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Why are mobile voice calls so expensive when abroad?

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Why are mobile voice calls so expensive when abroad?*

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Abstract

Mobile phone usage when travelling abroad is expensive. We show that the more firms enter the market - which may lower domestic voice call prices - the higher wholesale and retail prices for mobile usage abroad may become.

1 Introduction

As soon as your plane arrives abroad, the charges you face for mobile phone usage become sky-high. Entry of new mobile network providers has been considered as one of the key explanations of the reduction in domestic mobile call charges since the mid 90's. In sharp contrast to this, voice call prices when travelling abroad have not been reduced. In fact, the European Commission (2000) found that mobile phone usage abroad became more expensive from 1997 to 2000.

When consumers use their mobile phone abroad their domestic mobile provider acts as a downstream firm and the foreign network as an upstream firm. The high retail charges are at least partly resulting from high wholesale prices (roaming prices). Collusion and unilateral facilitating practices initiated by firms with significant market power have been suggested as key explanations. The main message from the present paper is that the average wholesale price is increasing in the number of upstream firms, and the predictions are thus in line with the market observations mentioned above.

A key technological feature of the wholesale market is that the choice of network in the visited country is random in the sense that the probability that

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a given network is chosen is independent of wholesale prices. As consumers observe when arriving abroad, the choice of network seems to be random, and during a stay abroad network connection switches frequently between different available networks. As a consequence, consumers will typically neither have complete information on which network they are connected to nor corresponding retail prices. Thus, they will typically base their consumption on the average retail price, and this may be seen as a consequence of the random network selection.[1]

These idiosyncratic features give rise to the result that prices increase in the number of upstream firms. An upstream firm knows that its wholesale price does not affect the probability of its network being chosen, and an increase in the wholesale price will only affect demand through the change in the average price.

Since the late 90's policy makers have been concerned about the high retail and wholesale prices on mobile usage when traveling abroad, and a European regulation on retail and wholesale prices came into force in June 2007 (European Union, 2007). The question on which we focus, why have these charges not been reduced in the same way as domestic call prices as more firms have entered the market, has been discussed informally by policy makers as well as by economists (European Commission, 2000, European Regulatory Group, 2005, Oftel, 2002, Sutherland, 2001, and Valletti, 2004, among others). Formal analyses on the topic are important, however, in order to evaluate the new regulatory obligations imposed in Europe. Given the huge attention towards roaming prices there are, to our knowledge, surprisingly few formal analyses on the wholesale roaming markets. Valletti (2003) analyzes the incentives for domestic roaming where an operator wants roaming rights on a domestic rival's network. Salsas and Koboldt (2004) analyze wholesale international roaming within a duopoly framework in two countries. Their main focus is on the effects of the ability to redirect roaming traffic and effects of cross-border mergers. Given their assumption of duopoly they do not focus on the main topic of the present paper, how an increase in the number of networks affects wholesale charges.

As for mobile usage when abroad customers are likely to base their fixed-to-mobile demand on average prices. This reflects the difficulty to distinguish between different domestic mobile networks due to number portability. Gans and King (2000) show that an increase in the number of mobile operators may increase domestic fixed-to-mobile charges. Similar to wholesale roaming prices, fixed-to-mobile termination charges have remained high. As shown in the present paper, the source of inefficient wholesale pricing may partly be the same in the two markets. While customers base their demand for mobile usage when abroad on average prices due to a technological feature (random network selection), domestic fixed-to-mobile demand is based on average prices due to a regulatory obligation (number portability).[2]

[1] The consumers may endogenously select which network to connect to abroad (labeled manual network selection), but the majority of consumers do not use this opportunity (Oftel, 2002).

[2] Gans, King and Wright (2006) provide a comprehensive overview of the literature on the

The paper is organized as follows. In Section 2 we present the basic model. In Section 3 we discuss the impact of some recent changes in the market and the robustness of some of our key assumptions.

2 The model

We set up a simple model with two domestic downstream firms and n foreign upstream firms, and we consider the following two-stage game: At stage 1 each of the n upstream firms sets its wholesale price w_j, where $j = 1, ..., n$. We thus assume that both downstream firms are offered the same wholesale price from firm j.[3] Furthermore, we assume that both downstream firms buy the wholesale service from all the n upstream firms (see the discussion below). At stage 2 the two downstream firms simultaneously decide their retail prices p_{ij}, where $i = 1, 2$ and $j = 1, ..., .n$. Note that firm i charges end-user prices which depend on which upstream firm the consumer is connected to.

We make two assumptions that reflect some idiosyncratic features of the case at hand:

Assumption 1: There is random network selection, such that the probability λ_j that a visitor is connected to firm j's network is independent of w_j, where $\lambda_j > 0$, and $\Sigma_{j=1}^{n} \lambda_j = 1$.

Assumption 2: The consumers only take the average price, $\overline{p}_i = \Sigma_{j=1}^{n} \lambda_j p_{ij}$, into account.

As discussed in the Introduction, Assumption 2 may be seen as a consequence of Assumption 1. From Assumption 1 it follows that both downstream firms face the following average wholesale price:

$$\overline{w} = \sum_{j=1}^{n} \lambda_j w_j \tag{1}$$

To rule out the possibility that collusion and/or unilateral strategic effects drive the results, we assume that there is perfect competition in the downstream market.[4] Demand for downstream firm i is then given by

$$D_i\left(\overline{p}_i, \overline{p}_{-i}\right) = \begin{cases} 1 - \overline{p}_i \ \text{ if } \overline{p}_i < \overline{p}_{-i} \\ \left(1 - \overline{p}_i\right)/2 \ \text{ if } \ \overline{p}_i = \overline{p}_{-i} \\ 0 \ \text{ if } \ \overline{p}_i > \overline{p}_{-i} \end{cases} \tag{2}$$

Since both downstream firms face the same average wholesale price (1), it follows that at stage 2 the average retail price is $\overline{p}_1 = \overline{p}_2 = \overline{w}$. Note that

economics of mobile communications.

[3] The assumption is consistent with what is observed in the market (see e.g. Salsas and Koboldt, 2004, and Sutherland, 2001).

[4] This is the reason why we assume that there is just two downstream firms. Increasing the number of downstream firms above two will not change the results.

it is the average price that is important. Downstream firms have flexibility to set some prices, p_{ij}, which deviate from $\overline{w}$ as long as the average price is competitive. Consequently, the downstream firms may implement a uniform retail price without losing competitive strength. A uniform retail price, which is consistent with market observations, is thus an equilibrium in the present model (not an assumption).

The aggregate demand is given by

$$D(\overline{w}) = 1 - \overline{w} \tag{3}$$

At stage 1 the upstream firm j faces the following demand (we assume that one unit of the upstream good is needed to produce the final service):

$$D_j(\overline{w}, \lambda_j) = \lambda_j(1 - \overline{w}) \tag{4}$$

At stage 1 upstream firm j solves the following maximization problem:

$$\max_{w_j} \pi_j = w_j \lambda_j (1 - \overline{w}) \tag{5}$$

The first-order conditions for the upstream firms, $j = 1, ..., n$, become[5]

$$(1 - \overline{w}) - w_j \lambda_j = 0 \tag{6}$$

By adding up the n first order conditions we find the weighted average wholesale price

$$\overline{w} = \frac{n}{n+1} \tag{7}$$

By inserting (7) into (6) the wholesale price charged by firm j becomes:

$$w_j = \frac{1}{\lambda_j} \frac{1}{n+1} \quad \text{for } j = 1, ..., n \tag{8}$$

By inserting (7) and (8) into (5) we find that $\pi_j = 1/(n+1)^2$. We then have the following results

Proposition 1 *The profit of upstream firm j is (i) decreasing in the number of upstream firms n and (ii) independent of upstream firm j's market share λ_j.*

It has been argued that when λ_j is independent of w_j, this will give rise to a race between upstream firms to increase network coverage and quality (e.g. at airports). However, the fact that λ_j is independent of w_j, will not as such provide investment incentives. The higher λ_j, the lower is the optimal w_j for firm j, and this will reduce incentives to invest into λ_j.

From (7) and (8) we have the following results, respectively:

[5] Second-order condititions are fullfilled.

Proposition 2 *The weighted average wholesale price $\overline{w}$ is (i) increasing in the number of upstream firms n and (ii) independent of the distribution of λ_j.*

Proposition 3 *The wholesale price of firm j, w_j, is (i) decreasing in the number of upstream firms n and (ii) decreasing in firm j's market share λ_j.*

The reason why the weighted average wholesale price exceeds the monopoly wholesale price reflects the structure on the demand side. In particular, since a marginal increase in w_j by firm j increases the average wholesale price $\overline{w}$ only by a factor λ_j, the elasticity of demand, from firm j's perspective, may be very low.

Given our assumption of perfect competition among the downstream firms, an increase in $\overline{w}$ is passed on to consumers in a 1:1 relationship. More generally, also under imperfect competition, and with reasonable assumptions, we have that an increase in $\overline{w}$ will increase retail prices. A Corollary which follows from Proposition 2 is thus:

Corollary 1: *The average retail price is increasing in the number of upstream firms.*

In practice, the upstream firms are present in their domestic retail markets. When more firms enter the domestic retail market, this will at the same time increase the number of upstream firms in the wholesale roaming market. Fierce competition for domestic voice calls (a high n) will then increase roaming wholesale and retail prices. As mentioned in the Introduction, this is consistent with the findings by the European Commission (2000) in a sector inquiry into international roaming charges. The inquiry used data from 1997 to 2000, and one of the main findings was that during this period wholesale roaming prices (and consequently retail roaming prices) increased. In the same period, the domestic mobile charges were significantly reduced and the number of mobile operators was increasing.

As long as the national regulatory authorities care more about domestic consumer surplus and profits than about the negative impact of higher roaming prices, higher prices for international roaming may be seen as an externality from increased domestic retail competition. This may explain why a supra-national regulatory approach is now initiated by the EU (European Union, 2007).[6]

3 Extensions and robustness of key assumptions

3.1 "Zone pricing"

A number of mobile operators now offer a uniform retail price for several countries (labeled "zone pricing"). We now assume the same model structure as

[6] European Union (2007) states that "[The 2002 regulatory framework for electronic communications] has not provided national regulatory authorities with sufficient tools to take effective and decisive action with regard to the pricing of roaming services.....This Regulation is an appropriate means of correcting this situation."

above, except that we assume that there are c different upstream markets (i.e. countries), and within each upstream market there are n firms. In the Appendix we show that the weighted average wholesale prices now become

$$\widehat{\overline{w}} = \frac{cn}{cn+1},$$

and we have the following result:

Proposition 4 *Uniform retail pricing used for several countries ("zone pricing") will, all other things equal, increase the weighted average wholesale price,* $\widehat{\overline{w}}$.

The intuition is analogous to the basic model; the higher the number of upstream firms within a "zone" (cn), the smaller the effect of a price increase will be on demand and the higher wholesale prices will be. Thus, all other things equal, the introduction of "zone pricing" tends to further increase the voice call charges abroad.

3.2 Endogenous choice of the number wholesale roaming agreements

In the model we have assumed that the downstream firms have wholesale agreements with n upstream firms. This may be seen as consistent with the observation that mobile operators generally have roaming agreements with several network operators in each country. One reason is that the downstream firms in so doing may improve coverage for their end-users when travelling abroad. In emerging markets this seems to be relevant. In mature markets, where several upstream firms have full coverage, this argument is less appealing. A downstream firm may reduce the number of wholesale agreements (n), and thereby undercut the rival since the average wholesale price is lowered.

Another rationale for having several agreements in a particular country has been to increase wholesale demand at home. A high number of wholesale agreements implies more demand from foreign visitors. This is not incorporated in the basic model above, but may be seen as a justification for the assumption that the downstream firms have agreements with the n upstream firms even if this increases the average wholesale price.

3.3 Network selection depending on wholesale prices

Recently, new technology has improved the ability to steer traffic to preferred networks. Active traffic steering makes it possible to set operators up against each other. If the n upstream firms provide a homogenous wholesale service (i.e. identical coverage and quality), we may expect a Bertrand game in the upstream market. This may drive wholesale and retail roaming prices downwards.[7]

[7] This is shown by Salsas and Koboldt (2004), who discuss international roaming within a two-country duopoly setting.

4 Appendix

Assumption 1 implies that the probability that upstream firm j in country k is used is λ_j^k, where $\lambda_j^k > 0$, and $\Sigma_{j=1}^n \lambda_j^k = 1$ for $k = 1, ..., c$. The probability that a consumer travels in country k, where $k = 1, ..., c$, is χ^k, where $\chi^k > 0$ and $\Sigma_{k=1}^c \chi^k = 1$. We now put the restriction to the maximization problem that the retail price is uniform for all c.[8]. The weighted average wholesale price now becomes $\widehat{\widehat{w}} = \Sigma_{k=1}^c \chi^k \Sigma_{j=1}^n \lambda_j^k w_j^k$, and the profit of upstream firm j in country k is given by $\pi_j^k = w_j^k \chi^k \lambda_j^k \left(1 - \widehat{\widehat{w}}\right)$. By using the system of first-order conditions the weighted average wholesale price becomes $\widehat{\widehat{w}} = cn/(cn+1)$.

5 References

European Commission (2000), On the initial findings of the sector inquiry into mobile roaming charges, Working document.

European Union (2007), Regulation (EC) No 717/2007 of The European Parliament and of the Council of 27 June 2007 on roaming on public mobile telephone networks within the Community and amending Directive 2002/21/EC.

European Regulators Group (2005), ERG common position on the coordinated analysis of the markets for wholesale international roaming.

Gans, J., S. King and J. Wright (2006), Wireless Communications, in M. Cave, S. Majumdar and I. Vogelsang (eds.), Handbook of Telecommunications Economics Vol II, North-Holland, Amsterdam.

Gans, J. and S. King (2000), Mobile network competition, customer ignorance and fixed-to-mobile call prices, Information Economics and Policy, 12, 301-327.

Oftel (2002), Mobile international roaming research reports.

Salsas, R and C. Koboldt (2004), Roaming free? Roaming network selection and inter-operator tariffs, Information Economics and Policy, 16, 497-517.

Sutherland, E. (2001), International roaming charges: over-charging and competition law, Telecommunications Policy, 25: 5-20.

Valletti, T. (2004), Obligations that can be imposed on operators with significant market power under the new regulatory framework for electronic communications, Journal of Network Industries, 5, 51-81.

Valletti, T. (2003), Is mobile telephony a natural oligopoly?, Review of Industrial Organization, 22, 47-65.

[8] As we argue above, with random network selection it is reasonable to assume that the consumers only take the average retail price in the country they visit into account. A uniform retail roaming price for a given foreign country is then equilibrium. However, consumers obviously know which country they travel to, and consequently it is not reasonable to assume that they base their consumption on the average retail price for several countries if there are differences in the retail roaming prices between countries. Hence, it may not be equilibrium to offer a uniform price for several countries. However, such uniform prices are observed, and to analyze the effect of such a practice, we now put a restriction to the maximization problem that the downstream firms use a uniform retail price for all c countries.

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Foros, Øystein Kind, Hans Jarle	*Økonomiske aspekter ved Internetts markedsstruktur.* SNF-arbeidsnotat nr. 74/2002, Bergen.
Nysveen, Herbjørn Pedersen, Per E.	*Individual and cross media communication in converging media environments: A review of research on the antecedents and effects of communication using various media in marketing contexts.* SNF-Working paper No. 65/2002, Bergen
Pedersen, Per E. Nysveen, Herbjørn Thorbjørnsen, Helge	*The adoption of mobile services: A cross service study.* SNF-Report No. 31/2002, Bergen
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Pedersen, Per E.	*The adoption of text messaging services among Norwegian teens: development and test of an extended adoption model.* SNF-Report No. 23/2002, Bergen.
Foros, Øystein Kind, Hans Jarle Sand, Jan Yngve	*Do Incumbents Have Incentives to Degrade Interconnection Quality in the Internet?* SNF-Working paper No. 22/2002, Bergen.
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Kristoffersen, Siri Hege	*Prising og uforstand – ein analyse av prissetjing med ufullstendig informerte konsumentar i den norske marknaden for mobiltelefoni* SNF-rapport nr. 54/2001, Bergen.
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Gooderham, Paul N. Ulset, Svein	*Knowledge transfer between parent and developing country subsidiaries. A Conceptual Framework.* SNF-Working Paper No. 08/2001, Bergen.
Staahl Gabrielsen, Tommy Vagstad, Steinar	*Second-period pricing in a duopoly with switching costs: the effect of size and composition of customer bases.* SNF-Working Paper No. 09/2001, Bergen.
Pedersen, Per E.	*Adopsjon av mobil handel (m-handel) -en forstudie* SNF-rapport nr. 07/2001, Bergen.
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Methlie, Leif B. Pedersen, Per E.	*MAP-IT: A Model of intermediary Integration Strategies in online Markets.* SNF-Working Paper No. 26/2000, Bergen.
Gabrielsen, Tommy Staahl Vagstad, Steinar	*Consumer heterogeneity and pricing in a duopoly with switching costs.* SNF-Working Paper No. 25/2000, Bergen.
Ulset, Svein Gooderham, Paul	*Internasjonalisering av telesektoren. Generelle lærdommer og spesielle utfordringer for Telenor*. SNF-arbeidsnotat nr. 16/2000, Bergen.
Ulset, Svein	*Virtual Network Operation. Strategy, Structure and Profitability.* SNF-Working Paper No. 15/2000, Bergen.
Foros, Øystein Kind, Hans Jarle Sørgard, Lars	*Access Pricing, Quality Degradation and Foreclosure in the Internet.* SNF arbeidsnotat nr. 12/2000, Bergen.
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Seime, Gunn Randi	*Konkurransen i det norske mobiltelefonimarkedet.* SNF-rapport nr. 49/1999, Bergen.
Methlie, Leif B. Pedersen, Per E.	*Multimedia Banking* *Bankenes strategiske situasjon. Ny teknologi – ny konkurransearena – ny struktur.* SNF-rapport nr. 41/1999, Bergen.
Pedersen, Per E.	*Multimedia Banking* *Programvareagenter i elektronisk handel. En kartlegging med vekt på agentbaserte tjenester og finanstjenestesektoren.* SNF-rapport nr. 40/1999, Bergen.
Pedersen, Per E.	*Multimedia Banking* *En agentbasert tjeneste for produkt- og leverandør-sammenlikning av finanstjenester*. SNF-rapport nr. 39/1999, Bergen.
Pedersen, Per E. Nysveen, Herbjørn Jensen, Leif Magnus	*Multimedia Banking* *En eksperimentell studie av atferdskonsekvenser ved bruken av agentbaserte tjenester i finanssektoren.* SNF-rapport nr. 38/1999, Bergen.
Fjell, Kenneth Foros, Øystein Gabrielsen, Tommy S. Hagen, Kåre P. Sørgard, Lars Vagstad, Steinar	*Problemstillinger for videre forskning på prising av tele-tjenester.* SNF-rapport nr. 27/1999, Bergen.
Fjell, Kenneth Hagen, Kåre P.	*Oversikt over forskningsprogrammet i teleøkonomi ved SNF: 1996-1998.* SNF-rapport nr. 26/1999, Bergen.
Fjell, Kenneth Foros, Øystein Hagen, Kåre P. Sørgard, Lars	*Telenor – bare lave priser ?* *Drøfting av Telenors rabattstruktur utfra et bedriftsøkonomisk og samfunnsøkonomisk perspektiv.* SNF-rapport nr. 23/1999, Bergen.
Staahl Gabrielsen, Tommy Vagstad, Steinar	*Konkurranseform i telesektoren: Hvordan rasjonalisere observert atferd?* SNF-rapport nr. 65/1998, Bergen.
Altenborg, Ellen	*Koordinering og insentiver i samarbeid om produktutvikling mellom forretningsområder i Telenor.* SNF-rapport nr. 39/98, Bergen

Methlie, Leif	*Multimedia Banking* *Strukturendring i bank. Distribusjon – grovanalyse.* SNF-arbeidsnotat nr. 31/1998, Bergen.
Methlie, Leif	*Multimedia Banking* *Strukturendring i bank. Strategisk posisjonering – grovanalyse.* SNF-arbeidsnotat nr. 30/1998, Bergen.
Foros, Øystein Ulset, Svein	*Naturlige grenser for teleselskapene.* SNF populærvitenskapelig særtrykk nr. 10/1998, Bergen.
Ulset, Svein Spiller, Pablo	*Organizing Global Seamless Networks: Contracts, Alliances and Hierarchies.* SNF Reprint No. 26/1998, Bergen.
Ulset, Svein	*Infrastruktur og konkurranse i telesektoren.* SNF særtrykk nr. 27/1998, Bergen.
Ulset, Svein	*Value-Creating Interconnect* *International Competition in Global Network Services. Technology, Organization and Performances.* SNF-report No. 28/1998, Bergen.
Ulset, Svein	*Value-Creating Interconnect* *Optimal Organization of the Converging Information and Communication Technology (ICT) Industries. Theoretical analysis and some illustrative data from the Norwegian market.* SNF-report No. 27/1998, Bergen.
Methlie, Leif B. Nysveen, Herbjørn	*Multimedia Banking* *Kundeatferd ved bruk av Internett og andre kanaler.* SNF-rapport nr. 29/1998, Bergen.
Ulset, Svein	*Verdiskapende samtrafikkavtaler.* *Hvordan kan organisering av infrastruktur bidra til utvikling av bedre og billigere teletjenester. En analyse av betingelsene for konkurranse og samarbeid i telesektoren.* SNF-rapport nr. 25/1998, Bergen.
Spiller, Pablo T.	*Value-Creating Interconnect.* *Unbundling and the Promotion of Local Telephone Competition: Is Unbundling Necessary in Norway?* SNF-Report No. 03/1998, Bergen.
Bjørnenak, Trond Gabrielsen, Tommy Staahl	*Verdiskapende samtrafikkavtaler.* *Prising av samtrafikk.*

Vagstad, Steinar	SNF- rapport nr. 02/1998, Bergen.
Andersen, Christian Sannarnes, Jan Gaute	*Analyse af tilgangsafgifter ved irreversible investeringer under usikkerhed.* SNF-rapport nr. 07/1998, Bergen.