

# Deregulating Fixed Voice Telephony? Empirical Evidence from the European Union

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## Table of Contents

① Motivation

② Literature

③ Data

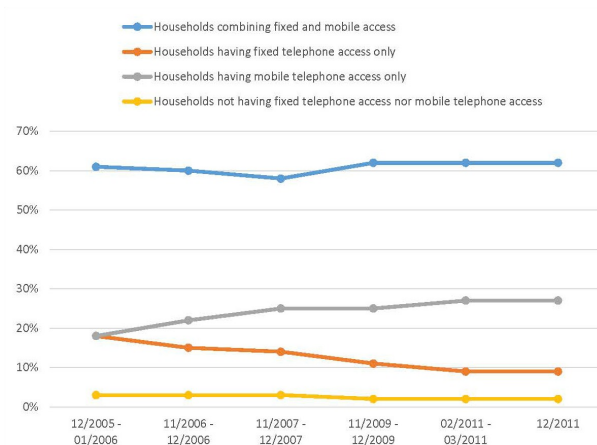
④ Empirical Analysis

⑤ Conclusion

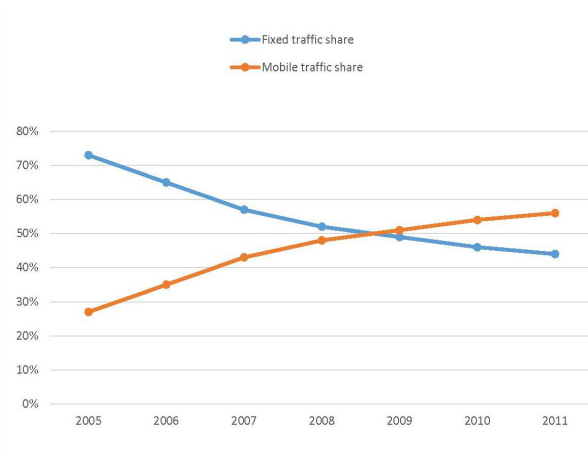
## What is our paper about?

- The decline of the traditional landline telephony
- The rise of the Internet-based (VoIP) telephony
  - VoIP - Voice over Internet Protocol
  - Voice data sent in packets using the Internet
  - Managed vs Unmanaged VoIP: Access and voice traffic handled by Internet provider vs Independent content providers (Skype, Viber)
  - Managed VoIP equivalent to landline telephony
  - Unmanaged VoIP not considered
- EU regulatory response

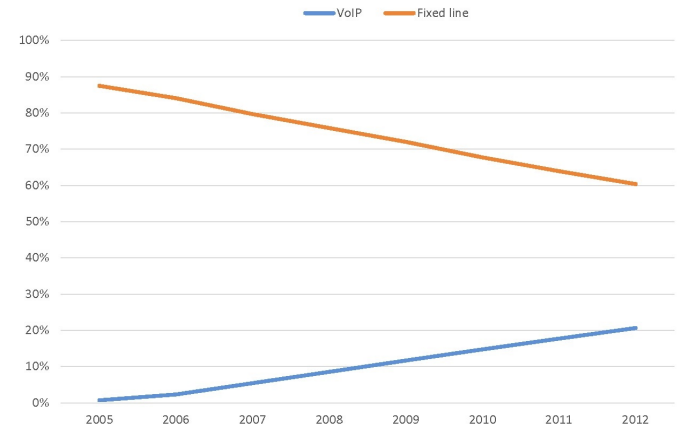
## Dual access remains common...



## ...but the traffic is shifting to mobile networks

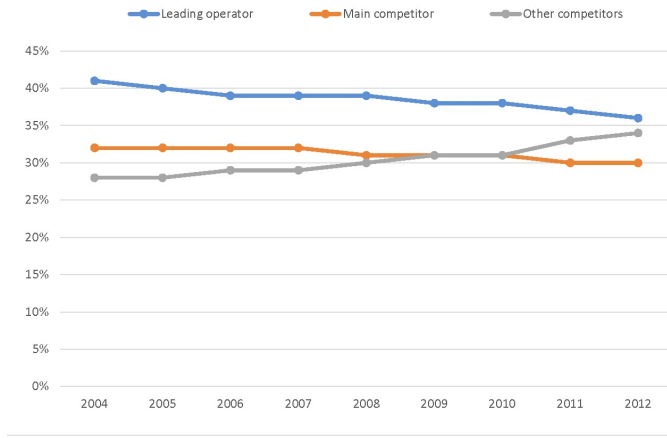


## Substitution between landline and VoIP access



## Mobile Market - Incumbency Advantage?

Fixed line incumbents also mobile incumbents in all but three EU countries (Lithuania, Romania, UK)



## EU Regulatory Framework

- The Recommendation on relevant electronic markets
  - Pre-defines the electronic product and service markets susceptible to *ex ante* regulation
- The latest version (2007) included three fixed telephony markets:
  - Access (1/2007)
  - Call origination (2/2007)
  - Call termination (3/2007)
- Reasoning: Fixed line operators insulated from the competitive pressures
  - Natural monopoly
  - Non-substitutable service due to special features (Internet access, alarm systems) and higher quality compared to mobile and VoIP



## EU Regulatory Framework

- Update of the Recommendation due in 2014
- Deregulation of the markets 1/2007 and 2/2007?
- Competitive pressure from the Internet-based telephony
- Changed structure of the broadband market
  - High broadband penetration
  - Reduced entry barriers: deployment of alternative technologies and entry based on physical network infrastructure and bitstream access
- Fixed line access not substitutable with mobile?
- Deregulation may lead to re-monopolization of the market and harm the captive users

## Research Question

- What is the degree of demand and supply substitution between the fixed line and VoIP/mobile access in the EU?
- Are the fixed line and VoIP/mobile access part of the same market?

## Literature: Fixed-VoIP substitution

- Kwak & Lee (2011): Call demand for VoIP in South Korea. Access substitution not considered
- Cecere & Corrocher (2011): Relationship between fixed line, mobile and VoIP telephony using the UK consumer survey data. No distinction between managed and unmanaged VoIP

## Literature: Fixed-mobile substitution

- Barth & Heimeshoff (2012a), Barth & Heimeshoff (2012b), Briglauer, Schwarz & Zulehner (2011): Fixed-mobile substitution in the EU and Austria
- Grzybowski (2012), Grzybowski & Verboven (2013): Fixed-mobile substitution in the EU
  - Broadband technology drives fixed-mobile substitution
  - DSL → complementarity, cable and 3G → substitution
- No study explicitly considers VoIP

## Contribution

- Access-level substitution between fixed, VoIP and mobile telephony
- Cross-country framework & EU policy-making
- Demand & supply substitution
- Our results:
  - (a) Consumers substitute fixed with mobile and VoIP telephony
  - (b) Fixed line operators set prices independently of VoIP but account for mobile prices
  - (c) Remedies (carrier pre-selection) brought down the landline price
  - (d) Fixed line access constitutes a market separate from VoIP/mobile access

## Data (1)

- Provided by the Analysys Mason
- 2006q2 - 2011q4
- 25 EU Member States
- Supplemented with the data by Eurostat
- Includes data on country-level voice subscriptions (fixed, mobile and VoIP), prices, market shares of broadband technologies, carrier pre-select users, F2F and F2M termination rates and socio-demographic variables

## Data (2)

Prices constructed as hypothetical monthly bills

- Mobile: Average monthly revenue per user
- VoIP: Average double play (broadband + VoIP telephony) monthly bill
  - VoIP usually provided as a cheap add-on to pre-existing broadband connection

## Data (3)

- Different WTP for VoIP/mobile of fixed line subscribers with and without access to broadband

$$\text{Monthly bill} = (1 - a) \cdot \text{Fixed line bill} + a \cdot (\text{Fixed line bill} + \text{Broadband bill}),$$

where  $a$  denotes the share of users with both fixed line and broadband access

- $a$  approximated by broadband penetration rate
- Fixed line/broadband bill = average monthly revenue per fixed line/broadband subscription



## Demand side

$$\begin{aligned} q_{it}^{fix} = & \alpha_0 + \alpha_1 q_{it-1}^{fix} + \alpha_2 p_{it}^{fix} + \alpha_3 p_{it}^{mob} + \alpha_4 p_{it}^{voip} \\ & + \sum \alpha_k X_{it}^k + \gamma_i + \nu_{it}, \end{aligned}$$

where  $X_{it}^k$  includes:

- Number of DSL subscriptions
- Number of non-DSL broadband subscriptions
- Average annual income per household

## Identification

- Lagged quantity and price variables instrumented with their own lags
- Further instruments employed:
  - Average fixed line, VoIP and mobile prices in the neighboring countries
  - Second lag of the number of DSL subscriptions
  - Cost shifters: F2F and F2M termination rates, population density, cost of capital, wage index in the telecommunications sector (lagged by one period)

## Results: Fixed-Line Demand

Dependent variable: $\ln(q)$						
Variable	Fixed Effects		Fixed Effects IV		Random Effects IV	
	Coef.	Std. Er.	Coef.	Std. Er.	Coef.	Std. Er.
l.q	0.957***	(0.023)	0.935***	(0.026)	1.017***	(0.010)
p_fix	-0.051**	(0.023)	-0.084**	(0.043)	-0.021	(0.019)
p_voip	0.008	(0.008)	0.048***	(0.014)	0.035***	(0.013)
p_mob	0.072**	(0.029)	0.071*	(0.042)	-0.004	(0.020)
dsl	0.075	(0.025)	0.044	(0.036)	-0.013	(0.011)
other_broad	-0.002	(0.002)	-0.002	(0.003)	0.000	(0.001)
gdp_hh	-0.000	(0.032)	-0.014	(0.038)	-0.015	(0.017)
Intercept	-0.454	(0.521)			-0.239	(0.195)
N	143		143		143	
R <sup>2</sup>	0.975		0.969		0.969	
F	635.73		504.3			
Prob>F	0.0000		0.0000			
Sargan statistics			3.855			
Underidentification			35.893***			
Hausman $\chi^2$			12.19*		43.23***	

Significance levels : \* : 10% \*\* : 5% \*\*\* : 1%.

Robust standard errors are reported in parentheses.

## Supply side

$$p_{it}^{fix} = \alpha_0 + \alpha_1 p_{it}^{VoIP} + \alpha_2 p_{it}^{mob} + \alpha_3 q_{it-1}^{fix} + \alpha_4 cps_{it-1} \\ + \sum \alpha_k X_{it}^k + \gamma_i + \nu_{it},$$

where  $X_{it}^k$  includes:

- Fixed line incumbent's share in mobile and broadband market
- Cost shifters: F2F and F2M termination rates, cost of capital and price index of telecommunications equipment (lagged by one period)
- Number of broadband subscriptions and GDP

## Identification

- Mobile and VoIP prices instrumented with their own lags and prices in the neighboring countries
- Further instruments employed:
  - Cost shifters: Number of unbundled local loops and wage index in the construction sector (lagged by one period)
  - Time trend

## Results: Fixed-Line Pricing

Dependent variable: $\ln(p)$						
Variable	Fixed Effects		Fixed Effects IV		Random Effects IV	
	Coef.	Std. Er.	Coef.	Std. Er.		
l.q	-0.292 ***	(0.070)	-0.394 ***	(0.074)	-0.250 ***	(0.062)
p.mob	0.566 ***	(0.091)	0.392 ***	(0.123)	0.207	(0.151)
p.voip	0.020	(0.027)	-0.080	(0.061)	-0.097 *	(0.053)
l.cps	-0.008	(0.022)	-0.051 *	(0.029)	-0.045	(0.034)
inc.mobile	1.206 ***	(0.263)	0.161	(0.253)	0.585 **	(0.251)
inc.broad	0.805 ***	(0.124)	0.777 ***	(0.201)	0.581 ***	(0.187)
l.ftf	-0.001	(0.009)	0.000	(0.006)	0.008	(0.009)
l.ftm	-0.078 ***	(0.028)	-0.056	(0.034)	-0.035	(0.035)
l.broad_lines	-0.018	(0.051)	-0.246 *	(0.134)	-0.209 **	(0.106)
l.ir	0.003	(0.007)	0.006	(0.006)	0.012 *	(0.007)
l.equip_ind	-0.183	(0.125)	0.481 **	(0.193)	0.496 ***	(0.189)
gdp	0.022	(0.097)	0.213 *	(0.119)	0.411 ***	(0.110)
Intercept	6.290 ***	(1.648)			3.929 ***	(1.304)
N	183		139		139	
R <sup>2</sup>	0.617		0.622		0.544	
F	19.90		18.13			
Prob>F	0.0000		0.0000			
Hansen's $\chi^2$			10.019			
Underidentification			17.434 **			
Hausman $\chi^2$			77.75 ***		28.78 ***	

Significance levels : \* : 10% \*\* : 5% \*\*\* : 1%.

Robust standard errors are reported in parentheses.

Variance inflation factors are reported in curly brackets.

## SSNIP Test

- Critical elasticity (Briglaue et al. (2011)):

$$\epsilon_c = \frac{\log(m + t) - \log(m)}{\log(1 + t)},$$

where  $m = \frac{p-c}{p}$  and  $t$  is the assumed price increase.

- For a 75% price-cost margin and 5-10% price increase, critical elasticities are in range  $\epsilon_c = [-1.25, -1.18]$
- Landline probably constitutes a separate market

## Conclusion

- Demand-side access substitution of fixed line with VoIP/mobile
- Fixed line providers consider mobile but not VoIP price in their price setting
- Removing entry obligations from the incumbent could impede the competition (negative and significant effect of the number of carrier pre-select users on fixed line price)
- SSNIP test indicates that fixed line constitutes a separate market



Thank you for your attention!