Regulation and Investment in Network Industries: Evidence from European Telecoms

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Main Question

How access regulation affects infrastructure investment in the European telecommunications markets?

Theoretical Backdrop

- Regulation vs. competition
  - Changing paradigm in the economics of telecoms: regulated monopoly to access regulation (Hellwig, 2008)
  - Service-based vs. facilities-based competition (Cave, 2004)

- Market efficiency
  - Static efficiency – optimal allocation of resources for a given technology (Armstrong, 2002)
  - Dynamic efficiency – optimal investment pace
  - Trade-off: Static vs. dynamic efficiency (Valletti, 2003)

Theoretical Backdrop

- Access regulation – dynamic efficiency
  - Net Present Value of infrastructure investment (textbook)
  - Real Options approach – uncertainty (Jorde et al., 2000)
  - Increased volatility of incumbent's stocks (Jorde et al., 2000)

  - More variety and innovative service of entrants boosts end-consumer demand (Foros, 2004, Kotakorpi, 2006)
  - "Ladder of investment" hypothesis (Cave, 2006)
  - Preemption game (Gans & Williams, 1999; Guthrie, 2006)

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Existing Empirical Evidence

- Mixed results on effects of regulated entry on investment
- Aggregate level of analysis
- Ignores endogeneity of regulation
- Mostly U.S. studies

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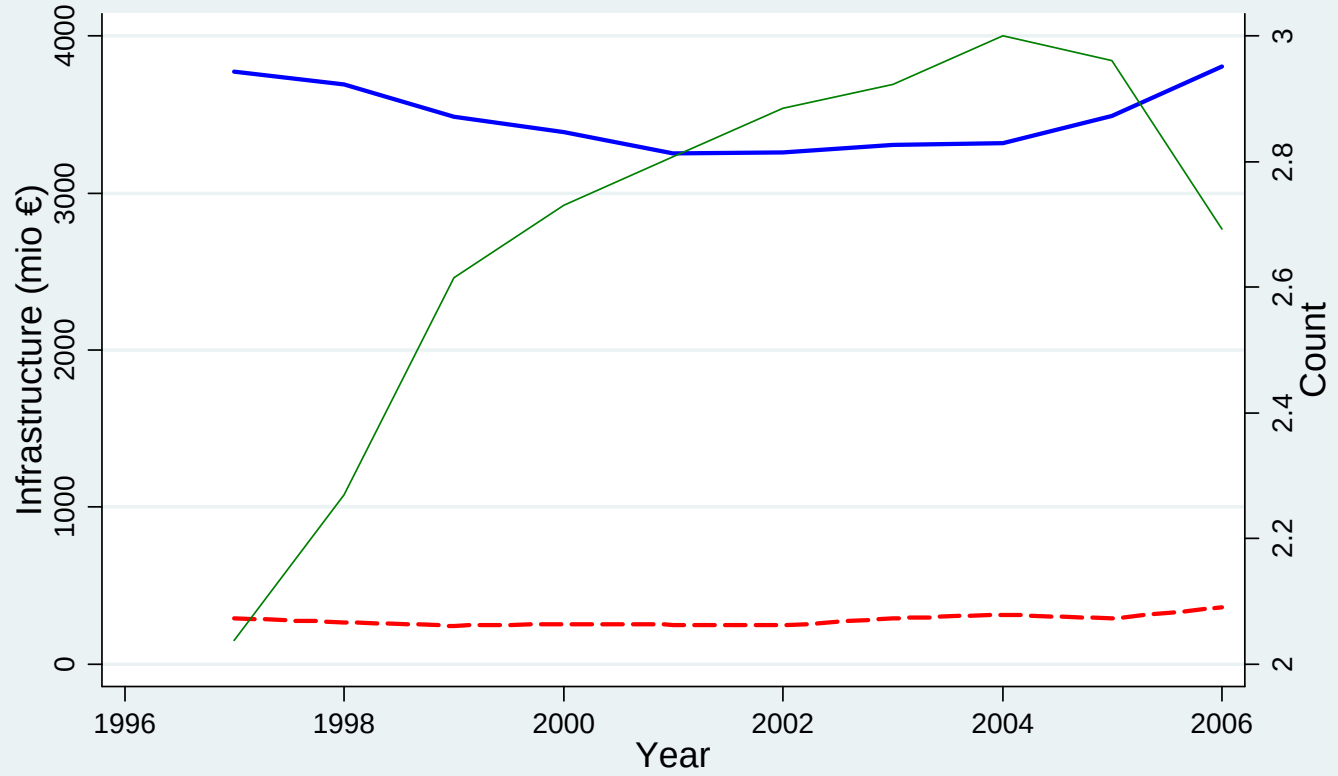
Dataset and Main Variables

- Data used in the analysis covers over 70 fixed-line telecom operators from 20 European nations over the period 1997-2006 (yearly observations)
- Domestic tangible fixed assets – proxy for infrastructure
  - Nominal figures corrected by Producer Price Index for telecom equipment
- Regulatory index (Plaut Economics)
  - Based on inputs
  - Sector-specific index: it captures regulations specific to fixed-lines
- Control variables (costs, demand, M&A activity, etc.)

EU Fixed-line Telecoms: Average Stock of Infrastructure by Operator's Type

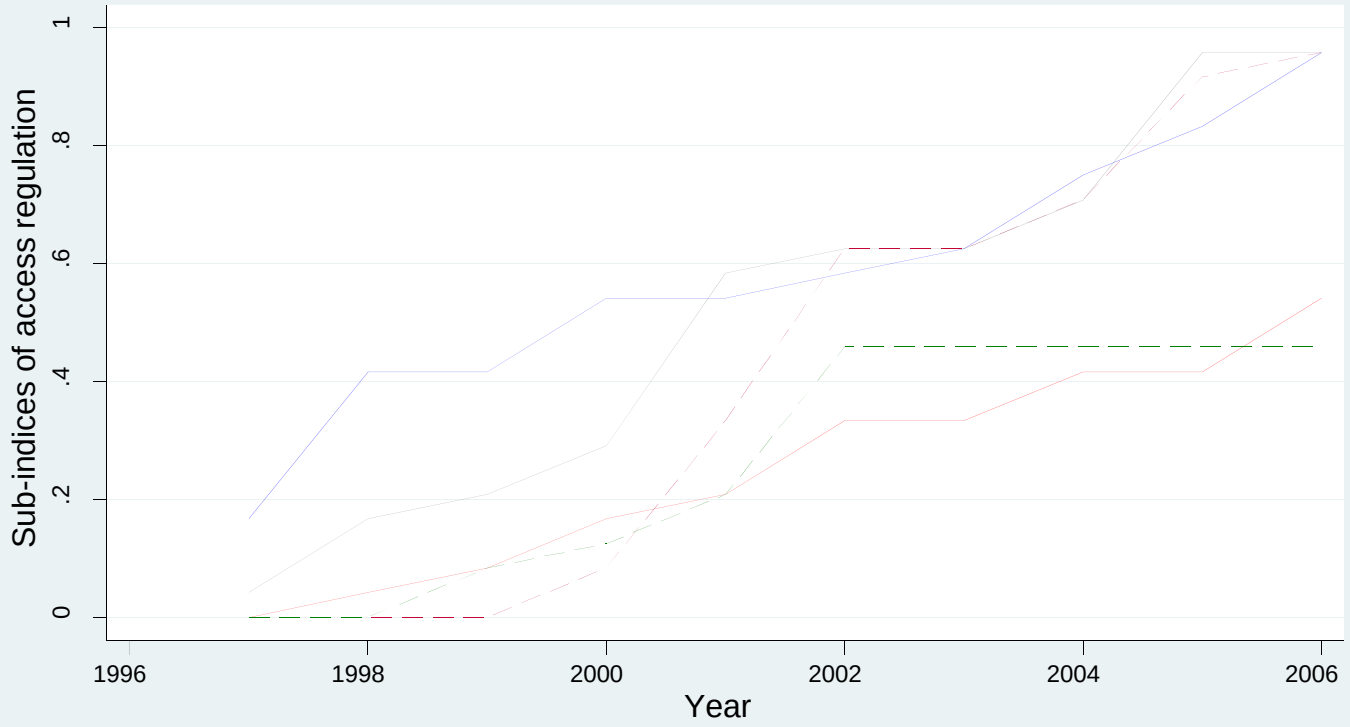


Source: Authors' calculations based on data from Amadeus and Osiris

Regulation Variable

- Fixed-line segment
  - Existence of accounting separation obligation
  - Existence of full unbundling regulation
  - Existence of subloop unbundling regulation
  - Existence of regulated line sharing regulation
  - Existence of regulated bitstream access

Sub-indices of Access Regulation: EU Averages



Source: Authors' calculations based on data from Plaut Economics

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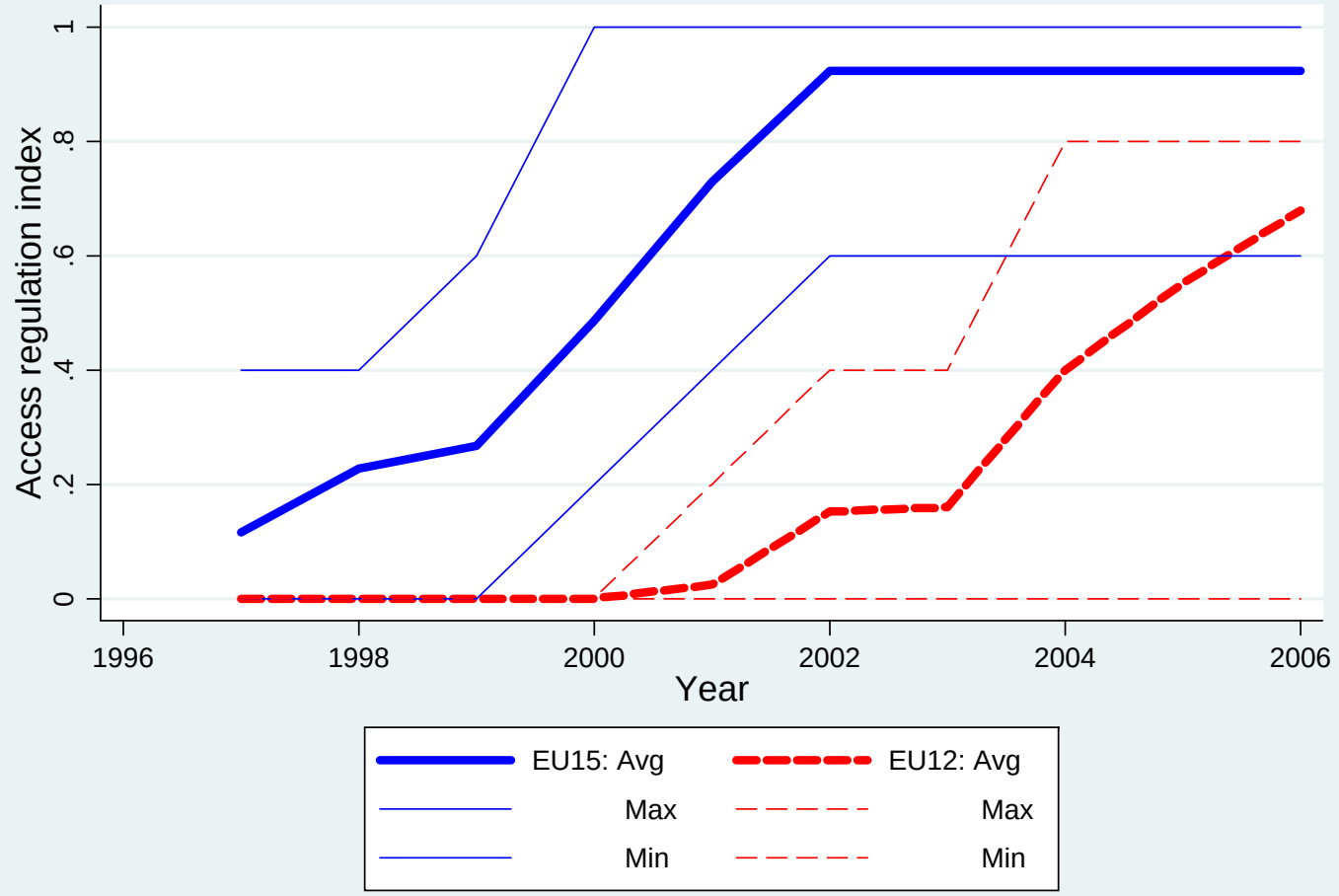
Telecoms in "Old" and "New" EU Member States: Access Regulation Index



Source: Authors' calculations based on data from Plaut Economics

Empirical Model of Investment in Fixed-line Telecoms

THREE SIMULTANOUS EQUATIONS:

i. Incumbent

$$\Delta IncInfr_{it} = \alpha^{I}_{i} + \beta^{I} IncInfr_{it-1} + \gamma^{I} EntInfr_{it} + \delta^{I} Reg_{it} + \boldsymbol{X}^{I}_{it}\boldsymbol{\theta}^{I} + \varepsilon_{it}$$

ii. Entrants

$$\Delta EntInfr_{it} = \alpha^{E}_{i} + \beta^{E} EntInfr_{it-1} + \gamma^{E} IncInfr_{it} + \delta^{E} Reg_{it} + \boldsymbol{X}^{E}_{it}\boldsymbol{\theta}^{E} + \zeta_{it}$$

iii. Regulation (Access to the local loop)

$$\Delta Reg_{it} = \alpha^{R}_{i} + \beta^{R} Reg_{it-1} + \gamma^{R} IncInfr_{it} + \delta^{R} EntInfr_{it} + \boldsymbol{X}^{R}_{it}\boldsymbol{\theta}^{R} + \eta_{it}$$

Instrumental Variables / Exclusion Restrictions

- Index of access regulation in neighboring markets
  - Separately for new EU and old EU
- Political variables (Comparative Manifesto Project, 2006)
  - Measure of government's attitude toward market regulation
  - Position of government on the right-left scale
  - Measure of government's attitude toward European integration
- Lagged levels of the infrastructure stock

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IV Estimation Results

equation:	**Incumbent**	**Entrants**	**Regulation**
dep var:	$\Delta\log(IncInf_t)$	$\Delta\log(\Sigma EntInf_t)$	ΔReg_t
dynamic effects:			
lagged level	-0.676***	-0.817***	-0.685***
	(0.149)	(0.080)	(0.094)
strategic effects:			
$\log(IncInf_t)$	-	-0.407	0.157**
		(0.433)	(0.013)
$\log(\Sigma EntInf_t)$	0.179*	-	-0.002
	(0.112)		(0.021)
Reg_t	-0.975**	1.195*	-
	(0.377)	(0.634)	
controls:			
$NoEnt_t$	1.172	-7.351***	0.084
	(0.798)	(1.024)	(0.165)
...	...	...	...
N	110	110	110
Hansen J	3.42 (3)	4.26 (3)	-
Serial correlation	0.12	-0.18	-0.03

* p<0.1, ** p<0.05, *** p<0.01; robust standard errors in brackets

Main Findings

- Access regulation discourages investment by incumbents in fixed-line telephony
- Access regulation encourages **total** investment by entrants
- Competitive pressure encourages infrastructure investment by incumbents
- National regulators toughen access regulation in response to increased stock of incumbent's infrastructure

Estimation Results for Individual Entrants

estimation method:	**OLS**	**IV**
dep var:	$\Delta\log(\text{EntInf}_t)$	$\Delta\log(\text{EntInf}_t)$
dynamic effects:		
$\log(\text{IncInf}_{t-1})$	-0.075**	-0.078**
	(0.030)	(0.032)
strategic effects:		
$\log(\text{IncInf}_t)$	-0.115	-1.492*
	(0.230)	(0.883)
Reg_t	-0.935*	-1.942*
	(0.556)	(1.103)
controls:		
...	...	...
N	237	192
Hansen J	-	4.97 (4)
Serial correlation	0.01	0.05

* p<0.1, ** p<0.05, *** p<0.01; robust standard errors in brackets

Additional Finding

- Access regulation discourages infrastructure investment by **individual** entrants
- Robustness checks
  - LLU prices
  - Cable competition

Implications for policy

- Careful with simplified empirical assessments
  - Endogeneity of regulation
- Regulatory commitment problem
- Our findings imply that regulation hampers future facilities-based competition

The Commission has argued:

"*Empirical evidence shows that investment and innovation are strongest where there is effective competition between infrastructures. However, there is still no infrastructure-based competition on around 80% of the EU's local loops. This means that ex-ante regulation continues to play a crucial role in maintaining competition and protecting consumers by setting conditions for access to the incumbent's infrastructure." Staff paper, p.3*

⇨ The current system does not lead towards infrastructure-based competition.