Broadband Diffusion: Empirics and Policy

and more…

Nicola Matteucci

DiSES, Marche Polytechnic University, Ancona, IT

IUS, Incisa, Florence, IT

UNU-MERIT, Maastricht, NL

Structure of the presentation

- An introduction to Ancona, Marche, Univpm, DiSES and our MoU (UnB-Univpm).
- A brief overview of my research interests.
- A synthetic presentation of my recent research on telecoms and broadband, focusing on methodological issues and open questions
- Q&A

Ancona, Marche, Univpm, DiSES and our International Collaboration Agreement (MoU UnB-Univpm).

Where we are…


Trento
Trieste
Aosta
Milano
Venezia
Torino
Bologna
Genova
Firenze
Ancona
Perugia
L'aquila
ROMA
Campobasso
Bari
Napoli
Potenza
Catanzaro
Cagliari
Palermo

Ancona early settlements and Greek foundation

- Bronze age (3500 -1200 B.C.): early settlements; Piceni settlements
- Greeks were visiting the Ancona's natural harbour since the Mycenaean civilization (ca.1600-1100 B.C.). During V century B.C., Greeks identified Ancona location as Ἀγκών (ankle).
- In 387 B.C., a group of Greeks (Doric), escaping from Siracusa, founded the town over the main "ankle promontory", and constructed the acropolis with a temple to Aphrodite.
- Then came the Romans…

Foundations…Greeks and Romans

Weather…City beach

Weather…Winter

Useful links and QR guides to know the Marche Region and Ancona

MARCHE (region)

- http://en.visit.marche.it/
- http://www.italia.it/en/discover-italy/the-marches.html
- http://www.le-marche.com/

ANCONA (regional capital)

- http://www.visitancona.com/en/
- http://www.ancona2400.it/
- http://www.tripadvisor.com

Our Faculty of Economics: right on the ancient promontory, in the city centre

Our Faculty of Economics: …other side

DiSES (Fac. Economics): main research lines

- Our Department (DiSES) has a prevalent "applied Economics" flavor, with an emphasis on quantitative methods.
- Theoretical approaches are also present, both mainstream and not (evolutionary). The research lines have increased over time.
- Nowadays, we cover: Agricultural Economics, **Antitrust and Regulation,** Econometrics (both Micro and Macro), Economics of Money and Credit, Growth and Development, **Industrial and Business Economics,** International Economics, **Law and Economics,** Labor Economics**,** Macroeconomics, Public Economics.
- Our DiSES colleagues cover: Demography, Economic History, Economic Sociology, Economic Statistics, History of Economic Thought.

DiSES: main features

- At DiSES, teaching has always been given paramount importance at all levels: Undergraduate degrees, Master degrees and PhDs.
- We adhere to the EU "Bologna system": 3+2 years (Bsc.+Msc)
- We have two Economics & Business curricula entirely taught in English, BOS and IEB (both belonging to, IEC - International Economics and Commerce - framework programme)
- http://www.econ.univpm.it/IEC
- Every year, we offer 10 scholarships to the best international students for attending IEC (we had already Brazilian students!)
- The other Department (Management), runs Management and Law curricula and two PhD curricula.

DiSES - PhD in Economics

- DiSES manages its own Doctoral (PhD) programme in Economics.
- It was started in 1985, just after the PhD system was officially introduced in Italy.
- DiSES' Doctorate soon became known as one of the leading PhD programmes in Economics in Italy, with top-level students coming from all over the country and from abroad.
- Last year, we celebrated the 30th anniversary of foundation
- To date, approximately 190 students have graduated from our PhD programme, including many international residents.
- We offer three-year scholarships for the best PhD candidates.

DiSES - PhD in Economics

- Every year, 7-10 new PhD students enroll.

- The first year is entirely devoted to standard courses.
- After Mathematics for economists, three fundamental modules of Econometrics, Microeconomics and Macroeconomics are taught + final examinations.
- II and III years (if no extension is required) devoted to writing the PhD thesis.
- The PhD programme details: http://www.dises.univpm.it/phd
- Currently, dozens of "post-docs" carry out research activities at DiSES, beside our regular Faculty members and an increasing number of visitors.

WP and scientific journals

- The Department publishes several working papers series, including:
  - "DiSES Working Papers", regularly indexed by RePEc,
  - "Gretl Working Papers",
  - "MoFiR Working Papers",
  - "Society and History",
  - "CRISS Working Papers".
- The Editor and most of the Board of the journal "Economia Pubblica- Italian Journal of Public Economics", is located at DiSES/Univpm.
- http://www.francoangeli.it/riviste/sommario.asp?idRivista=16
- http://ojs.francoangeli.it/_ojs/index.php/ep/index
- Your submissions are welcomed at any time!

About myself

My early research fields

- PhD in Economics (oligopoly theory) with a thesis on exclusive contracts and entry deterrence in the pay-TV sector
  - Related antitrust implications for AGCM's and EU Commission's contemporaneous merger cases "Telepiù-Stream" and "Sky".
- Applied works on employment dynamics and skill-biased technical change (Bratti and Matteucci, 2005).
- Applied works on R&D, ICT and productivity (TFP) (Matteucci et al 2005; others).
- Studying Digital TV-DTT competitive strategies and policy-making in EU and Italy (applied level).
- Interoperability and technical standardization activities for ICT and Digital TV products and services.
  - The last two really painstaking, for EU heterogeneity (Matteucci, 2008; 2009).

From TV to broadband & e-Services

- Following the sectoral convergence and media metamorphosis, since 2011 I have tackled telecoms and then e-Services.
- 1° step. IPTV and Connected TV/Hybrid TV.
- Then, a real jump on broadband and its policy-making
  - Statistical methodologies and composite indicators.
  - Infrastructural investment, supply-demand interactions and industrial policy.
  - Antitrust (state aid) and Regulation for broadband markets
- e-Services (including e-Government) diffusion and policy-making.
- Finally, to "make happy my wife", I have also worked a bit on the Happiness and Economics literature….(☺)

Broadband Diffusion: Empirics and Policy

An European perspective on broadband

- To contribute to the debate on the outcomes of the liberalization and privatization of network industries and public utilities
  - Focus on broadband investments
  - Current technological transition to Next Generation Access Network (NGAN) or ultra-broadband (fibre optics-based communication lines).
  - Billions of €/$ of new investments needed, worldwide, to shift the existing techno-economic paradigm of the telecom industry.
  - Towards a converging and interoperable (IP-based) communication industry (formerly telecom+broadcasting).
  - **A very ambitious EU Digital Agenda: to eliminate the broadband infrastructural digital divide: basic one by 2013, NGA one by 2020.**
  - In some countries, the main priority is not just residential broadband (better than average in urban areas), but rural industrial districts, touristic areas and Public Administration buildings, often located outside urban areas; (in Italy, the NEC model of diffused industrialization).

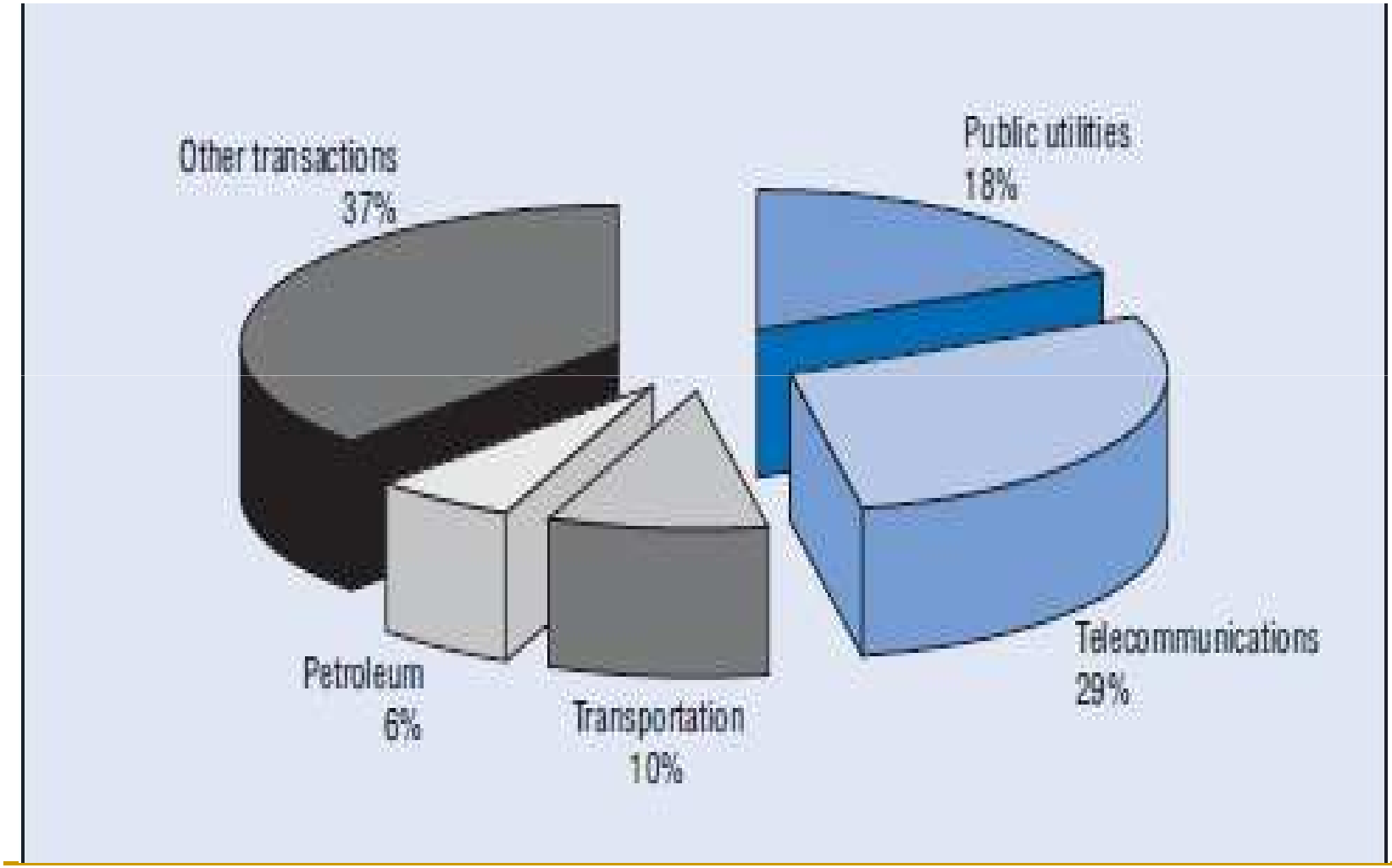
An European perspective on broadband

- How to harmonize public interests and private incentives?
- Privatized operators now obey to private incentives (invest just in the most lucrative areas: "dark", "grey", leaving uncovered "white" ones)
- How to invest in neglected areas (in primis, "white" areas), taking into account the interconnected nature of the infrastructure to be built, without endangering the private operators' legitimate expectations and business plans?
- In EU, in principle, we have very rigorous state aid control norms (tomorrow presentation).
- The practical solution has been to grant a special status to broadband investments publicly financed or supported, drafting a special mix of "hard" and "soft" law to guide Members States' industrial policies for the sector.
- A main example: EU Commission's Broadband Guidelines of 2009 and 2013 (I and II ed.).

Connected streams of literature

- To link the telecom debate to that on "new" industrial policies and public intervention in the economy:
  - Debate on disappointing privatization outcomes (hold up of investments).
  - Poor network infrastructure status and performance after privatization
    - UK: (Helm, 2009). From railways crashes to BT downsizing
    - Electricity markets in US
    - Etc.
  - Increasing presence of Neo-Colbertism and new interventionist industrial policies in US and several OECD countries (Rodrik, 2004; Bianchi, 2010, Mayhew, 2013)
  - Tailored industrial policies for Information Society in Est-Asia, with South Korea, Taiwan and Japan being leading examples
  - A debate also active in Brazil (pro and cons of industrial policies for Brazil and the necessity of sole horizontal interventions).
  - Current debate on the future of public enterprises (eg: Florio and Fecher, 2011; Clò et al. 2015).

Infrastructure privatizations over total privatization transactions, OECD 1990-2006 (%)



Source: OECD (2007)

Summary: some hot issues on the table

- Ambiguous outcomes of several privatizations (both in developed and developing countries).
- Falling investments of privatized operators
  - Sterlacchini (2012) for R&D drops in EU big privatized corporations.
- Loss of public service levels in some EU countries. Emergence of sizable infrastructural digital divides.
- Bacchiocchi et al (2011): dubious effects of privatization per se on prices.
- Italy is a case in point.
  - Depletion of the privatized operator by hostile takeovers financed by bank debt (Florio, 2007).
  - Matteucci (2013): a first estimate of the real hidden infrastructural divide in Italian broadband.
  - Some shortcomings more expected(able), some less.

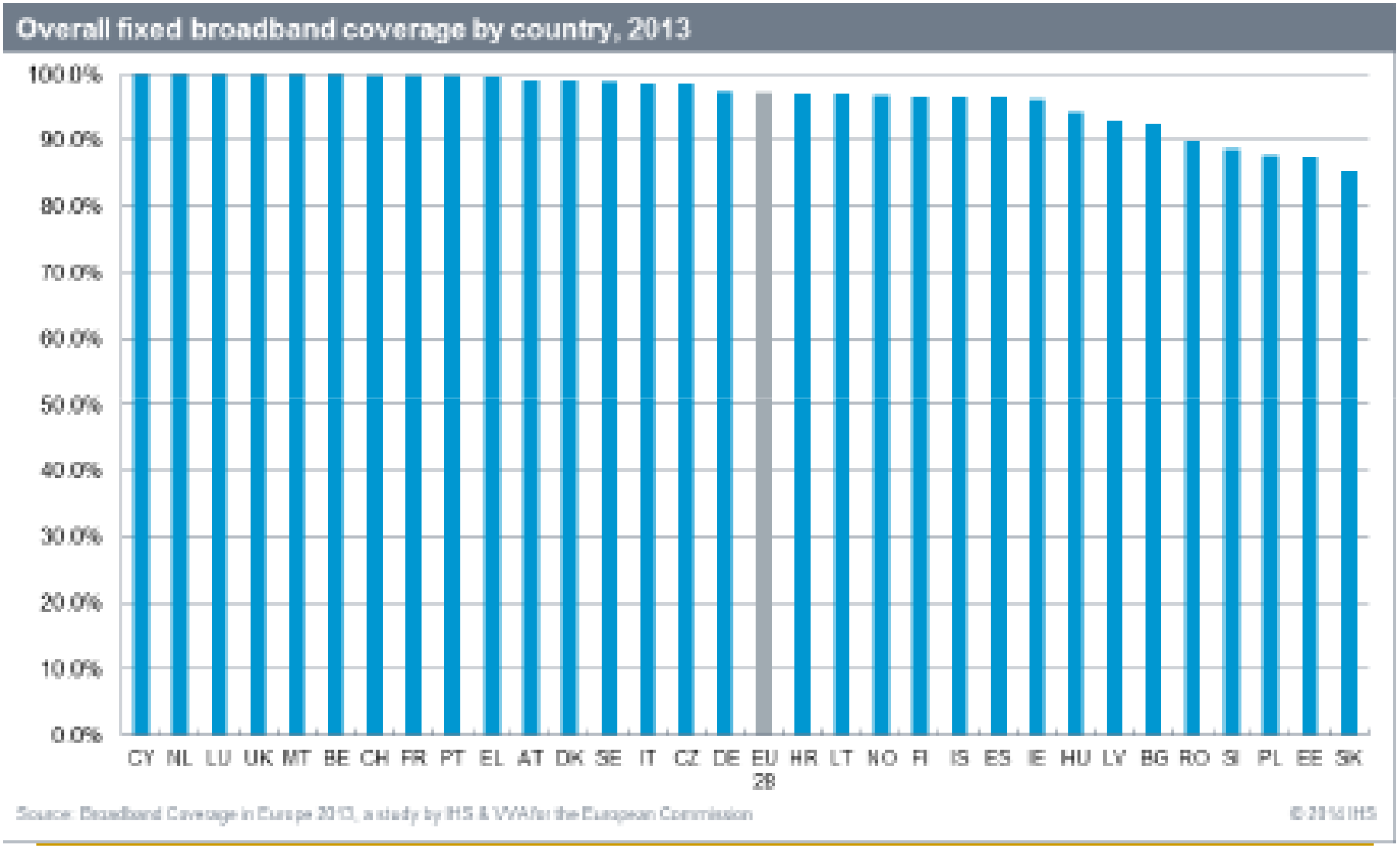
Detecting telecom investments: how?

- OECD telecom investment data are diffused aggregate
  - Dubious correction of capital variations attributable to M&A and pure financial investments
- Telecom operators hide data (☹): why?...(☺)
- My indirect strategy for detecting market failures (☺): Look at "smart" coverage data for basic and premium FG broadband.
  - Even for EU, it's difficult task.
- Latest EU Commission-sponsored data (*Broadband Coverage in Europe, 2013*) recently trying to measure **net minimum** broadband "coverage" (effective 2 Mbs).
- Dubious results, due to cross-country sectoral heterogeneities and country differences in definitions and infrastructures.
- Need to perform a country-by-country artisanal aggregation exercise

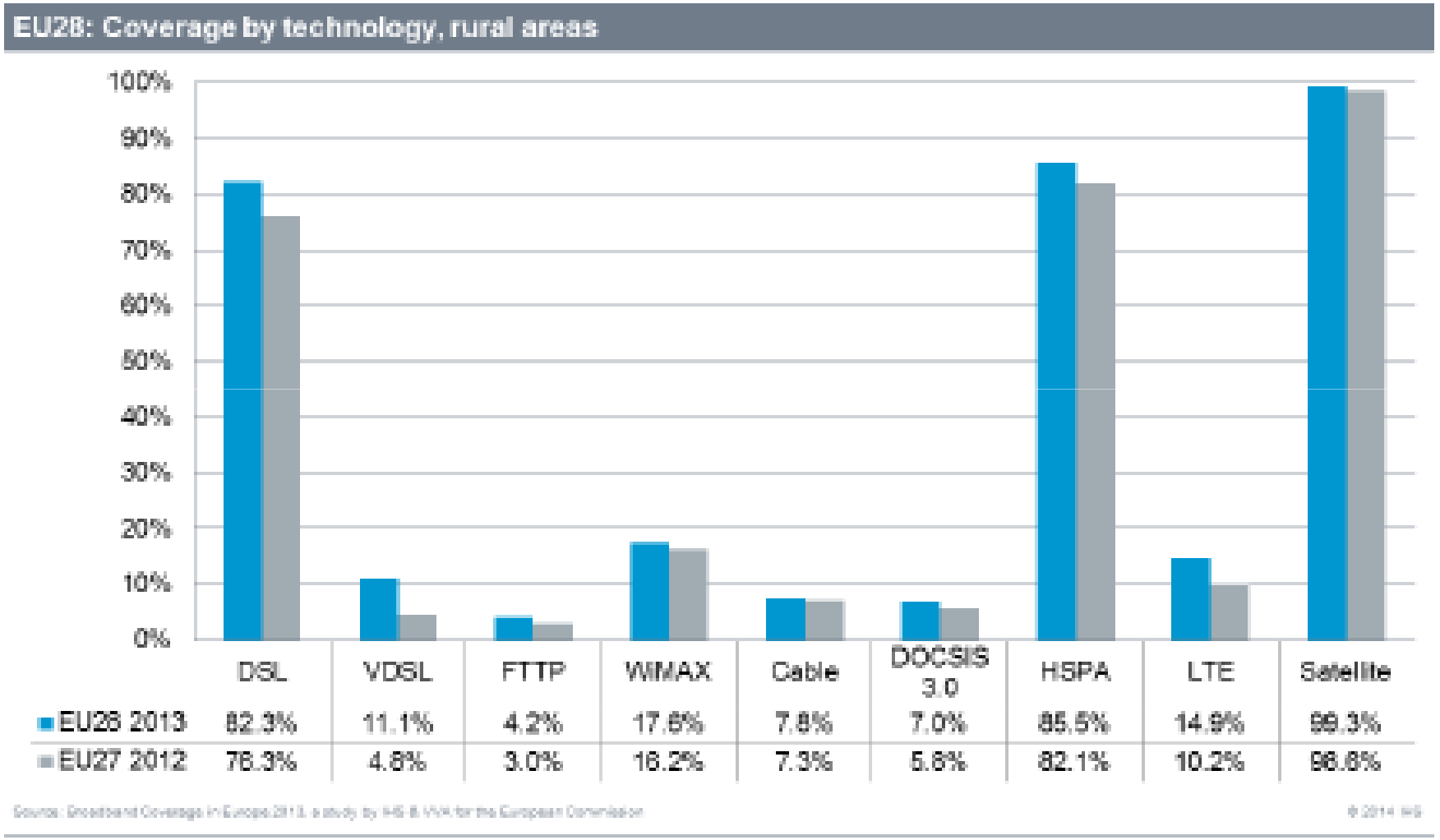
Methodological issues in broadband measurement

- Ranking methodologies inherently flawed
  - sensitiveness of ranks and appropriate numeraires
- Numeraires hampered by ongoing fixed-mobile substitution
  - Usage of other refined proxies: analogue telephony fixed legacy (Ford, 2011; Matteucci, 2013)
- Multidimensionality of broadband diffusion measures:
  - service coverage, actual subscriptions, capacity/stability (quality) of connection, pricing schemes
  - Usage of composite indexes introduce other problems. Eg: weighting.
- Obsolescent definitions used in official broadband statistics systematically overestimate laggard countries (Matteucci, 2013).
- Need for comprehensive sectoral analyses, before comparing countries

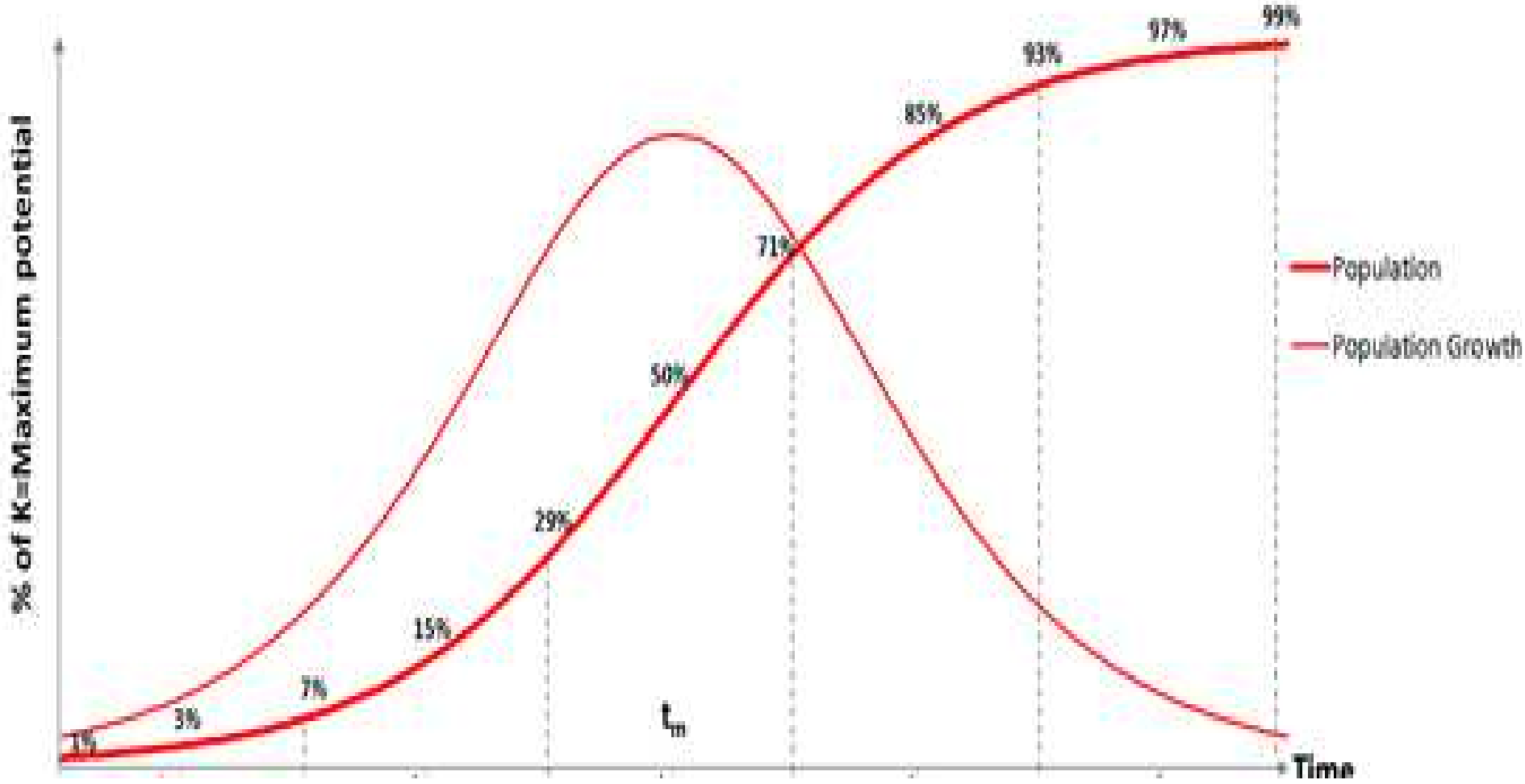
EU overall fixed broadband coverage: happy end?



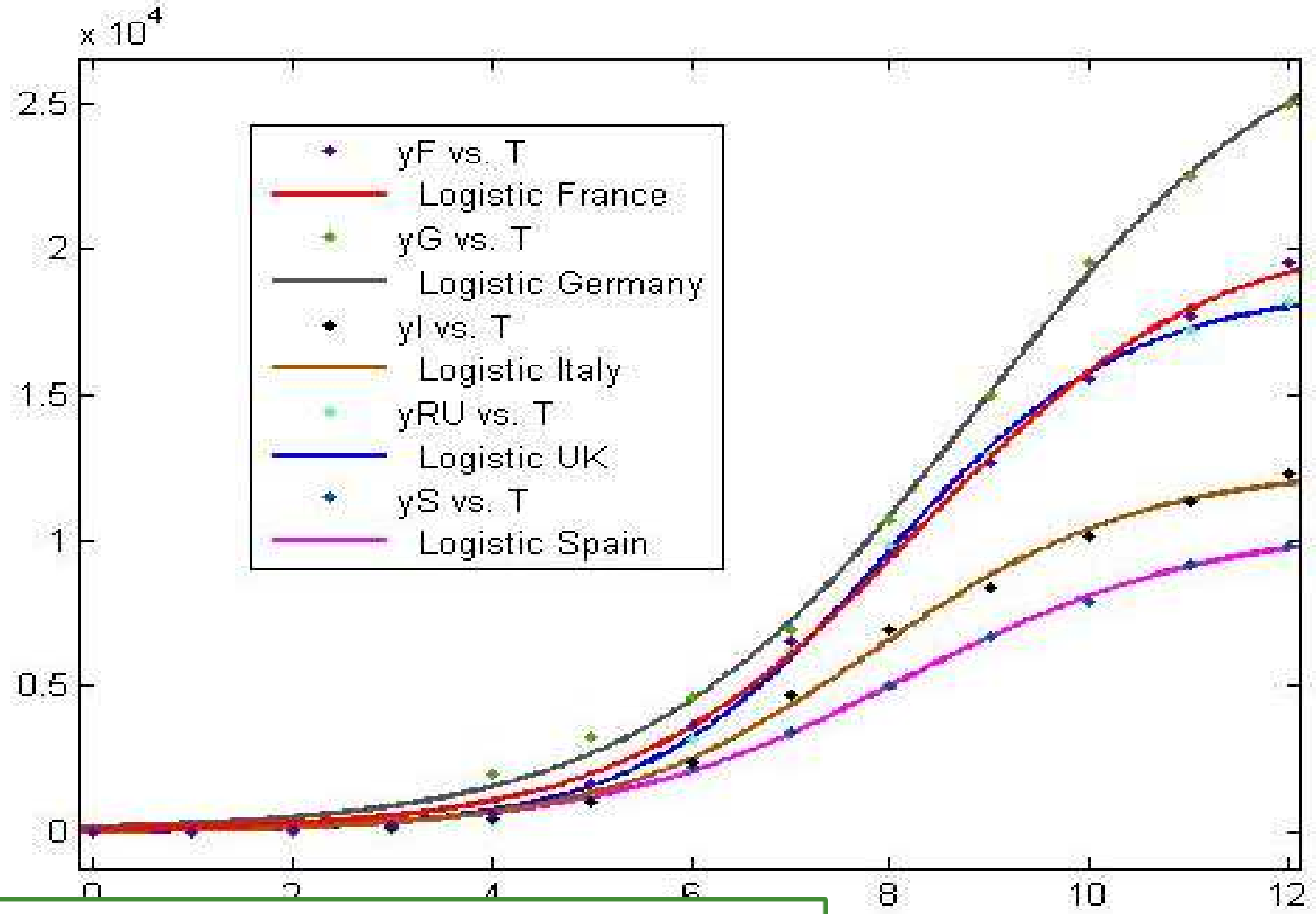
The rural challenge: “white areas”: not at all!



The ideal benchmark, since Rogers



NLS logistic fitting of big5: fixed broadband **adoption** data



Source: Matteucci (2013)

NLS logistic fitting: parameters

	A	***b***	***M*** (millions)	Inflection year (month)
France	289.8	0.68	20.7	2005 (Apr.)
Germany	192.3	0.59	28.9	2005 (Oct.)
Italy	361.5	0.75	12.5	2004 (Oct.)
UK	665.1	0.82	18.7	2004 (Nov.)
Spain	207.4	0.65	10.6	2005 (Feb.)

Source: Matteucci (2013)

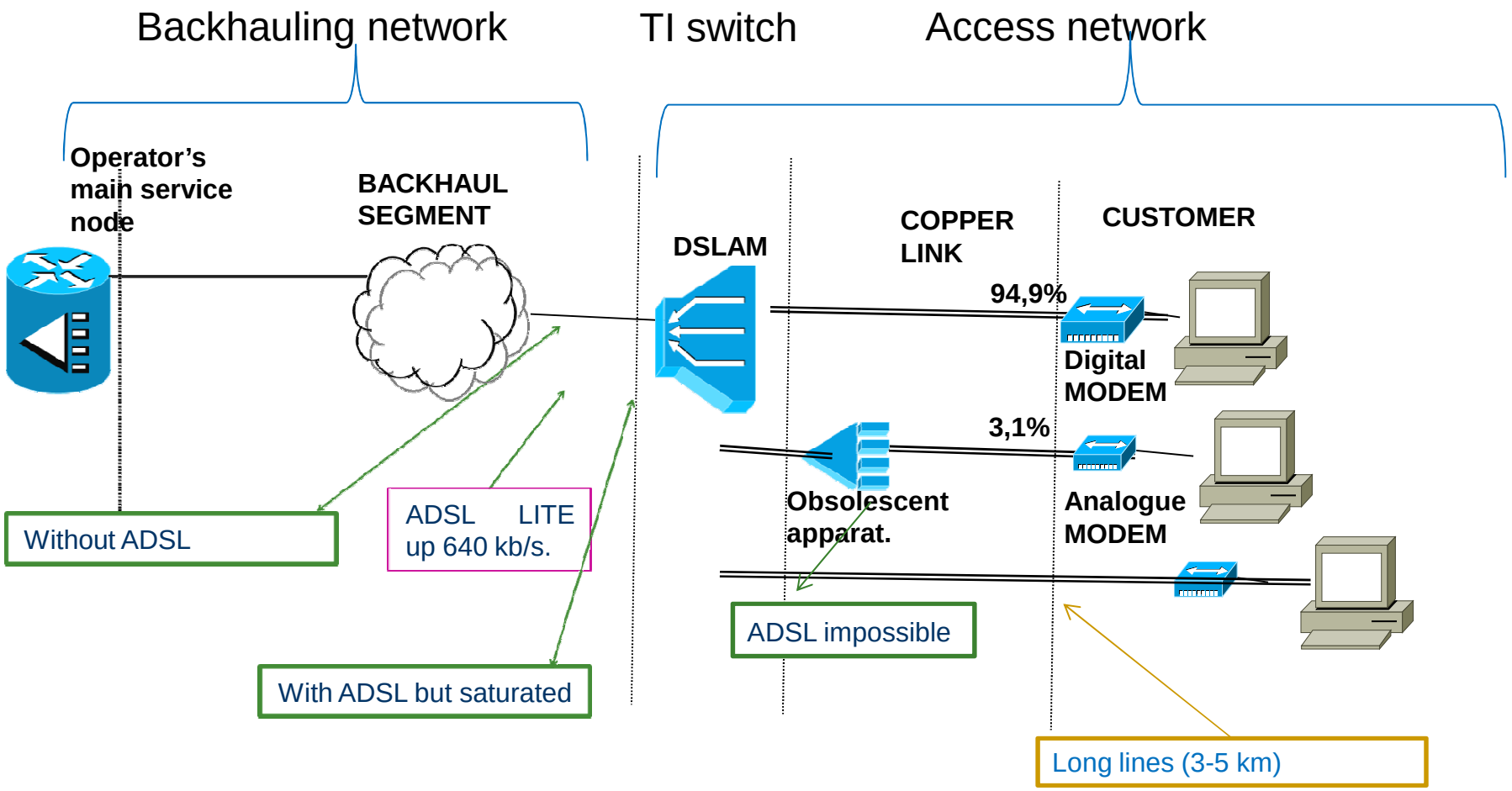
Some other methodological issues

- Many studies focused on diffusion curves of ICT and media sectors (including broadband), together with their explanatory factors.
- Most use econometric specifications (Liikanen et al. 2004; Bohlin et al. 2010; Lee et al 2011)
  - Underlying assumption: countries share the same parameters and diffusion drivers
- However, beside broad diffusion path similarities and determinants, country specificities chiefly matter
- Room for single-country 'morphological' studies of broadband diffusion and complementary ad-hoc institutional and regulatory analysis.

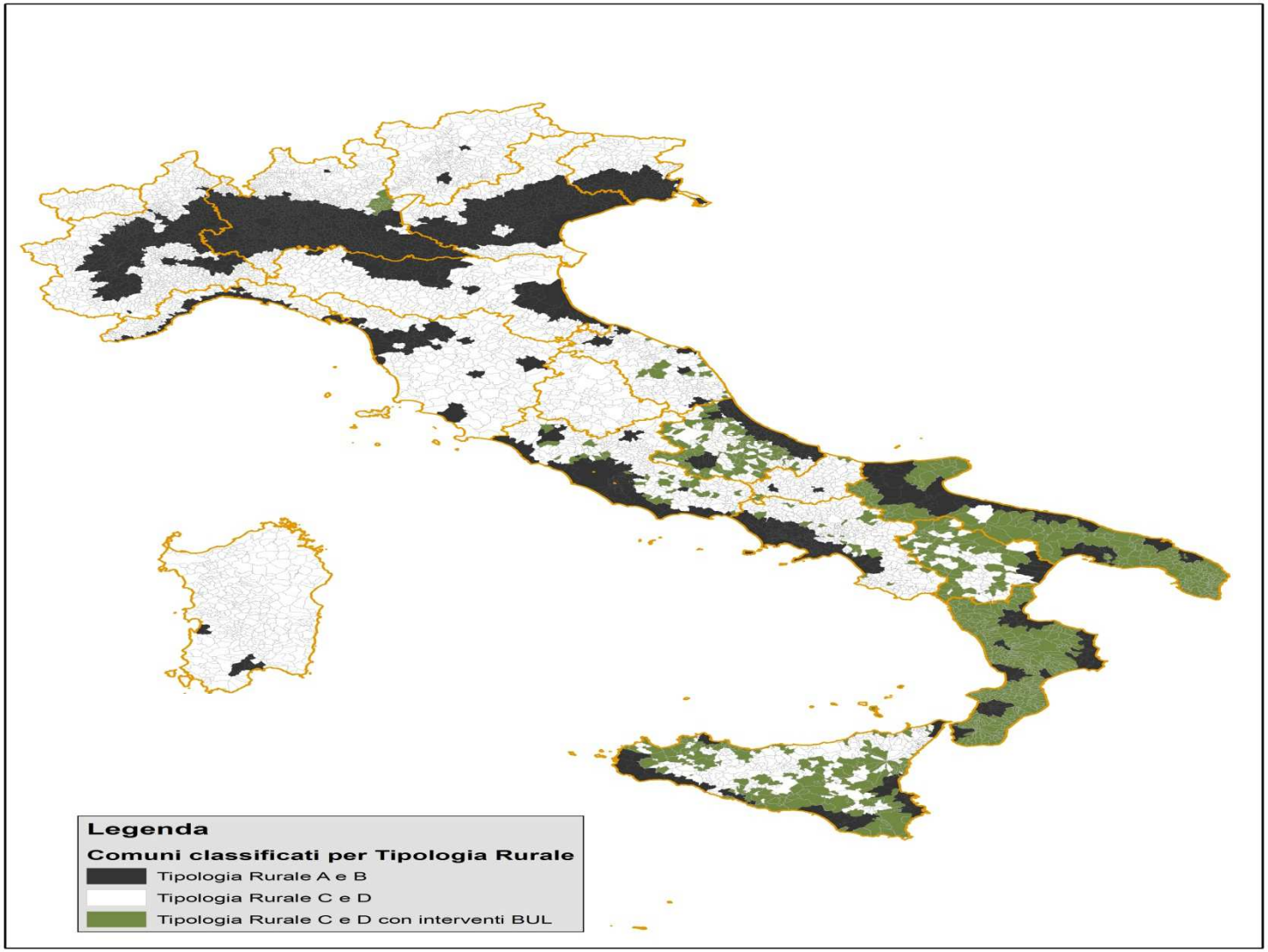
New industrial policies and broadband

- Western countries are now acknowledging that "ICT sectors and broadband need the State"
- US has done it since the beginning, and hasn't told us (☹)
  - Recovery and public investment acts after the 2008's crisis (ARRA in US, cfr. LaRose et al 2014)
  - Australian public plan for ensuring broadband as Universal Service
- Also in EU, someone has done it in an elegant way, without telling (France, Germany), someone has done it late and with more problems (Italy)
- Increasingly courageous plans for broadband also in EU.
- Just counter-ciclical policies? Not at all!
  - Exceptions: someone came late and did not understand what happened before (Slovenia now privatizing its incumbent, with concealed enthusiasm by some other Member State...(☺)

The Italian legacy: ADSL network topology



The Italian inverted BUL challenge



Source: Lehnus and Matteucci (2016)

Building public infrastructure: needs

	Total	**FEASR**	**Residual needed**	
	Valori assoluti e % di colonna	*Valori assoluti e % di colonna*	*Valori assoluti e % di colonna*	*% "residuo su totale area" e % "residuo su Italia"*
Nord-Est	607	282	324	*53,5*
	23,8	*20,1*	*28,3*	*12,7*
Nord-Ovest	910	301	609	*67,0*
	35,7	*21,4*	*53,2*	*23,9*
Centro	404	320	84	*20,7*
	15,9	*22,8*	*7,3*	*3,3*
Sud	357	257	101	*28,2*
	14,0	*18,3*	*8,8*	*4,0*
Isole	270	243	27	*10,1*
	10,6	*17,3*	*2,4*	*1,1*
Italia	2.548	1.403	1.145	-

Source: Matteucci (2014)

Diffusion of e-Services

Seri, Bianchi &Matteucci (2013): e-Services diffusion in EU

- Studying public eServices (eGovernment, e-Participation, eHealth, e-Procurement, etc.)
- Panel data analysis of public eServices diffusion across EU countries.
- 2001-2011, 17 countries. 150-170 obs.
- $y_{it} = \alpha_i + x_{it}'\beta + \varepsilon_{it}$
- Analysis of the determinants of the supply and demand of eServices
- Broadband, education and non-corruption found to be important and significant drivers of eServices diffusion.
- Methodological considerations lead to take with cautions existing data for certain countries.

Determinants of e-government adoption, usage and gap – individuals.

Variables	(1) GovAI	(2) GovAI	(3) GovUI	(4) GovUI	(5) GapI	(6) GapI
gdppc	−0.005**	−0.005**	−0.000		−0.004	
	(0.002)	(0.002)	(0.002)		(0.015)	
cofog99	0.021		0.020		−0.024	
	(0.020)		(0.014)		(0.089)	
brofix	0.020***	0.018***	0.011**	0.011**	0.063	0.087***
	(0.003)	(0.002)	(0.005)	(0.005)	(0.038)	(0.019)
cpi	0.039		−0.036		−0.171	
	(0.033)		(0.026)		(0.213)	
educ	0.019**	0.023***	0.017***	0.017***	0.043	
	(0.008)	(0.007)	(0.006)	(0.006)	(0.074)	
Constant	−0.501*	−0.129	−0.082	−0.199	−0.867	−1.900***
	(0.300)	(0.145)	(0.247)	(0.126)	(1.631)	(0.491)
Observations	155	160	74	79	38	45
R^2	0.663	0.656	0.458	0.345	0.526	0.487
Number of countries	20	21	19	21	19	23

Standard errors in parentheses.

Figures rounded to the 3rd decimal.

*** $p < 0.01$.

** $p < 0.05$.

* $p < 0.1$.

Determinants of e-government adoption, usage and gap – enterprises.

Variables	(1) GovAE	(2) GovAE	(3) GovUE	(4) GovUE	(6) GapE	(7) GapE
gdppc	−0.001		−0.003**	−0.003**	0.000	
	(0.002)		(0.001)	(0.001)	(0.002)	
cofog99	−0.012		−0.033**	−0.036***	0.011	
	(0.017)		(0.013)	(0.012)	(0.021)	
brofix	0.007***	0.007***	0.010***	0.009***	−0.000	
	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	
cpi	0.082***	0.084***	0.025		0.119***	0.054*
	(0.028)	(0.028)	(0.020)		(0.035)	(0.029)
educ	0.032***	0.031***	0.012***	0.014***	0.023***	0.025***
	(0.007)	(0.006)	(0.005)	(0.004)	(0.008)	(0.005)
constant	−0.611**	−0.691***	0.431**	0.602***	−1.447***	−0.893***
	(0.256)	(0.217)	(0.177)	(0.107)	(0.325)	(0.216)
Observations	155	156	150	153	132	177
R^2	0.573	0.572	0.504	0.518	0.235	0.164
Number of countries	20	21	20	20	20	28

Standard errors in parentheses.

Figures rounded to the 3rd decimal.

*** $p < 0.01$.

** $p < 0.05$.

* $p < 0.1$.

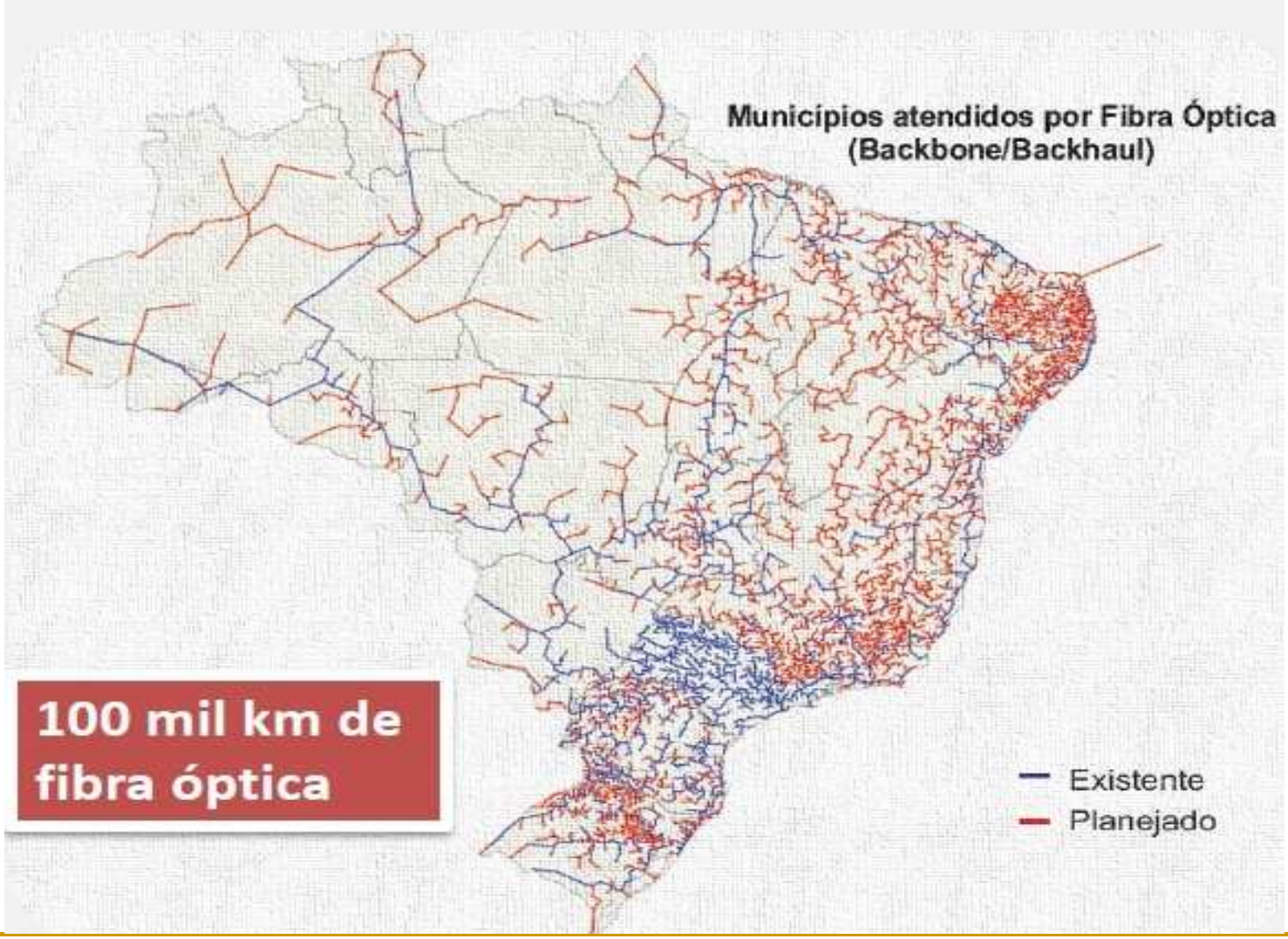
Determinants of e-participation.

Variables	(1) Partic	(2) Partic
gdppc	−0.003	
	(0.003)	
cofog99	0.008	
	(0.030)	
brofix	0.009**	0.005**
	(0.004)	(0.002)
cpi	−0.015	
	(0.037)	
educ	−0.027**	−0.024**
	(0.012)	(0.012)
constant	1.060***	0.894***
	(0.375)	(0.225)
Observations	124	128
R^2	0.073	0.042
Number of countries	18	19

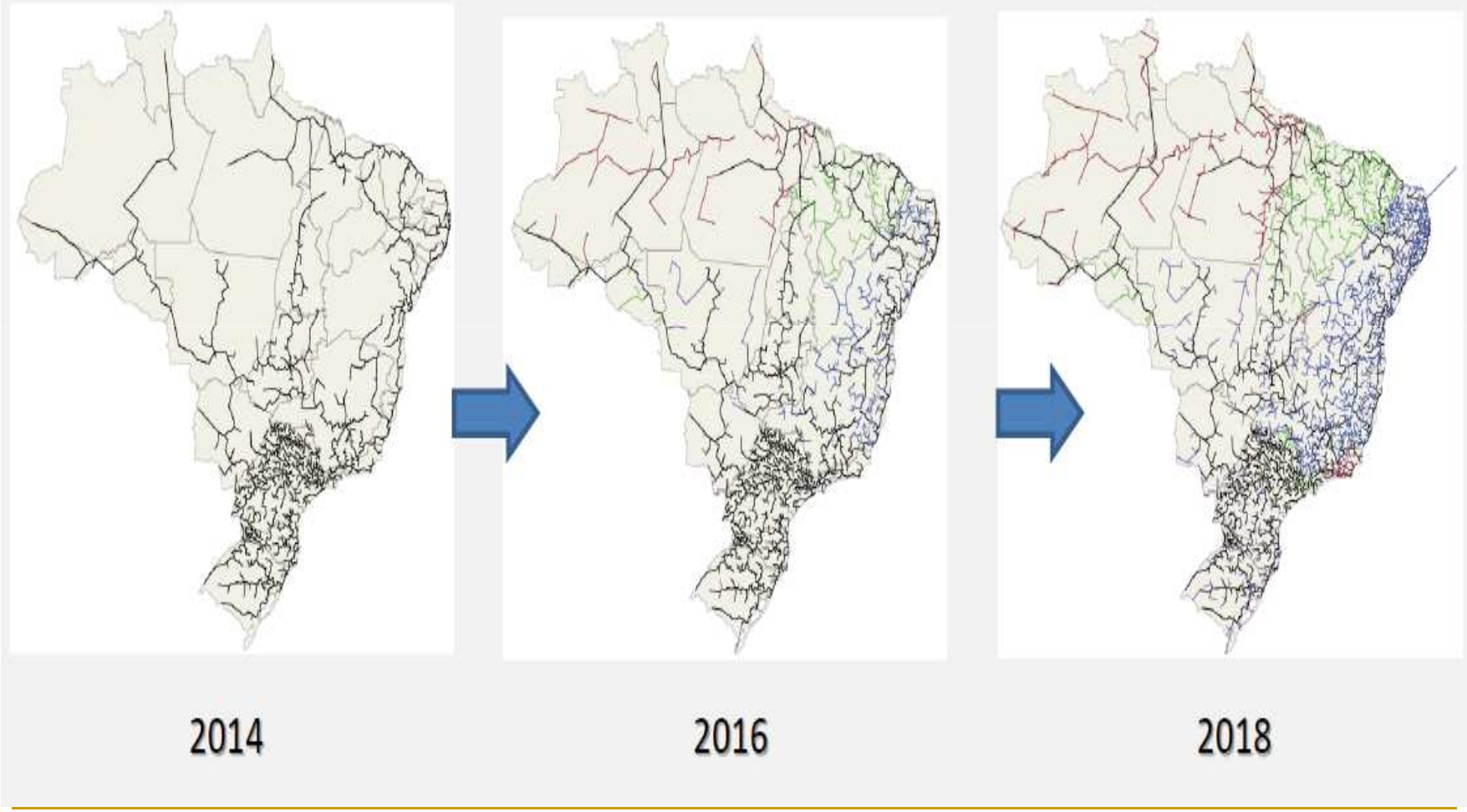
Standard errors in parentheses.
Figures rounded to the 3rd decimal.
***$p < 0.01$.
**$p < 0.05$.
*$p < 0.1$.

WHAT ABOUT BRAZIL?

How to bring basic and possibly NGA services?



Incremental steps, with municipalities nearest to existing network first?



The two diffusion benchmarks

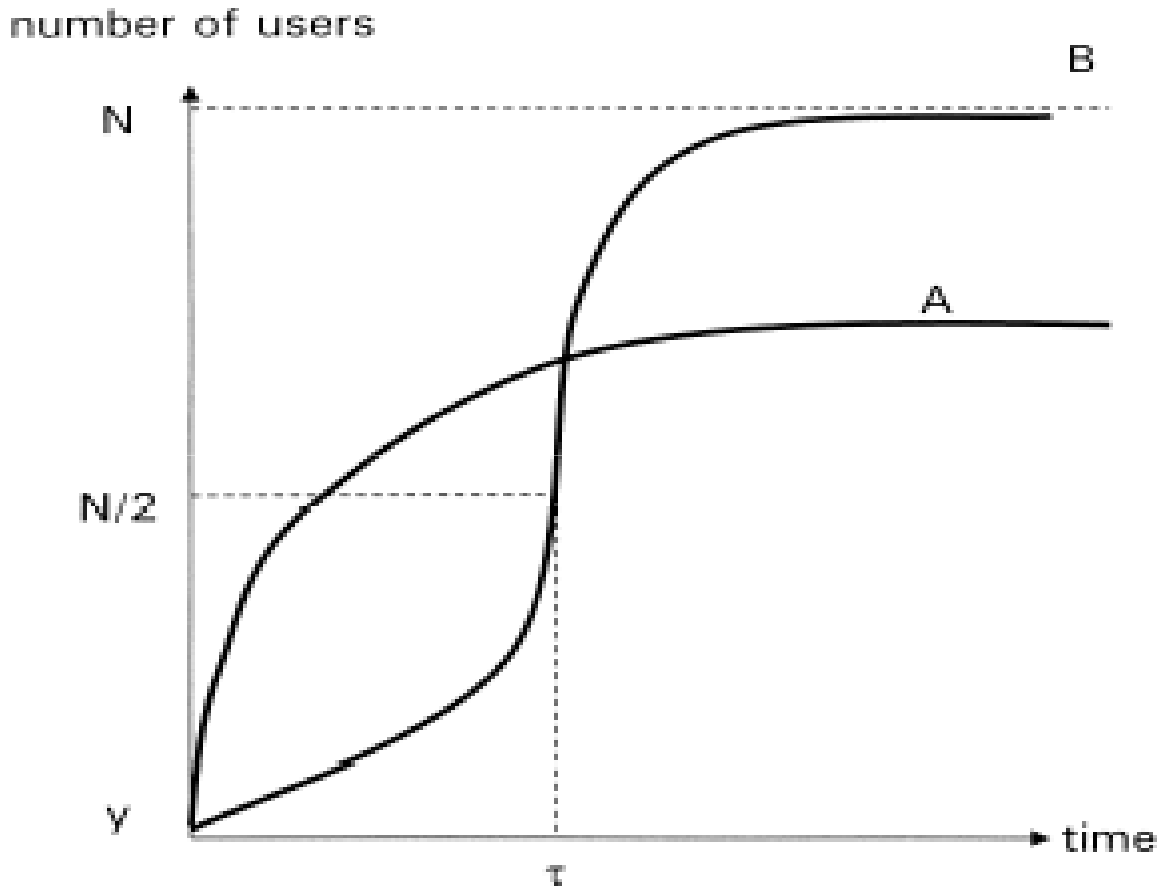


Fig. 1. Plots of the modified exponential (A) and logistic (B) diffusion functions.

Obrigado pela vossa atenção e por terem ficado tanto tempo!

I am reachable here…

n.matteucci at univpm.it

http://works.bepress.com/nicola_matteucci
http://www.univpm.it/nicola.matteucci
https://ideas.repec.org/f/pma1564.html