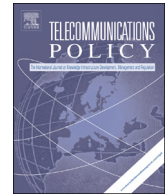




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# How much do switching costs and local network effects contribute to consumer lock-in in mobile telephony?

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## ABSTRACT

Our study focuses on the identification and measurement of switching costs and local network effects in mobile telecommunications. As these two phenomena are the two components of consumer lock-in, omitting one of them likely results in biased estimates of the second, limiting applicability to policy relevant questions. Yet, there have been only a few attempts to integrate them into one model of subscriber behavior. Our study adds to this stream of research by applying a discrete choice experiment designed specifically to model subscription choices on a representative sample of mobile phone users in Poland. We find that the effective prices of calls appear to be a major determinant of operator choice. Switching costs continue to affect consumer behavior despite the introduction of number portability. Local network effects represent a smaller, albeit significant, component of consumer lock-in. Subscribers are heterogeneous with respect to the magnitudes of both lock-in components.

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## 1. Introduction

Switching costs and network effects are two distinctive features of mobile communications and have received great attention in recent years from operators, policy makers and academics. There is a large body of the literature documenting various impacts of both phenomena on market competition, firm strategies and subscriber behavior. In the vast majority of empirical studies, however, the roles of switching costs and networks effects have been considered separately, which has significant drawbacks. Separate modeling threatens the validity of measurement regarding the actual magnitudes of both effects and blurs their actual roles in consumer behavior.

We argue that both effects are two sides of the same coin and that omitting one of them leads not only to biased estimates of the second but also limits the applicability of the results to issues of practical interest. We provide two examples of such questions of considerable policy and managerial interest: (i) To what extent can switching cost remedies such as mandatory number portability address the lack of subscriber switching in an environment where network externalities or other sources of barriers to mobility exist? (ii) Can firms utilize network effects to effectively mitigate the pro-competitive consequences of reducing switching costs, and at what cost? To provide reliable answers to such questions, one cannot ignore the joint effect of switching costs and network effects on customer behavior.

Switching costs and network effects constitute two prominent types of consumer lock-in limiting subscribers' mobility across service providers. The theoretical literature shows that both effects have not only common implications but also

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causes. According to Farrell and Klemperer (2007), the desire for compatible purchases from the same provider is a common defining element of both switching costs and network effects.<sup>1</sup> Switching costs create a need for the compatibility of consumer's own purchases, while network effects create a need of compatibility of purchases with other users to enable interaction. Both types of compatibility create economies of scope and lock-in mechanisms that impede mobility across service providers.

The aim of this study is to assess the importance of switching costs and local network externalities for the mobility of subscribers across mobile operators under termination-based discriminatory tariffs. More specifically, we conduct a stated preference valuation study in the form of a discrete choice experiment to (i) estimate the magnitudes of switching costs and local network effects integrated into a single model of subscriber choice while controlling for other important factors such as price and possible operator-specific differences; and (ii) estimate the relative importance of number portability in the total switching costs encountered by subscribers. Despite strong arguments for the joint consideration of switching costs and network effects, very few studies have actually followed this path. Fuentelsaz, Maicas and Polo (2012) analyze the joint effect of switching costs and network effects in determining the level of competition in the European mobile communications industry and confirm that both effects affect market conduct. Maicas, Polo and Javier Sese (2009) use individual level behavioral data from actual switchers in Spain and focus mainly on the impact of number portability on switching costs. Given the nature of their data, they can control for network effects in a limited way. They find that switching costs together with absolute firm size and the cost of an offer are the main predictors of choice. Number portability reduces total switching costs, but their magnitude remains high. Switching costs depend on a number of relationship characteristics with the current operator, which reduces the scope for effective policy intervention aiming at their further reduction. In another empirical study, Maicas et al. (2009) explicitly control for both switching costs and local network effects in their model of subscriber choice. The number of family and friends in the same network followed by switching costs are main drivers of operator choice. Contrary to the results of their former study, however, the price of the mobile plan does not influence subscribers' decisions.<sup>2</sup>

Our work builds on both choice studies of Maicas et al. but differs at least in three important aspects. First, instead of using revealed behavioral data and actual levels of service attributes, we conduct a full-fledged stated preference study. This approach is well suited to the objectives of our paper and offers important advantages to the modeler. Actual choices usually exhibit low variability in key explanatory variables and high co-linearity, which increases the standard errors of the estimates and may even produce biased results (Louviere, Hensher, & Swait, 2006). In a discrete choice experiment, rich information can be conveniently collected within a survey and subscribers can be asked about their preferences regarding hypothetical mobile subscription plans that are not actually available on the market. Second, we operate on a large representative sample of subscribers in the Polish mobile market. This facilitates the external validity of our results and increases the policy relevance of our conclusions. Third, instead of average revenue per user (ARPU), we use off-net and on-net rates as price variables in our model. The results of our pretest qualitative survey suggest that respondents are more comfortable with unit cost measures than lump-sum payments when comparing mobile plans. Given the large heterogeneity in actual usage in the representative sample, unit prices are more convenient for comparing benefits from network externalities.

Our study contributes to the existing research on switching costs and network effects in mobile communications in several ways. The model integrates all important drivers of subscription choice in mobile telecommunications. It was designed specifically for the purpose of disclosing the actual role of two distinctive factors in this market, namely switching costs and network effects, while controlling for prices and quality differences. We explicitly account for consumer heterogeneity with respect to all effects of interest by means of a random parameters logit model. We provide monetary valuations of local network effects and switching costs with and without number portability. Like other studies, we separate the influence of number portability to assess the effectiveness of this regulatory intervention in Poland. Moreover, we estimate the value of number portability for two groups of subscribers: individual users and small and medium size entrepreneurs. This is the first full scope study of the factors shaping subscription choices in mobile telecommunications, which adopts a state-of-the-art stated preference study. We show that discrete choice experiments offer an attractive alternative to analyses of actual behavioral data, which have important limitations. Our study reliably measures the magnitudes of mobility barriers in mobile telecommunications and brings results that can address policy and managerial considerations.

The remainder of the paper is organized as follows. In the next section, we review the relevant literature on network effects and switching costs. In Section 3, we describe the structure of the mobile phone market in Poland, where our empirical study was conducted, present the design of our study and characterize the sample. Section 4 provides the model specifications, estimation results and resulting implicit prices of the attributes of a mobile phone plan. The final section offers discussion and conclusions.

<sup>1</sup> Precise citation (page 1971): *both switching costs and proprietary network effects arise when consumers value forms of compatibility that require otherwise separate purchases to be made from the same firm.*

<sup>2</sup> The study utilizes a sample of university students who were presented with a single choice set of three alternatives. The skewed sample and limited number of choice observations may result in low variability of key variables, which stokes concerns about the accuracy of estimates and external validity of the results.

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