research.

In the next phase of the analysis the scope of the paper is extended to allow for comparisons across tables. To the best of my knowledge this type of cross-tabular calculation does not appear elsewhere in the existing literature. It can address questions such as whether the same countries (or countries from the same region) tend to perform well or poorly across categories or whether the results have a more random character. Here too though some of the observations will generate a research agenda rather than well-formulated questions. As it happens, much of this agenda will need to revolve around finding explanations for the systematically favourable performance of the relatively impoverished countries from the East Africa region.

But it will also involve the development of an analytical framework in which the use of products and technologies helps to determine their overall impact on welfare. Sen's concept of functionings already captures the essence of such an idea.

2 Survey Method and Characteristics of Respondents

As described in the reference given in footnote 1, the methods used to collect the data accord very well with the goals of this study as these were described above. For one thing, the method includes a diverse group of 11 African countries, some very poor and others among the richest on the continent. There is also a dispersion of the sample countries by region (including East, West and Southern Africa). Within each country, moreover, the survey relies on a relatively large number of respondents as described in footnote 1. Relatedly, the data are collected with the aid of national statistical methods which help to provide nationally representative information. (I am thinking here for example of national census sample frames and enumerator areas). Finally, the survey covers an unusually wide range of ways in which mobile phones are actually used to enhance welfare in the relevant countries. For analytical convenience I have divided these mechanisms into 4 categories in the presentation of the results (namely, economic, health, social and safety-related measures). Thus collected, the results are surely the most comprehensive now available on the use of mobile phones in developing countries.

Table 1 well reflects the basic conditions of mobile phone use in the poorest developing countries since most of the sample belongs to what the World Bank refers to as the low-income category (see the bottom row for the per capita income levels of the eleven sample countries). For example, only in slightly more than half of them does the population own this technology. Among owners only about one quarter are able to use the phone for browsing the Internet. This is surely due in large part to the relative cost of the products that are required for such a purpose. In fact, lack of affordability is given (in the next set of rows) as the main reason for not buying a mobile phone in general (followed by a lack of electricity). Finally, from among those using public phone facilities, three quarters rely on

mobile phone kiosks as opposed to the quarter of respondents who use fixed-line payphones.

There are, however, some notable exceptions to these average tendencies. On the one hand, one should single out the two relatively developed countries, South Africa and Botswana. I shall focus on the former because it is structurally more similar to developed countries than the latter. That South Africa displays exceptional characteristics can be seen from almost every row in the table. To begin with, this country has the highest rate of mobile phone ownership in the sample, which is due primarily to its relatively high level of per capita income (a factor which is often the main explanatory variable in accounting for rates of diffusion of information technology across developed and developing countries).² Because of its exceptionally high rate of mobile phone adoption there is very little sharing of mobile phones in South Africa (as is also the case in countries that are described as high income or developed). Indeed, 7.3 is the lowest percentage of all countries in the sample. Or again, at 51, this relatively affluent country exhibits double the average percentage of those who are able to use their mobile phones to browse the Internet. In the following rows, dealing with the inability of respondents to own a phone, the reason is less to do with affordability compared to the other countries and more to do with broken and stolen products (with the latter reflecting perhaps the unusually high crime rate in the country).³ A final observation concerns the use of fixed-line or mobile phones in public places. Being more advanced than almost all other African countries at the time when mobile phones were introduced on the continent, South Africa had by then built up a larger stock of fixed-line equipment. It is on this stock that the country still depends relatively heavily in the use of public phones, as can be seen in Table 1.

On the other hand there are countries that are underdeveloped even by African standards. One might expect these countries to exhibit the opposite tendencies that have just been described in relation to South Africa. Consider for example the case of Ethiopia which is shown in the table as having the second lowest per capita income in the sample (and, one suspects, on the continent as a whole). It can be quickly discerned that the expectation for this country is strongly confirmed. In particular, it comes last in the sample with respect to ownership of mobile phones and Internet browsing capability; affordability is a more severe constraint than for any other country and the extent of sharing is among the highest (being the mirror image of a low ownership rate in the country).

At least at the extremes therefore income helps to explain some variation in the data by country (and the more so if Botswana is included in the comparison). A relevant question is whether this variable will continue to exert an influence on the patterns of use shown in the next section. There I shall examine the specific ways in which the benefits of mobile use are actually extracted by members of the eleven sample countries.

3 Results for Four Mechanisms of Mobile Phone Use

As noted above I have divided the results into four categories dealing with economics, health, social capital and safety. It should be borne in mind though that for some items the classification into these groups is not entirely clear-cut and other possibilities could be considered.

² See for example Goodman (2005).

³ For data see [UNODC.org](http://unodc.org).

Table 1 About the respondents (%)

	Uganda	Kenya	Tanzania	Rwanda	Ethiopia	Ghana	Cameroon	Nigeria	Namibia	S. Africa	Botswana	Average
Do you own a mobile phone?	46.7	74.0	35.8	24.4	18.3	59.5	44.5	66.4	56.1	84.2	80.0	53.6
% Prepaid	98.0	99.8	99.5	90.1	98.4	97.4	99.0	99.0	91.8	87.5	94.4	95.9
Do you share your mobile with others?												
No	49.5	71.4	78.5	72.7	67.6	77.5	78.0	79.6	53.7	92.7	67.7	71.7
Yes	50.5	28.6	21.5	27.3	32.4	22.5	22.0	20.4	46.3	7.3	32.3	28.3
Is your mobile phone capable of browsing the internet?	14.9	32.3	19.2	19.1	6.5	28.5	14.9	22.7	30.7	51.0	29.5	24.5
Why don't you have a mobile phone?												
Cannot afford it	76.5	82.3	87.3	81.6	88.3	70.6	69.7	76.6	71.8	62.8	81.1	77.1
No mobile coverage	30.8	4.2	9.3	12.9	23.3	21.1	42.6	15.0	15.3	1.5	5.8	16.5
No electricity at home	79.9	39.0	87.6	64.9	50.3	40.2	50.5	56.8	73.2	8.5	48.9	54.5
No one to call	20.6	4.7	23.2	17.5	24.1	13.4	16.0	17.4	17.7	5.8	7.0	15.2
Phone broken	9.8	13.3	12.8	4.5	0.1	18.1	5.7	6.9	16.8	28.7	20.3	12.5
Phone stolen	7.3	20.8	3.8	3.9	0.3	10.4	9.0	13.8	10.1	17.5	13.2	10.0
What type of public phones are you using most?												
Telephone booth (fixed line operator)	18.7	0.0	90.3	5.1	20.2	0.9	4.8	7.6	95.1	35.9	4.4	25.7
Telephone kiosk (umbrella operator)	81.2	100.0	9.7	93.8	75.5	93.3	94.7	91.7	4.9	62.3	95.6	73.0
GNP per capita	\$1,300	\$1,800	\$1,500	\$1,300	\$1,100	\$3,100	\$2,300	\$2,600	\$7,500	\$11,00	\$16,200	\$4,300

Source Research ICT Africa

3.1 Economics-Related Mechanisms

What is notable is in the first place that all the top-rated countries in the table are drawn from East Africa. More specifically, 13 out of the 18 cells in the table belong to this region, an outcome that is very unlikely to have been generated by chance. One part of an explanation of these patterns has to do with m-Pesa (see below) and its confinement largely to Kenya, Tanzania and Uganda. This mobile-money venture began in the first-mentioned country and then spread to the other two countries in the region. As shown in Table 2, however, mobile money has spread far more widely in Kenya than the other two countries. Indeed, the rate of use of m-Pesa in Kenya is almost 80 %, compared to the sample average of just 19 %. It is indeed the former value that largely accounts for the fact that this country does best on average for all the economics related mechanisms of mobile phone use (see last row in Table 2).

M-Pesa is a service developed by Vodafone and designed for emerging markets, where many people are still underserved by financial service providers. The first launch of m-Pesa was in Kenya by Safaricom [in 2007] and one year later by Vodacom in Tanzania. Both Safaricom and Vodacom are part owned by the UK's Vodafone and hence have access to the m-Pesa model⁴(Samuel et al. 2005).

Some of the reasons for the comparative success of m-Pesa in Kenya are related to a receptive regulatory environment, the dominant status of Safaricom in the market and a strong demand for this firm's 'send money' function because of the high numbers of domestic migrants transferring funds back home. (The Economist, 20 September, 2012).⁵ The absence of a comparable demand in Tanzania is one reason why adoption of the m-Pesa model in that country has lagged behind Kenya. Another reason has to do with the viability of the alternative to mobile phones in the two countries (see below for a general version of this argument).

In Kenya the most popular methods previously used were asking a friend or family member to take the money by hand or to use a bus or a courier company. We know that these methods can be high risk and do result in losses. The high crime rate in Kenya and Nairobi in particular created a greater demand for a safe way of sending money compared to Tanzania where the risk of robbery is lower (Samuel et al. 2005).

For the other rows in Table 2, however, a more general explanation is needed for the superior performance of East African countries. What I will advance for this purpose is a variation of findings already published in the scant literature on the beneficiaries of mobile phone use. Waverman et al. (2005) for example,

Find that mobile telephony has a positive and significant impact on growth and *this impact may be twice as large in developing countries compared to developed countries*. This result concurs with intuition. Developed countries by and large had fully articulated fixed-line networks in 1996... In developing countries, we find that the growth dividend is far larger because here mobile phones provide, by and large, the main communications networks; hence they supplant the information-gathering role of fixed-line systems (Waverman et al. 2005).

⁴ It is worth noting that mobile money arose from within the Kenyan population before being formalized by Vodafone. The 'receptive regulatory environment' involved complex negotiations with the banking authorities who were initially opposed. I am grateful to the referee for pointing this out.

⁵ Other articles on m-Pesa include Jack and Suri (2010) and IFC (2010).

In a case-study of Tanzania, South Africa and Egypt, Goodman (2005) extend this logic to cover not just fixed line communications available to households but also other means of contact such as ease and cost of travel and availability of well-functioning public pay-phones. They point for example to the travel time and cost savings achieved by a mobile phone call as opposed to travel as a means of communication. The savings were found to be higher in Tanzania than in South Africa because in the former 'roads are worse and public transport less extensive' (Goodman 2005). Similarly,

In Tanzania, a strikingly high proportion of respondents (57 per cent) felt that a major impact from mobile phones was faster and improved communication. The proportion in South Africa mentioning this as an impact was substantially lower at 8 per cent. This probably reflects a greater presence and reliability of fixed-line phones in South Africa prior to the introduction of mobile phone services (Goodman 2005).

Generalizing these examples, the hypothesis is that the more difficult and expensive it is to communicate by means other than mobile phones, the more (percentage) use will be made (*ceteris paribus*) of this technology. And since it is assumed that the said difficulty varies inversely with country income, the prediction is that the most intensive percentage use of mobile phones will occur in relatively poor countries. (This assumption does not require a great leap of faith for it seems almost obvious that rail transport, paved roads and passenger cars vary directly with per capita income).

The reasoning just advanced helps to explain the pattern observed in Table 2 for it is the five Eastern African countries that have the lowest incomes in the sample. (That pattern is one which, among other things, includes countries from the region appearing in first place in all six rows). Of course, the explanatory framework I have adopted does not account for all entries in the table, especially those in which relatively rich countries are involved. For these cases, a country specific explanation may need to be involved (South Africa's second-placed ranking in the case of beeping may constitute one such example).

It is noteworthy in this regard to compare the results shown in Tables 2 and 3 with those of subscriptions for mobile phones in the same countries (shown in Table 4).

The interest lies in the almost diametrically opposite results of the two cases. On the one hand, it has already been shown that the poorest countries tended to make the most of mobile use whereas on the other hand these countries were heavily weighted against adoption of this technology. In this case it is the richest two countries—South Africa and Botswana—that occupy the top positions in adoption rates. Conversely, the East African countries which performed so well in rates of usage, fall into the bottom five places (with one exception) on this metric. Resolving this apparent paradox has to do as suggested above with the contrasting role of income in the two cases. As far as adoption goes, per capita income plays a facilitative role, as it mostly does with the diffusion of durable goods.⁶ But the benefits of use from mobile phones tend to be greater with lower income because this variable stands as a proxy for the difficulty of finding alternative ways to communicate (other than that is than with mobiles).

I turn finally to compare the rows as opposed to the columns of Table 2. The most popular row in this table deals with beeping (at an average use rate of 81 %). In essence this phenomenon involves making a call to another mobile number and then hanging up before the call is answered in the hope that it will be returned by the other party in the future. Sometimes beeping is associated with a specific message such as when for example two rings mean 'I'm leaving now' (Donner 2007). In any event the cost of the original call

⁶ See Rogers (1995) and Stoneman (1983).

Table 2 Economics-related mechanisms of mobile phone use

	Uganda	Kenya	Tanzania	Rwanda	Ethiopia	Ghana	Cameroon	Nigeria	Namibia	South-Africa	Botswana	Average
% Using mobile phone to find work	51.9	38.1	33.6	52.1	42.2	33.3	43.2	29.4	42.7	33.8	38.2	39.9
% With saving on time and travel cost	84.7	88.3	67.7	63.9	95.6	78.5	58.7	59.6	84.9	83.7	72.2	76.2
% With more getting done in the day	32.7	57.8	79.2	40.9	55.3	55.4	54.1	47.1	49.8	57.5	58.4	53.5
% Using more for business than social calls	41.7	24.3	31.4	16.2	35.2	28.8	38.3	35.4	30.2	17.6	20.3	29
% Using mobile phones for sending and receiving money	27.5	78.6	37.7	17.5	0.4	3	4.9	9.3	6	7.9	16.3	19
% Using mobile phones for beeping	74.8	91.6	85.9	69.1	92.7	64.5	78	80.7	84.2	92.3	83.3	81.6
Average	52.2	63.1	55.9	43.3	53.6	43.9	46.2	43.6	49.6	48.8	48.1	49.8

Note also that the averages at the bottom of the table are just that: they are consistent with some people using all the mechanisms or a larger number using only one or two. Beeping is an activity which refers to deliberately missed calls. That is, an individual dials a number and then immediately cancels the call. Depending on the number of beeps it contains a message for the other party. It is classified as an economic mechanism because the goal is to save on costs

Source Research ICT Africa

is saved, an amount which presumably explains the popularity of the phenomenon in poor African countries (but also among the poor in relatively affluent sample countries such as South Africa). Together with mobile money, beeping is an interesting example of how important innovations can be made in and for African countries, which, to this extent, are not only reliant on information technology applications from the advanced countries.⁷

Not far behind beeping is the second-highest mechanism (row) in Table 2 namely, the percentage with savings from mobile phones on time and travel costs. These savings have also been described as important in the study by Goodman (2005) noted above. What they found was that,

In the survey sample, 91 per cent of respondents in Tanzania called friends and relatives rather than travelling to see them. In South Africa, 77 per cent of mobile users called rather than visited.... Indeed, for many families surveyed the costs of travelling to see relatives would be prohibitive, especially in the poorest rural communities, and mobile therefore represented the only option of maintaining contact. ...The impacts were slightly larger for Tanzania, *where roads are worse and public transport less extensive*. The potential importance of mobile as a substitute for travel is easy to under-estimate. Of the communities surveyed in South Africa, only 4 out of 10 had a regular bus service to the nearest town and the typical round-trip cost was 15 Rand. In contrast, a typical pre-paid voice call cost R 5... . It is not surprising that so many respondents identify mobiles as a source of saving both time and travel cost. ...one respondent in Mafia Island, Tanzania, said he was now able to keep in daily contact with his immediate family, who all lived in Dar es Salaam (Goodman 2005).

It should be clear that this particular explanation also relies on the view espoused earlier in the paper that the use of mobile phones depends heavily on the availability and quality of the relevant infrastructure for alternative means of communication.

3.2 Health-Related Mechanisms

Table 5 shows the use of mobile phones for four medical (m-health) applications. These data are also summarized, as in the previous section, with regard to the top three countries in each of the four mechanisms (see Table 6). Tables 5 and 6 are similar to their counterparts in the previous section in that Uganda and Kenya again play a significant role, though in this case Rwanda comes to the fore in a way that it did not do previously.

These results might well be explicable in terms of the relative amounts of foreign aid that are given for m-health applications (certainly Rwanda seems to receive a relatively substantial amount of aid for this purpose). Unfortunately, however, such comparative data are not readily available⁸ and I shall try instead to explain why the three East African countries in question are especially amenable to this type of technology. Such a task is perhaps most easily accomplished in the case of Uganda. According to one observer for example,

There is not a doubt that Uganda has made a huge stride in mobile health. While neighboring country, Kenya, has made a name for itself with innovations in mobile money transfer, Uganda has made outstanding progress in improving access to health services using mobile technologies. For instance, Ugandans can easily verify whether

⁷ It is often thought that developing countries have to rely entirely on rich countries for new technologies. But the case of IT shows that even the poorest countries, especially Kenya-can partly meet their own needs.

⁸ Available data deal with aid by sector rather than the use of IT by sector.

Table 3 Leading countries according to economics related use mechanisms

	1st	2nd	3rd
% Using a mobile phone to find work	Rwanda	Uganda	Cameroon
% With savings on time and travel cost	Ethiopia ^a	Kenya	Namibia
% With more getting done in the day	Tanzania	Botswana	Kenya
% Using more for business than social calls	Uganda	Cameroon	Ethiopia
% Using mobile for sending and receiving money	Kenya	Tanzania	Uganda
% Using mobile for beeping (the caller dials but hangs up before the call is answered)	Ethiopia	S. Africa	Kenya

^a Following numerous sources, Ethiopia is defined here as being part of Eastern Africa (e.g. Encyclopedia Britannica)

a doctor and or clinic is licensed or not by simply sending an SMS. From fastening the diagnosis of HIV-infected babies to educating users on sexual and reproductive matters... . Uganda is indeed proving to be East Africa's testing ground for new m-health innovations⁹(Mulupi 2012).

What is special about Rwanda in this context is that it is rated second out of 123 countries by the World Economic Forum according to how high ICT is prioritized by the government.¹⁰ This distinction, accorded to one of the world's poorest countries, is partly a reflection of the support given to the technology at the highest levels of government. In particular, in that country,

the presidency has taken the lead with forward-looking policies for e-health and ICT. The government's e-health plan, valued at \$ 32 million, is designed to support district health information systems, and computerize the national healthcare system. The plan involves government leadership at the highest levels... . Two parts of the plan, Rapid SMS alerts for emergencies and mUbuguzima monitoring tools for community health workers, are being rolled out nationally (Mulupi 2012).

Kenya's frequent appearance in the table is due in part to the same institutions that were responsible for the m-Pesa programme in that country. Safaricom, for example, the owner of that successful programme, has also developed an m-health product ('Daktari 1525') which enables subscribers to contact doctors for advice at any time of the day or night. However, many of Kenya's mobile health applications have emerged from a new class of technological entrepreneurs who are often associated with 'iHub', one of Africa's most prominent IT incubators (BBC News, 19 July, 2012). On the user side, it is plausible to imagine that Kenyans are especially responsive to m-health initiatives because so many of them are already accustomed—via m-Pesa—to new applications of mobile phones.¹¹

Note, finally, that in terms of rows rather than columns, the 'percentage having mobile contact with health care workers' is the most commonly used of the four mechanisms (with an average figure of almost 50 %). This is probably due to the fact that it is the most general of the mechanisms, including a wider variety of applications than the other three.

⁹ For a recent discussion of mobile phones and the health sector see (Mulupi 2012). For an example of a successful Ugandan m-health innovation see Stoneman (1983), Hellström (2010) and Luscombe (2012).

¹⁰ For a description of these calculations see one of the Forum's annual reports.

¹¹ Note that there is a tendency in the m-health literature to ignore the obvious predominance of voice communication by mobile, possibly because it seems less interesting in terms of technical innovations.

Table 4 Mobile cellular subscriptions by country, 2009 (in descending order)

Country	Cellular subscriptions (in percentages)
Botswana	96.1
South Africa	94.2
Ghana	63.4
Namibia	56.1
Kenya	48.7
Nigeria	47.2
Tanzania	39.9
Cameroon	37.9
Uganda	28.7
Rwanda	24.3
Ethiopia	4.9

Source World Bank, Little IT Book, 2011

3.3 Social Capital Mechanisms of Use

According to many people IT has the potential to increase social capital. As such this technology will tend to increase existing patterns of social contact and civic engagement. The World Bank (2008) points specifically to ‘bridging social capital which connects actors to resources, relationships and information beyond their immediate environment’. In these ways the participants will tend to gain from the increased social capital thus generated. Goodman notes that ‘Social capital may be an even more important concept for developing countries than developed, as in many cases people in the former have less access to formalized structures of support such as the legal system or the financial system, and may rely on informal networks instead’ (James and Versteeg 2007).

Following a suggestion by Granovetter, Goodman also distinguishes between strong links and weak links. The former ‘are those between close friends and family, people who are regularly in contact and have a lot in common. Weak links are those between acquaintances or distant friends in irregular contact. Both types of links are crucial’ (James and Versteeg 2007). One of the purposes of this section is to analyze the strength of the linkages shown in Table 7. First, however, let me deal with the relationships between the columns shown in that table and in the summary of best-performing countries contained in Table 8.

Table 8 shows that once again the East African group of countries performs better than a random influence would dictate. In particular, these countries take up 12 of the cells in the table compared to the 8 that would occur on the basis of chance alone (i.e. 5 out of the 11 countries in the sample). I continue to ascribe this performance to the difficulty of communicating—by other means than mobile phones—in the relatively low-income countries of the region. That said, however, the prominence of East Africa is lower here than in previous sections.

One question is whether the inclusion of Nigeria among the leading countries in Table 8 (twice first and once second) requires me to reconsider the role of low income in East Africa as an explanation of the previous patterns. In fact, it does not much alter that story because Nigeria has a per capita income just above the level of Kenya, the richest country in impoverished East Africa. The region’s average income, that is to say, does not alter significantly after Nigeria is added to the group.

Table 5 Health-related mechanisms of mobile phones use

	Uganda	Kenya	Tanzania	Rwanda	Ethiopia	Ghana	Cameroon	Nigeria	Namibia	South-Africa	Botswana	Average of countries
% Who set alarm for medical appointment	36.3	30	10.2	22.6	4.5	17.8	22.5	24.6	24.3	22.2	40.3	23.2
% Who set an alarm for taking medicine	48.3	36.8	14.5	42.4	8.5	14	20.5	22	15.5	15.1	31.8	24.5
% Who obtain SMS reminder from clinic or doctor	45.2	22	9.1	24.2	8.9	10.7	12.3	21.5	9.8	15.6	18.4	18
% Having mobile contact with health care workers	59.6	0	62.5	83.8	67.4	78.8	18.1	69.9	10.5	75.5	22.4	49.9
Average	47.4	22.2	24.1	43.3	22.3	30.3	18.4	34.5	15	32.1	28.2	

Source Research ICT Africa

Table 6 Leading countries according to health-related use mechanisms

Mechanism	1st	2nd	3rd
Setting alarm for medical appointment	Botswana	Uganda	Kenya
Setting alarm for taking medicine	Uganda	Rwanda	Kenya
Obtaining SMS reminder from clinic or doctor	Uganda	Rwanda	Kenya
Having mobile contact with health workers	Rwanda	Ghana	South Africa

Another task is to explain what accounts for that country's excellent performance in some of the rows in Table 7. My suggestion—and it is only speculative—is that the forms of social capital most sought after by Nigerians—dealing with politics and religion—were strongly emphasized in the elections of 2011,¹² a time at which the data were collected for the survey on which this paper is based. There may, that is to say, be a causal connection between the dominant features of the election and the forms in which social capital were primarily sought at around the same time the data were collected. Even then, however, the direction of any such causality is not clear.

I turn finally to the rows in Table 7 and hope to establish some form of pattern between them. Unfortunately, however, only the highest position occupied by friends and family can be explained in terms of the distinction between strong and weak links described above. Numerous authors for example have alluded to the frequent and close relationships within this group and they also find what was shown in Table 7, namely, that it is a highly important empirical relationship relative to weaker links. But for the other entries shown in that table, it is impossible to say how frequent and intense were the contacts between parties. All that the data show are the percentage of people who seek to build up one or other of the contacts given in that table. Contacts with colleagues for example, the next most important entry, could be weak or strong depending on the nature of the relationship.

3.4 Safety-Related Mechanisms of Use

The results for safety-related mechanisms of mobile phone use are shown in Tables 9 and 10. Beginning as usual with columns, Table 9 continues to highlight the prominent role played by countries from Eastern Africa, which, in the form of Ethiopia and Tanzania, make up five of the top six places. The final column, by contrast, contains no countries from the region. Indeed, three such countries belong to Southern Africa and enjoy incomes that are at or near the top of the sample group.

For these exceptional cases, South Africa, Botswana and Namibia, an explanation could take the form of a relative prevalence of violent crime.¹³ After all, these countries belong to Southern Africa, a region that suffers from the highest rates of this type of crime in all of Africa ([UNODC.org](http://unodc.org)). The basic idea is that in places with high rates of violent crime, access to a mobile phone becomes more pressing (in terms of safety) than in countries where the rates are lower.

For the East African countries, however, this line of argument would seem to be largely irrelevant, since the crime rate there is neither unusually high nor exceptionally low. In these cases—Ethiopia and Tanzania—I fall back on a variant of the argument advanced in the three previous sections, namely, that income is a proxy for numerous other relevant

¹² See BBC News, 18 April 2011.

¹³ See footnote 3.

Table 7 Social capital mechanisms of mobile phone use

	Uganda	Kenya	Tanzania	Rwanda	Ethiopia	Ghana	Cameroon	Nigeria	Namibia	South Africa	Botswana	Average
% Using a mobile phone to mobilize the community or for political events	21.6	17.2	21.8	12.2	6.6	9.3	8	27.9	36.3	9.1	10.8	16.4
% Using a mobile to increase their contact with those who share hobbies/sports	53.1	61.3	36.6	33.6	66	31.6	45.9	51.4	55.7	35.8	51.6	47.5
% Using a mobile to increase their contact with those who share political views	32.3	34	21.1	26.2	16.8	19.9	19	42.7	26.1	15.7	27	25.5
% Using a mobile to increase their contact with those who share religious beliefs	53.9	56.6	49.8	38.4	47.2	44.3	49.9	62.4	36.4	36.2	47.6	47.5
% Using a mobile phone to increase their contact with family and friends	90.3	88.5	74.5	79.5	80.8	68.5	82	78.3	77.2	68.5	75	78.5
% Using a mobile to increase their contact with colleagues	71.2	70.9	62.2	59.4	54.9	57	53.4	65.5	47.2	50.8	62.9	59.6
Average	53.7	54.8	44.3	41.6	41.6	45.4	38.4	43	54.7	46.5	45.8	45.8

Figures represent number of users of a particular mechanism as percentage of adult users of mobile phones in a country

Source Research ICT Africa

Table 8 Leading countries according to social capital mechanisms of use

Mechanism	1st	2nd	3rd
% Using mobile phone to mobilize community etc.	Namibia	Nigeria	Tanzania
% Using mobile phone to increase contact with those sharing hobbies	Ethiopia	Kenya	Namibia
% Using mobile phone to increase contact with those sharing politics	Nigeria	Kenya	Uganda
% Using mobile phone to increase contact with those sharing religion	Nigeria	Kenya	Uganda
% Using mobile phone to increase contact with friends and family	Uganda	Kenya	Ethiopia
% Using mobile phone to increase contact with colleagues	Uganda	Kenya	Botswana

variables. More specifically, I argue that in places with relatively high average income, access to a mobile phone becomes more pressing (in terms of safety) than in countries where the rates are lower. The point here being that income tends to stand as a proxy for other forms of communication than mobile phones, such as public transport, payphones, postal services, fixed line phones and telecentres. Where these are scarce or entirely non-existent there are few or no alternatives to mobile phones as a means of communicating with the authorities or others who can deliver protection (some mechanisms though are more about checking up on the safety of close friends or family, but in these cases, too, a central issue is about the lack of alternatives to the mobile phone).¹⁴

I turn now to briefly examine the rows of Table 9. Noting that safety is an important component of basic human needs (Maslow) it is worthwhile to ask how much IT contributes to it. Such a question has unfortunately not been widely posed in the literature on the welfare impact of mobile phones. Yet, as Table 9 suggests, the relationship between mobiles and safety appears to be a powerful one. Indeed, as many as 82 % of the sample use this technology as a way of checking on the safety of close friends and family. In addition 64 % of the sample feel more secure as a result of having a mobile phone.

4 Cross-Tabular Analysis

So far my analysis has been confined to individual tables grouped according to economics, social capital and so on. In this section I seek to examine the results at a cross-tabular level, as if the groupings no longer mattered. Which mechanism, for example, is the strongest (on average) across all of the four tables presented above? And which countries (again on average) achieve the highest scores across all these tables? The (partial) answer to both questions is contained in Table 11. The left-hand column lists the highest-rated mechanism across all four tables, whereas the column on the right shows the highest ranked countries across all the mechanisms that were described above.

The most striking comparison between the two columns lies in the variety of groups from which the mechanisms and countries are drawn. In terms of the first column, the entries are drawn from the economic, social capital and safety mechanisms, in contrast to the second column where all the entries are drawn only from the last-mentioned group (safety). Taken together, the two columns indicate that safety is an important (and in my view neglected) aspect of the relationship between mobile phones and individual welfare.

¹⁴ The Economist points out that individuals are known to make reductions in even basic types of spending in order to buy time for their mobile phones ('Vital for the poor', November 10, 2012). See also 'Mobile Phone Use at the Kenyan Base of the Pyramid', iHub Research, 2012.

Table 9 Safety-related mechanisms of mobile phone use

	Uganda	Kenya	Tanzania	Rwanda	Ethiopia	Ghana	Cameroon	Nigeria	Namibia	South Africa	Botswana	Average
% Who feel more secure from mobile phone	57.4	69.6	81	49.9	85.3	63.2	53.5	62.4	65.2	71.2	45.6	64
% Using mobile phone for finding out about safety issues and to alert people	53.6	52.8	60	28.1	53	55.9	40.4	61.6	69.7	58	49.3	52.9
% Using mobile phones to check on the safety of loved ones and to see where they are	81.5	79.3	85.7	66.2	94.6	85.5	67.6	76.9	87.8	92.1	88.6	82.3
Average (cols)	64.2	67.2	75.6	48.1	77.6	68.2	53.8	67	74.2	73.8	61.2	66.4

Source Research ICT Africa

Table 10 Safety-related mechanisms of mobile phone use

Mechanism	1st	2nd	3rd
% Who feel more secure from mobile phone	Ethiopia	Tanzania	South Africa
% Using mobile phone for finding out about safety issues and to alert people	Namibia	Nigeria	Tanzania
% Using mobile phones to check on the safety of loved ones to see where they are	Ethiopia	South Africa	Botswana

Table 11 Cross-tabular results (rows and columns)

Mechanism	Country
% Using a mobile phone to check on the safety of loved ones (safety) 82.3	Ethiopia 77.6 (safety)
% Beeping (economics) 81.6	Tanzania 75.6 (safety)
% Using mobile phone to increase their contact with friends and family (social capital) 78.5	Namibia 74.2 (safety)
% With savings on time and travel cost (economics) 76.2	South Africa 73.8 (safety)

The need for safety is to be expected in Africa where crime rates are on average higher than in many other parts of the developing world. The two cases from Southern Africa, South Africa and Namibia, are particularly clear examples of this point.¹⁵ But it is also true that safety is a fundamental need which comes just after physiological needs in Maslow's (1943) well-known hierarchy (Maslow 1943). Researchers would do well to bear this in mind when examining the welfare effect of mobiles.

Of the economics-related mechanisms in the left-hand column of Table 11, two stand out, namely, beeping and saving time and travel costs. The former is especially important in places where income is low and the need to save on costs of communication is correspondingly high. That is why it tends to be relatively poor East African countries which dominate these categories (though Nigeria has a per capita income just above the richest of those countries, Kenya). I have already referred to research which shows that savings in time and travel costs are substantial for two African countries (Goodman 2005) and the importance of beeping has been well established in the literature (Donner 2007). In short, the presence of these two economics related mechanisms in Table 11 is no great surprise and serves only to confirm on a larger scale what others have already found.

5 Conclusions

1. This paper has sought to analyze a recent large-scale survey of mobile phone use across eleven African countries, ranging from the relatively rich (such as South Africa) to the relatively poor (such as Ethiopia). These data comprise the first comprehensive study of mobile phone use in developing countries.
2. Since use is a better indicator of welfare than penetration, the results give as comprehensive a view of the micro-impact of mobile phone use as is now available

¹⁵ See footnote 3.

for Africa and indeed developing countries as a whole (though as noted there are a few relatively limited case studies on the topic).

3. The most important general finding is that East Africa is by far the best-performing region across all four mechanisms of use I have identified, namely, economics, social capital, health and safety.
4. Part of the explanation for this finding is country specific: the role of mobile money in Kenya, m-health in Uganda and the role of the president in promoting mobile phones in Rwanda's health sector. Another part however has to do with the fact that East African countries are the poorest in the sample.
5. This is important according to the following line of argument: the more difficult and expensive it is to communicate by means other than mobile phones, the more use will tend to be made of this technology. If it is assumed that the said difficulty varies inversely with per capita income, the prediction is that mobile phones will be most intensively used in relatively poor countries (which are especially lacking in a technological infrastructure in the form of paved roads, post offices, taxis, public phones, rail transport and so on).
6. The most important mechanisms in descending order are: using a mobile phone to check on the safety of family and close friends, beeping, using a mobile phone to increase contact with friends and family, saving on time and travel costs.
7. Safety is not widely discussed in terms of the benefits of mobile phones in developing countries. Yet, it is often described as a fundamental human need, coming second only to basic physical desires such as hunger and thirst. And the data show strong support for the connection between mobile phones and safety. For example, 82 % of the sample use this technology as a way of checking on the safety of close friends and family.
8. There remain numerous anomalies to explain. Why, for example, does South Africa perform so well in some tables and so poorly in others? Do the results suggested for eleven African countries hold when many more countries from that region are included?

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