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# Operator choice in the mobile telecommunications market: Evidence from Turkish urban population

Alparslan A. Basaran<sup>a</sup>, Murat Cetinkaya<sup>b,\*</sup>, Necmiddin Bagdadioglu<sup>a</sup><sup>a</sup> Department of Public Finance, Hacettepe University, Ankara, Turkey<sup>b</sup> Competition Authority, Bilkent Plaza B3 Blok, Bilkent, Ankara, Turkey

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## ABSTRACT

Using revealed preference subscriber level data from a survey which represents the urban population of Turkey, and operator level data concerning the period of 2004–2009 obtained from the regulatory authorities and the operators; this paper employs the multinomial and conditional logit methods to examine the operator choice decisions of subscribers in the Turkish mobile market. The paper particularly focuses on two issues. Firstly, it addresses the relationship between the mobile operator choice and the subscriber bases and average prices of the operators (size effects and price mediated effects, respectively). Then, it identifies the effect of the other households' choices on the operator choice of the respondents (social network effects). The results are in line with the theory that the prices and the subscriber base—and to a greater extent, the household effects—are important factors taken into account during the subscription decisions. The results also indicate that, compared with the period in which prices were loosely regulated, the estimated effects of prices and installed bases for the whole observed period are almost halved, while the effect of household network roughly keeps its level. These results make the focusing on narrower sub-networks i.e. calling clubs or social networks, an appealing strategy for the operators with relatively smaller networks. The paper suggests that the regulatory authorities should consider the possible sources of network effects in their market power analysis and future regulations. Meanwhile, the policy makers should be careful regarding the network quality regulations since the competition in Turkish mobile market seems to take the form of an intensified quality competition.

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## 1. Introduction

A network effect, which is the increase in the value of a network good for a user as the installed base of that network grows, is a salient feature of the mobile telecommunications market. Following [Liebenstein's \(1950\)](#) influential contribution on consumption externalities, [Rohlf's \(1974\)](#) leading article regarding telecommunications market and afterwards the prominent contributions by [Katz and Shapiro \(1985\)](#) and [Farrell and Saloner \(1985\)](#), currently the network effects have a rather well developed theoretical background as [Birke \(2009, p. 762\)](#) states. Although [Liebenstein's \(1950\)](#) paper on bandwagon effects, which means that individuals choose the goods or services that the majority choose, is the most influential paper on consumption externalities, [Rohlf's \(1974\)](#) study is the leading one regarding the telecommunications industry.<sup>1</sup> Without using the term “network effects”, [Rohlf's \(1974, p.16\)](#) shows that the level of utility from being a subscriber of a telecommunications service increases by the new subscribers of that service, and states that this property of the telecommunications industry is an essential point of consideration in analysing the industry.

\* Corresponding author. Tel.: +90 312 2914032; fax: +90 312 2667950.

E-mail addresses: [aab@hacettepe.edu.tr](mailto:aab@hacettepe.edu.tr) (A.A. Basaran), [mcetinkaya@rekabet.gov.tr](mailto:mcetinkaya@rekabet.gov.tr) (M. Cetinkaya), [necbag@hacettepe.edu.tr](mailto:necbag@hacettepe.edu.tr) (N. Bagdadioglu).

<sup>1</sup> [Schmalensee \(2011, p. 306\)](#) notes that [Rohlf's \(1974\)](#) paper has been cited 669 times according to Google Scholar.

Katz and Shapiro (1985) distinguish direct and indirect network effects. Most physical networks such as telecommunications exhibit direct network effects, where installed base of customers is an important factor considered by the potential consumers. In contrast, indirect network effects are usually seen in the industries where hardware/software relationship exists and the effects of installed base indirectly affects the choices of the potential consumers. Farrell and Saloner (1985) associate direct network effects with compatibility and indirect network effects with complementarity, and denote that because of this relationship the network with a larger installed base will be preferred more as a result of market mediated effects as they call. Regarding this issue Besen and Farrell (1994, p. 120) point out that, for the firms horizontally competing with each other, if there is compatibility between the networks “competition in the market”, otherwise “competition for the market” exists. Concerning mobile telecommunications markets Grajek (2010) felicitously states that although mobile networks are usually compatible from technological point, they are not always economically compatible because of on-net/off-net price discrimination.

In this context, the aim of this paper is to empirically explore the operator choice decisions of subscribers; that is the (operator level) network effects and the social network effects (household effects) in the Turkish mobile market. Another attempt of the paper is to check whether the effects of prices, installed base and household's choices on the operator choice changed by the introduction of strict price regulations. Using the data gained from a consumer survey carried out in the third quarter of 2009, the multinomial and conditional logistic methods (MNL and CL, respectively) are employed to investigate the presence of such effects. Although there are different approaches applied in the literature, such as the hedonic prices method and the diffusion models, as Czajkowski and Sobolewski (2011) state, the logistic analysis has advantages over the other approaches since it uses individual level data and directly models the utility functions.

The paper is organised as follows: the following section overviews the main literature on network effects focusing on the mobile communications market. Section 3 briefly outlines the main trends and the structure of the Turkish mobile market. Section 4 describes the model, the survey and the data. Section 5 presents the results of the logistic analyses. Finally, Section 6 concludes after briefly considering policy implications and suggestions for further research.

## 2. Empirical literature

In spite of the leading theoretical studies introduced in the first section, the empirical analysis regarding network effects in the mobile telecommunications market largely arose only in the last decade. One of the main reasons of this delay is the lack of detailed and available operator level and subscriber level data.

The empirical studies on network effects in the mobile telecommunications market support the theoretical setting.<sup>2</sup> As Grajek (2010, p. 131) indicates, “applying structural demand estimations yields evidence of network effects in many geographical markets”. For example; using a conditional logit analysis, Kim and Kwon (2003) show that in Korean market, subscribers choose the operators with a larger number of subscribers, which the authors call “size effect”. Confirming Kim and Kwon (2003), Fu (2004) shows that the subscriber base is an important factor in the operator choice for Taiwanese consumers. Fu (2004) also verifies that the effect of subscriber base differs according to the on-net/off-net price differential, i.e. there is as well tariff-mediated network effects as theoretically shown by Laffont, Rey and Terole (1998) and later pointed out and empirically analysed by Grajek (2010). This induced network effects as called by Birke and Swann (2006, p.71), reinforce the network effects that arise from the size of the installed base. This point attracted attention in the literature because of the fact that as long as mobile networks converge technologically, the regulation of interconnection (two way access) charges of the mobile operators became more of an issue in order to ensure a competitive mobile market and a level playing field as Brennan (2009, p.297) points out.<sup>3</sup> Doganoglu and Grzybowski (2007) focus on the German mobile market and demonstrate that the diffusion of mobile services had been significantly influenced by the network effects during the observed period of their study. Developing a structural demand model, Grajek (2010) affirms that the network effects boosted the Polish mobile market and a high degree of on-net/off-net price differential affected the perception of consumers, resulting with a low compatibility among mobile carriers.

Besides the network effects stemming from the size of the operator or the on-net/off-net price differentiation strategy of the operators, social network effects are also empirically analysed in the literature recently. The social networks are the networks in which the network participants have a closer relationship with each other compared with the outsiders. Newman (2003, p.174) gives friendships between people, business relationships between firms and family contacts as examples of social networks. Although Rohlfs (1974, p.18) is again the first one to point out social network effects in telecommunications market, Birke and Swann (2006) empirically examine the determinants of mobile operator choice in the UK market and find that, apart from the subscriber base, the consumers also value “who is on the network”. Regarding this last issue, applying discrete choice methods, Suarez (2005) concludes that despite the installed base of a mobile technology (CDMA, GSM and TDMA as analysed in the paper), the “strong-ties network effects” are also an important factor affecting the adoption of different mobile technologies. Concerning the “strong-ties/social/local/personal” network effects as used interchangeably in the literature, Corrocher and Zirulia (2009) conclude that the more aware users in Italy pay more attention to the subscription choices of their contacts. Similarly Maicas, Polo and Sese (2009), Birke and Swann (2010) and

<sup>2</sup> See Liebowitz and Margolis (2002), Farrell and Klemperer (2007) and Birke (2009) for reviews of network effects literature.

<sup>3</sup> See Elliot (2004), Albon and York (2006), Hoernig (2007, 2008), Gabrielsen and Vagstad (2008), and Armstrong and Wright (2009) for the analysis of on-net/off-net price discrimination and mobile call termination.

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