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The impact of mobile Internet usage on mobile voice calling behavior: A two-level analysis of residential mobile communications customers in Germany

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Abstract

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The literature on usage interdependencies between emerging and established mobile communications service categories is scarce. Therefore, this study examines the relationship between the monthly number of outgoing mobile voice (MV) minutes and monthly mobile Internet (MI) data traffic in a sample of 11,614 residential postpaid subscribers over 25 months from October 2011 to October 2013. Actual consumption and customer data was extracted from the billing system of the German subsidiary of a multinational mobile network operator (MNO). Multi-level analysis of the time-varying and -constant study variables reveals large heterogeneity between sample subjects with regard to their MI–MV associations. At the mean/median monthly level, the demand for conventional MV telephony decreases within the time window under investigation. However, for the majority of customers the relationship between the usage of the two service categories is complementary. Subscribers who are most likely to replace at least some of their MV minutes by MI traffic (1) are heavy MV users in the initial period (October 2011), (2) are heavy SMS users within the time window under study, (3) are male, (4) are older, (5) have a longer tenure with the MNO, (6) have not opted for a MV flat rate, (7) are currently not equipped with an Apple iPhone and (8) started operating their current handset more recently. Implications of the findings for MNO strategies seeking to respond to market changes and for future research are discussed.

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Keywords Consumer behaviors; Germany; mobile communications; mobile Internet usage; mobile voice calls; multilevel analysis; service use changes; service substitution

Contents

1. Introduction

Since its advent in the early 1990s, mobile voice (MV) calling has been the key source of revenue for mobile network operators (MNOs). However, while the consumption of MV calling minutes has remained at a high level, MNOs have been confronted with declining voice revenue over the past years, mainly due to the increasing proliferation of flat rate plans among customers (Krämer & Wiewiorra, 2012). At the same time, a rapid diffusion of Internet access over cellular mobile networks has led to an increase in turnover resulting from the use of mobile Internet (MI). However, several studies (e.g., Rio & Malik, 2013) argue that the growth in MI usage is a mixed blessing. MI expansion does not only imply an increasing mobile data business, but could also put turnover generated with profitable, established core services such as MV calling and the Short Message Service (SMS) under pressure. This, in turn, is largely attributable to a rising number of customers reverting to so-called rich communications services such as Skype or Facebook Messenger. This service category enables customers to make MV calls routed via Internet Protocol (IP) data streams in cellular mobile networks. Using MV over IP (MVoIP) requires either a device with a mobile operating system which supports the software-based application of the service or to access it over the service supplier's web portal via a browser interface. Thus, every MNO customer equipped with both an MI access and a web-enabled device has the option to make MVoIP calls. Until today, MVoIP suppliers do not charge for voice calls if both communication partners use the same provider. Therefore, the question arises in which way the diffusion of almost "free" MVoIP affects the demand for relatively "expensive" conventional MV calling at the individual level.

Several analysts worldwide forecast that MV calling is likely to be substituted by MVoIP (Analysys Mason, 2014; Ericsson, 2015; GSMA, 2015; Juniper Research, 2015; Ovum, 2014; Rio & Malik, 2013; Visiongain, 2014). Initial indications concerning potential impacts of growing MI usage on MV use changes can be obtained at the aggregate national level. According to data published by Ofcom (2014, pp. 290-292), in some countries, e.g., France (14.1%), or Russia (7.5%), the number of outgoing MV minutes in 2013 was higher than the accrued traffic in 2012. In contrast, in other countries MV minutes decreased in 2013 compared to 2012, e.g., Japan (–7.8%), or Singapore (–3.2%). Regardless of changes in MV demand, the volume of IP data transferred over mobile infrastructures grew substantially in each of the four countries mentioned. Specifically in Germany, which is the country addressed in the data set of the present study, the volume of MI data traffic rose by 47.2% from 267 million gigabyte (GB) in 2013 to 393 million GB in 2014. In comparison, the number of outgoing MV minutes slightly went up by 0.9% from 110 billion minutes in 2013 to 111 billion minutes in 2014 (Bundesnetzagentur, 2015, pp. 79-80).

However, it is highly questionable whether country-level calculations are able to shed light on variations in individual mobile communications services (MCS) usage. For instance, changes at the country-level may stem from a small minority of heavy MI users, whereas the majority of customers does not share the trend in the heavy user group (cf. Hox, 2010, p. 3). Put differently, country-level studies aggregate data of residential customers in a way that individual variance patterns may be masked. Thus, it can be concluded that country-level statistics are not ideal for measuring intra-personal changes in individual use intensities.

At the individual level, several studies on MCS use behaviors point to complementarities between MI and MV service usage (e.g., Gerpott, Thomas, & Weichert, 2014; Mäkinen, Luukkainen, & Karikoski, 2014). Contributions indicating substitutional tendencies are rare (Cecere & Corrocher, 2012; Karikoski & Luukkainen, 2011). Furthermore, there is evidence that MI and MV usage are not significantly related (Cassidy, Colmenares, Jones, Manolovitz, Shen, & Vieira, 2014; Gerpott, 2010a). Unfortunately, extant individual-level analyses that explore use behavior interdependencies suffer from various methodological shortcomings. Firstly, they rely on self-reported past use intensities of MI and MV (Mäkinen et al., 2014) or MVoIP in particular (Cecere & Corrocher, 2011, 2012; Hsiao & Chen, 2015). However, several authors have shown that such self-assessments share little variance with objective MI use behavior measures (e.g., Abeele, Beullens, & Roe, 2013; Berolo, Steenstra, Amick, & Wells, 2014; Boase & Ling, 2013; Bouwman, Reuver, & Nikou, 2013; Ørmen & Thorhauge, 2015; Reuver & Bouwman, 2014, 2015). Even work which is based on system-captured objective data of MNO customers' service usage is either cross-sectional (Gerpott, 2010a; Gerpott et al., 2014) or does not properly model repeated observations obtained from the same individuals (Karikoski & Luukkainen, 2011; Karikoski & Soikkeli, 2013; Verkasalo, 2007), which reduces its validity in explaining intra-individual changes in MCS use patterns. In short, to some extent past studies on MV calling and MI use changes capture differences at the inter-individual level but fail to adequately model intra-individual change. Therefore, past study results are methodologically not wholly convincing.

Against this background, the purpose of the present research is to examine changes in the relationship between MV and MI usage over time by modeling both intra-individual variation in MV calling behavior across time and inter-individual behavior differences. In order to explain differences between subjects in the slope of the relationship between MI usage and MV calling, we consider a set of predictor variables which include general and mobile contract-related customer characteristics (e.g. gender, age, current device tenure). Since some authors found significant associations not only between MV calling and MI use but also between outgoing MV calling minutes and the number of SMS sent (Gonzales, 2014; Grzybowski & Pereira, 2008; Karikoski & Luukkainen, 2011; Pinchot, Douglas, Paullet, & Rota, 2011; Rio & Malik, 2013) the last mentioned facet of an individual's mobile communication behavior is considered as a control variable in predicting MV use intensity (changes).

The rest of this article is organized into four sections. The second section reviews previous conceptual and empirical contributions to develop our research questions. Section 3 explains the empirical methods and section 4 reports the empirical results. The fifth section derives implications both for management scholars and practitioners in the field of MCS.