



ELSEVIER

Contents lists available at [ScienceDirect](#)

## Telecommunications Policy

URL: [www.elsevier.com/locate/telpol](http://www.elsevier.com/locate/telpol)

# The role of network effects and consumer heterogeneity in the adoption of mobile phones: Evidence from South Africa

Lukasz Grzybowski <sup>a,b,\*</sup><sup>a</sup> *Telecom ParisTech, Department of Economics and Social Sciences, 46 rue Barrault, 75013 Paris, France*<sup>b</sup> *School of Economics, Faculty of Commerce, University of Cape Town, Private Bag, Rondebosch 7701, Cape Town, South Africa*

## ARTICLE INFO

Available online 23 October 2015

## Keywords:

Mobile phones

Network effects

Consumer heterogeneity

## ABSTRACT

In this paper we analyze the role of network effects and consumer heterogeneity in the adoption of mobile phones. We estimate the decision to adopt a mobile phone using panel survey data of South African households between the years 2008 and 2012, which includes interviews with all adult household members. We construct variables which approximate network effects on the household level and find that the greater the number of mobile phones in the household, the greater the likelihood that the other household members will also adopt a mobile phone. Moreover, network effects depend on who in the household adopts a mobile phone. Without within-household network effects the penetration of mobile phones of 76.4% in 2012 would be lower by about 9.9 percentage points. The decision to adopt a mobile phone is also explained by observed and unobserved consumer heterogeneity.

© 2015 Elsevier Ltd. All rights reserved.

## 1. Introduction

In the last two decades mobile phones became the most important means of remote communication. At the end of 2014 there were nearly 7 billion subscriptions to mobile telecommunications services around the world.<sup>1</sup> In developing countries, where fixed-line telecommunications have not been deployed across the whole territory and especially in the rural areas, mobile phones are usually the only means of remote communication available to people. Mobile phones are also increasingly used as a platform through which services such as mobile banking are delivered. However, since mobile internet is not yet commonly used in the developing countries, the core value of mobile phones still comes from making and receiving calls and from texting, where the greatest share of communications presumably takes place between household members. There are therefore significant network effects from the adoption of mobile phones by household members, i.e., the utility from having a mobile phone should increase when the other household members also adopt mobile phones.

In this paper we analyze the role of network effects in the adoption of mobile phones. We use panel data of South African households including separate interviews conducted among all adult household members between the years 2008 and 2012. This data allows us to test empirically whether the fact that a particular household member has a mobile phone influences the decision by other household members to get a mobile phone. Network effects are approximated by the identity and number of household members who declared having mobile phones. To identify network effects a rich set of

\* Correspondence address: Telecom ParisTech, Department of Economics and Social Sciences, 46 rue Barrault, 75013 Paris, France

E-mail address: [lukasz@mushroomski.com](mailto:lukasz@mushroomski.com)<sup>1</sup> See International Telecommunications Union (ITU) at <http://www.itu.int>

individual and household characteristics is included in the estimation such as gender, age, professional activity, household size, the type of dwelling, income and others. Apart from the observed heterogeneity represented by these characteristics we also account for the unobserved heterogeneity. We make use of panel data and estimate individual-specific random effects which are assumed to be normally distributed.

We find that both network effects and heterogeneity matter for the adoption of mobile phones. The greater the number of mobile phones in the household, the greater the likelihood that the other household members will adopt mobile phones as well. Moreover, network effects depend on who in the household has a mobile phone. When the main decision maker has a mobile phone it is less likely that the other household members adopt mobile phones. We argue that this is because low-income households may opt for a single mobile phone to be used by all household members to communicate with non-household members. We confirm this by estimating additional regressions for the sub-samples of individuals from poorer and wealthier households. This effect prevails for the poorer households but not for wealthier ones. Without within household network effects the penetration of mobile phones of 76.4% in 2012 would be lower by about 9.9 percentage points.

Our results suggest that the typically observed s-shaped diffusion pattern of mobile phones can be explained by both the presence of network effects and consumer heterogeneity. On the one hand, network effects cause an exponential growth in the number of adoptions after the critical mass is reached (see [Cabral, 1990](#) for a theoretical model of the diffusion of innovations with network externalities). On the other hand, an s-shaped diffusion pattern is caused by consumer heterogeneity (see [Karshenas & Stoneman, 1993](#)). As our results suggest, there are relatively few consumers with a very high valuation of mobile phones and similarly relatively few with a very low valuation. The valuation of the majority of consumers due to both observed and unobserved factors is close to the average. Hence, when the cost of adoption decreases, mobile telephones are increasingly purchased by consumers with lower valuations which, for normally distributed valuations, results in an s-shaped diffusion pattern.

The remainder of the paper is organized as follows. [Section 2](#) summarizes the previous research on the diffusion of mobile phones and network effects. [Section 3](#) introduces the data. [Section 4](#) discusses the empirical framework. [Section 5](#) presents the estimation results and finally, [Section 6](#) concludes.

## 2. Literature review

There is a large body of research on the diffusion of mobile telecommunications services. Most of these studies use aggregate cross-country data. For instance, [Gruber and Verboven \(2001\)](#) estimate a logistic diffusion model for the EU countries and find that regulation and technological progress are important for the growth of the mobile industry. In another paper estimating a logistic diffusion model, [Koski and Kretschmer \(2005\)](#) analyze the effects of regulation and competition on the development of mobile telephony. These studies do not account for the presence of network externalities and, due to the nature of the data, heterogeneity is allowed only across countries. Therefore, they do not explain what causes the estimated s-shaped diffusion pattern.

Another stream of research tests the hypothesis of network effects to explain the diffusion of mobile phones. For instance, [Doganoglu and Grzybowski \(2007\)](#) estimate demand for subscription to mobile services in Germany using nested logit model for aggregate data and acknowledge the importance of network effects in the diffusion process. In another paper, [Grajek \(2010\)](#) finds significant network effects in the Polish mobile telephone industry. Since these studies focus on a single country assuming a representative consumer, they do not allow for the diffusion pattern to be explained by both network effects and consumer heterogeneity. Only consumer-level information observed over time with a good proxy for network effects can disentangle the impact of both effects.

Furthermore, [Grajek and Kretschmer \(2012\)](#) empirically investigate the existence of critical mass in the mobile telephony diffusion and [Grajek and Kretschmer \(2009\)](#) try to identify the network effects by studying mobile phone usage intensity. Based on panel data for operators in 41 countries they conclude that heterogeneity among adopters dominates network effects. Among papers which estimate network effects using individual-level survey data, [Kim and Kwon \(2003\)](#) conclude that Korean consumers prefer carriers that have larger consumer bases. In another paper, [Birke and Swann \(2006\)](#) use household survey data to identify price-mediated network effects in mobile telephony in the UK.

The papers mentioned above study network effects on the market level. However, in telecommunications markets, network effects are in general a local phenomenon, i.e., the main contacts are family and friends who live in the same local area. There are a few papers which study the role of local network effects from a theoretical or empirical perspective. For instance, [Sundararajan \(2007\)](#) develops a theoretical model in which agents, who are connected in a social network, value the adoption of a product by a heterogeneous subset of other agents in their neighbourhood. Each agent is located at a node of a graph, knows the nodes that he/she is connected with, but is not informed about the rest of the network structure. Sundararajan shows how in this setup the resulting network of adopters is influenced by the underlying social structure. On the empirical side, [Birke and Swann \(2005\)](#) study the coordination within each consumer's social network based on a survey of students in the UK. They find that the probability that two students have the same operator is higher the more frequently they call one another. In another paper, based on a survey of Italian students, [Corrocher and Zirulia \(2009\)](#) find evidence that consumers take into account local networks when deciding on mobile operators. They also find that consumers are highly heterogeneous with respect to the importance they give to the operators chosen by their friends/family members when

Download English Version:

<https://daneshyari.com/en/article/557254>

Download Persian Version:

<https://daneshyari.com/article/557254>

[Daneshyari.com](https://daneshyari.com)