

WHAT ARE THE ECONOMIC AND SOCIAL IMPACTS OF THE MOBILE PHONE SECTOR IN DEVELOPING COUNTRIES?

After a PhD in agricultural economics from the University of Berkeley, Jenny C. Aker focuses on the impact of ICTs on agro-foods markets in developing countries (performance and behavior of players). In this article, the author, based on the example of the cereals market in Niger, explains how the use of mobile phones – by reducing transport costs and correcting information asymmetry – has promoted harmonization, reduced prices and increased profits for traders.

Mobile Phones, Markets and Firms in Sub-Saharan Africa

In Sub-Saharan Africa, the use of mobile phones has positive impacts on the way local consumer goods markets operate. Indeed, a study conducted in Niger shows that mobile phones help reduce costs and give traders access to a wider number of markets. This leads to a harmonization and reduction in prices that is often to the consumer's advantage. These results appear to be in line with those obtained in other developing countries. They consequently make it possible to learn some lessons that can enhance the impact of information technologies on economic development.

By Jenny C. Aker, Assistant Professor of Economics at Tufts University and Post-Doctoral Fellow at the Center for Global Development

Africa has some of the lowest levels of infrastructure investment in the world. Merely 29% of the continent's roads are paved, barely a quarter of the population has access to electricity and there are less than three landlines available per 100 people (Ramachandran, 2008; World Bank, 2009). Contrasting with these limited investments in power, roads and landlines, access to and use of mobile telephony in Africa has increased dramatically over the past decade. Mobile phone subscriptions increased by 49% per year in Africa between 2002 and 2007, as compared with 17% per year in Europe, and the number of mobile phones in Sub-Saharan Africa now outstrips available landlines by a factor of ten to one (ITU, 2008).

The potential poverty alleviation benefits of mobile phones have been widely touted by policy-makers, the popular press and the private sector. In 2008, for example, *The Economist* explained, "A device that was a yuppie toy not so long ago has now become a potent force for economic development in the world's poorest countries" (*The Economist*, 2008). An emerging body of research suggests that this might indeed be the case, as mobile phones improve households' and firms' access to information, thereby making markets more efficient and improving welfare.

The effects of mobile telephony on market inefficiencies in Niger

Niger's 12 million people had access to a mere 20,000 landlines – about 2 landlines per 1000 people – when its first mobile phone network was introduced in 2001. Over the following seven years, mobile phone services became available throughout

the country's main population centres. By 2008, the number of mobile phone subscribers had reached 1.7 million, representing 13% of the country's population (Wireless Intelligence, 2008).

With an estimated 85% of its population living on less than USD 2 per day, Niger is one of the poorest countries in the world. The majority of the population consists of rural subsistence farmers, who depend on rainfed agriculture as their main source of income. Grains are dietary staples, accounting for over 75% of rural households' caloric consumption. These commodities are transported from the farm to the consumer through an extensive network of weekly markets. The transaction chain starts with the farmers, who sell the grains they produce to intermediaries. In turn, these intermediaries sell directly to wholesalers in local markets. Wholesalers are the main agents of inter-regional trade, selling agricultural produce to other wholesalers, retailers or consumers. With only one growing season per year (October), traders have to rely on imports of grain from neighboring countries (Benin, Burkina Faso, Mali and Nigeria) in April, once the local supply is depleted. The density of grain markets varies considerably by geographic region, with inter-market distances ranging from 10 km to over 900 km.

Economic theory has long established that information is a crucial factor in ensuring the efficiency of markets. Such information, however, also has to be freely accessible and symmetrical (*i.e.* everyone should have equal access to information). In low-income countries such as Niger, however, this is rarely the case: searching for information can be costly. As grain markets take ...

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... place only once a week, grain traders and farmers have historically traveled long distances to markets to obtain price information. This not only involves the cost of travel, but also the opportunity cost incurred by time spent on the road rather than in a productive capacity. The arrival of mobile phones in Niger introduced a new technology that significantly reduced the cost of obtaining price information compared with traditional search mechanisms. In theory, then, mobile phones should have reduced traders' search costs, thereby facilitating their search for market information.

The introduction of mobile phone coverage in Niger between 2001 and 2006 has coincided with a reduction of grain price dispersion of a minimum of 10%, suggesting that markets were approaching the Law of One Price (Aker 2008)¹. Moreover, mobile phone coverage was associated with a 12% reduction in the intra-annual variation of grain prices (Aker, 2008). Mobile phones had a greater impact on price dispersion for markets where travel costs were higher, namely those that are farther away and for those that are linked by poor-quality roads. This effect was stronger over time: the reduction in inter-market price dispersion increased as a higher percentage of markets had mobile phone coverage.

Cells for grain sellers

Why would mobile phones lead to a reduction in price differences across markets? Since mobile phones reduced traders' search costs by 50%, they were able to obtain more information. Grain traders operating in mobile phone markets searched in 26% more markets as compared to their non-mobile phone counterparts, and increased the number of market contacts by 33%. In addition, traders in cell phone markets sold in 22% more markets compared to their non-mobile phone counterparts. These figures suggest that traders with access to mobile phones could improve their ability to respond to surpluses and shortages, allocating grains more efficiently across markets and reducing price volatility. Mobile phones were associated with an increase in traders' profits, as traders decreased their costs and increased the prices received for their goods.

The evidence also suggests that traders were not the only ones to benefit from mobile phones. During the same period, mobile phones were also associated with a 3.5% overall reduction in average consumer grain prices in Niger². All other factors being equal, this would have enabled rural house-

holds to purchase an additional 5-10 days' worth of grain per year. This is significant in a country such as Niger, where persistent food crises are associated with higher food prices. During the 2005 food crisis, the presence of a functioning mobile phone base station was associated with a CFA 9.6 per kg reduction in consumer prices³. As the mean price of grain in non mobile phone markets was CFA 212 per kg (USD 0.50 per kg), this implies that grain prices in cell phone markets were 4.5% lower.

Evidence beyond Niger

While rigorous empirical studies on the impacts of mobile phones remain limited, there is increasing evidence of their effects on markets and well-being at the micro-level in low-income countries. In his study on fish markets in India, Jensen (2007) found that the expansion of mobile phone coverage led to a significant reduction in price dispersion across markets, as well as a decline in waste. The results of the study also suggested that there were important welfare improvements for both fishermen and consumers; fishermen's profits increased by 8% and consumer prices declined by 4%. More recently, Muto and Yamano (2009) studied the impact of mobile phones on farmers' market participation in Uganda. They found that mobile phone coverage was associated with an increase in the probability of market participation for banana farmers. And finally, Klonner and Nolan (2009) researched the impact of mobile phone coverage on labor force outcomes in South Africa, finding that the introduction of mobile phone coverage increased employment by 15 percentage points, with most of the impact due to increased employment by women.

The way ahead

Governments, donors, mobile phone companies and non-governmental organizations are increasingly aware of the potential of information technology in achieving development goals in a variety of sectors. In response to this, there has been a proliferation of mobile-phone based services and products, as well as mobile phone-based development projects.

Does information technology promote economic development in Sub-Saharan Africa? How can it be used to better contribute to economic growth and poverty reduction? Evidence from Niger and elsewhere points to the following:

- Access to information is crucial for ensuring that farmers, traders and consumers can engage in optimal arbitrage – in other words, buying and ...

¹ The law of one price is an economic theory that states that in an efficient market, identical goods should cost the same (minus transport costs).

² While this seems counterintuitive, more information enabled traders to move grains from high to low-supply areas, thereby reducing the intra-annual of variation and the mean. However, unless overall supply increased, this implies that some consumers were better off, whereas others were worse off.

³ Niger experienced a severe food crisis in 2005. Grain expenses represented 27% of per capita income, and were 8% higher in food crisis regions as compared to non-crisis regions (Aker 2008).

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... selling goods when and where it's needed most. This, in turn, improves market performance, which increases welfare.

- Mobile phones allow consumers, traders and farmers to search for market information when, where and how they want. While agricultural market information systems (MIS) have provided low-cost information to farmers, traders and consumers via radios or message boards, mobile phones are a particularly effective means of providing such information and are being quickly adopted in low-income countries⁴. Consequently, the role of mobile phones should be central to the future design and implementation of information systems in low-income countries.

- While development outcomes are not an explicit goal of IT companies, information technology can serve as an effective poverty reduction tool for governmental and non-governmental organizations. By combining the public sector's knowledge of and expertise in development-oriented domains (agriculture, health and education) with private companies' technical expertise and innovation (such as M-pesa⁵ in Kenya), public-private partnerships can increase the potential impact, sustainability and efficiency of development interventions. The key is ensuring that such partnerships are used to develop and disseminate relevant and effective information technology solutions to solve specific development challenges.

- Given high illiteracy rates in Sub-Saharan Africa, a majority of mobile phone users rely on mobile phones primarily for voice calls, rather than data services such as short messaging service (SMS) or internet. Mobile phone-based services and products therefore need to be adapted to this reality. Existing economic evidence suggests that mobile phones can, in fact, serve as a powerful tool for economic development in the world's poorest countries.

But mobile phones are not necessarily a panacea that will lift people out of poverty; rather, they can be used to reduce information costs, improve markets and strengthen development projects in a variety of sectors. While information is necessary for the efficient markets, it is not sufficient: markets (and development) require infrastructure and financial services to work, which is often not the case in Sub-Saharan Africa. Donors and international organizations that seek to improve market access in Africa therefore should not focus on information alone: power and roads are also needed to boost growth (Ramachandran, 2008). ●

⁴ Market information systems (MIS) is a service that attempts to address this issue by collecting market information on prices (sometimes quantities) of widely traded agricultural products from a variety of markets (rural assembly, wholesale and consumer) and disseminating them on a timely and regular basis via various media to a variety of actors – farmers, traders, government officials, consumers and others. The idea behind such systems is to reduce the costs for searching for information by coordinating the collection and dissemination of such information. Traditional MIS have relied upon message boards, radio or paper dissemination to disseminate the information, but information and communications technology (ICT) has provided new possibilities in this area.

⁵ M-Pesa (M for mobile, Pesa is Swahili for "money") is the mobile banking product launched by Safaricom in 2007.

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