

Why close the digital divide?

Tommaso Valletti (Imperial College London and University of Rome)

5th SEEK Conference

Overcoming the Crisis: How to Foster Innovation and
Entrepreneurship in a Diverging European Economy?

Academic Forum

Mannheim, October 8-9, 2015

Digital divide

- 20m hits on google
- Wikipedia: “A **digital divide** is an economic and social inequality with regard to access to, use of, or impact of ICT”.
 - The divide may refer to inequalities between individuals, households, businesses, or geographic areas, usually at different socioeconomic levels
- I will concentrate on impact of **broadband**, a ‘general purpose technology’ that functions across many areas of economic and social life

Policy makers

- Governments hope that the economic impact of faster broadband will be substantial
 - Work commissioned by DCMS (2013): fast broadband can add £17bn to UK's annual GDP
 - Digital agenda in EU, National broadband plan in US
 - Many government-sponsored evaluations that look at outcomes do **not** use credible strategies to assess the **causal** impact
 - **Pity**: estimates of the benefits of these 'projects' are then of limited use to policy makers

Academic work

- The big picture
 - **Enthusiasts** (Jorgenson): ICT explains most growth in productivity
 - **Sceptics** (Gordon): Internet less significant
 - **Middle camp** (Brynjoloffson and Hitt, Bloom et al.): important, but also people and firms to adapt to and innovate around technology
- Broadband and ICTs enable production complementarities, especially for skilled workers and knowledge-intensive firms



Evidence

- Scholar google: 1.5m hits...
- Not always very scientific
 1. Cross sections, or before/after, without untreated groups (with no control variables)
 2. Some control variables (still no untreated)
 3. Some comparison group (diff-in-diffs), but no much discussion of unobserved differences
 4. Quasi-randomness (instruments or discontinuity)
 5. Randomised control trials

What I (and co-authors) did

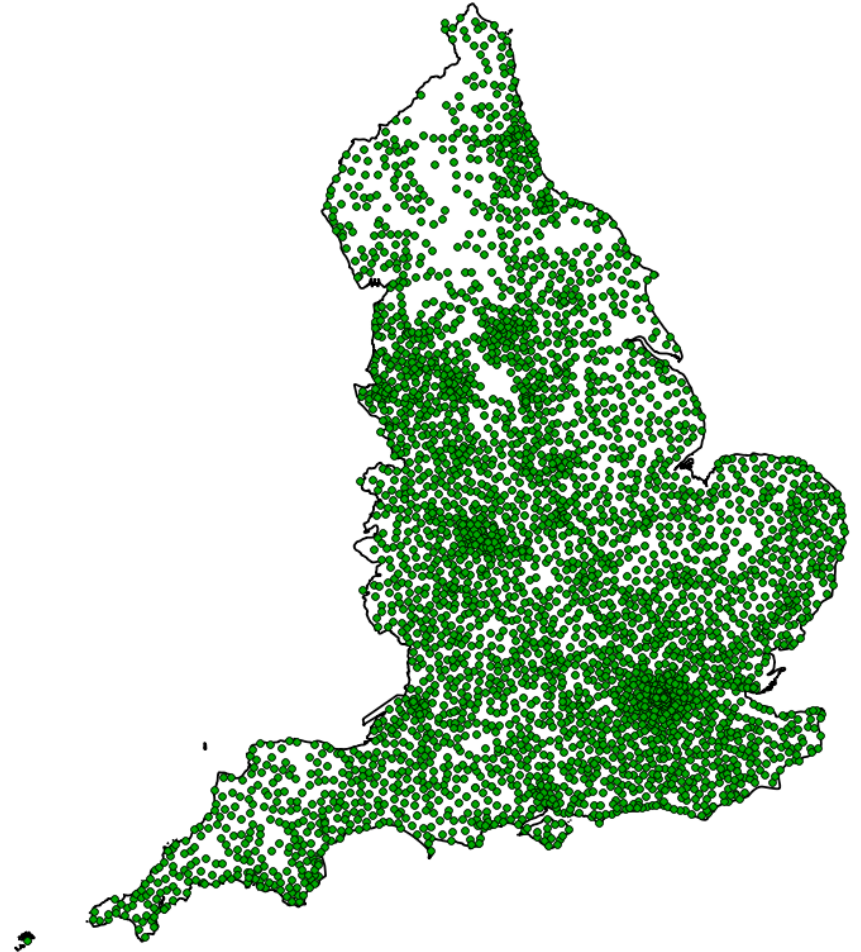
1. **Regulation**: unbundling the local loop – does it work?
2. **Cost-benefit analysis**: broadband digital targets – do they make sense?
3. **Social life**: politics and policies – affected by the broadband Internet?

1. Unbundling the local loop

- Market-led provision in most countries, role of state is to ensure a competitive market/apply appropriate regulations
- Investments and **unbundling**
- Nardotto, Valletti and Verboven (2015)
- 80,000 observations at the level of each Local Exchange (LE) in the UK, 2005-2010
- **Entry models** with credible **instruments** (size of catchment areas, distance from backbone, ...)

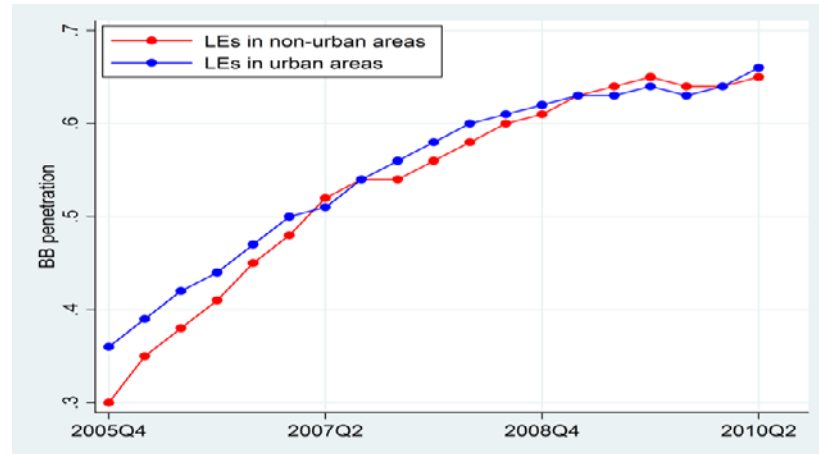
Data and results

- Results:
 - LLU unbundling did NOT increase penetration, but...
 - It increased quality (speed)
 - Competition from alternative technology (cable) is the most important factor to increase both penetration and speed

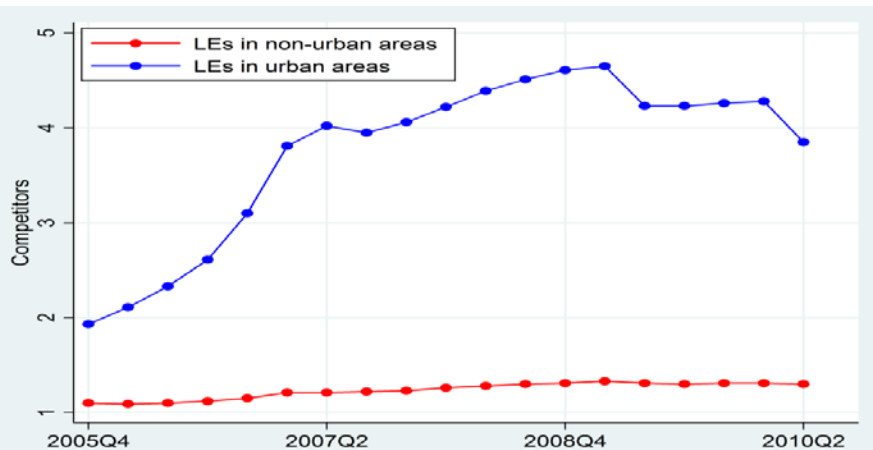


Impact of LLU

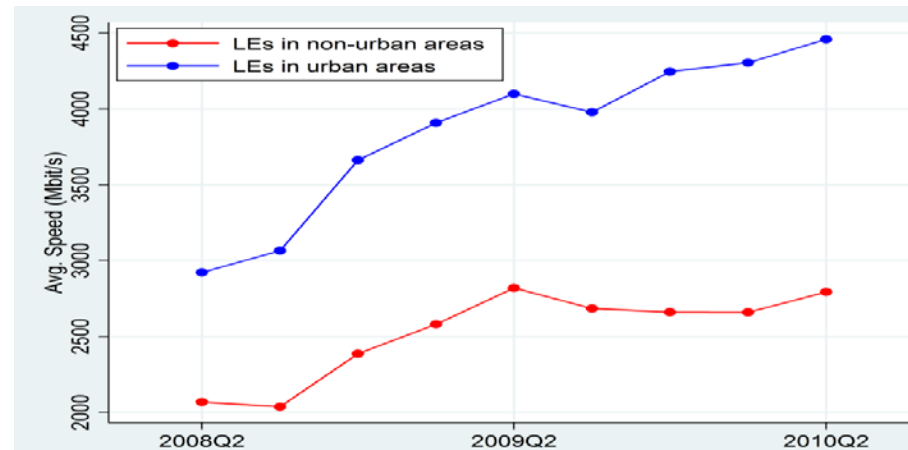
- Penetration? **NO**



- Entry of LLU operators? **YES**



- Speed? **YES**



LLU: implications

- LLU as a policy tool to increase adoption? NO
- Interplatform: YES
- The regulator managed NOT to create a digital divide
- Good for welfare?
- Probably yes, but the angle is that it increases product differentiation

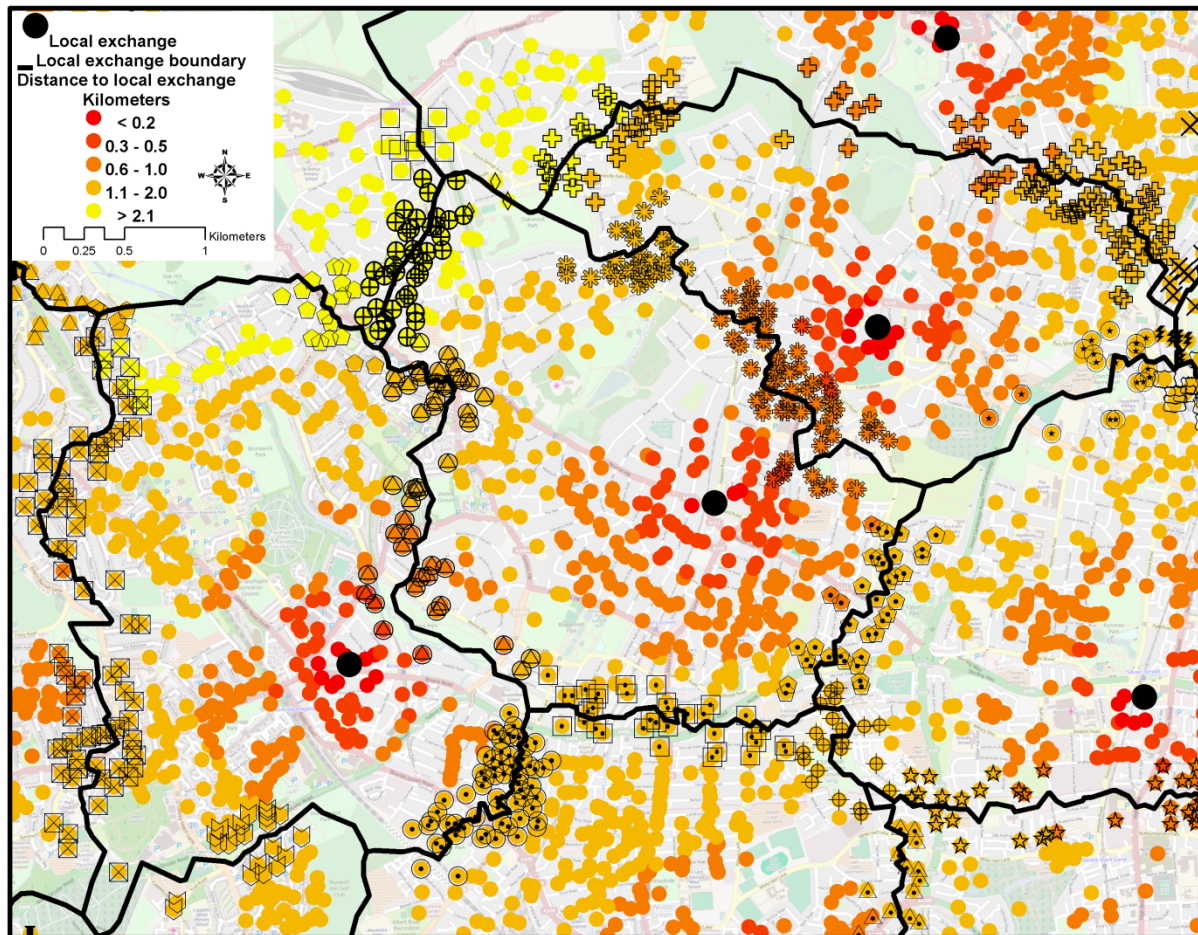
2. Digital speed and targets

- **EU Digital Agenda** says that in each member state:
 1. Every household should have broadband above **30 Mbps by 2020**
 2. 50% of households should have broadband above **100 Mbps by 2020**
- Can we assess the **costs and benefits**?
- Ahfleldt, Koutroumpis and Valletti (2015)
- Main idea: estimate WTP for speed via **capitalization effects in the housing market!**
- **Very rich UK data** (1995-2010, 1m observations at full postcode level):
 - Ofcom (Local Exchanges)
 - Speed data (“ping tests”)
 - Nationwide building society: property prices and characteristics

Speed matters

- We establish a **causal** link between broadband quality and property prices
- **Speed matters**: going from narrowband dialup to ADSL2+ (up to 24 Mbit/s) implies almost a 4% increase in price of a house, **but** diminishing returns
 - **Large effects**, differ by income and urbanization
 - Counterfactuals distinguish between benefits from **speed upgrade** (households already subscribing) and **coverage upgrade** (non-subscribers, less reliable)

Identification: Local Exchange and Boundary Effects



Digital targets: implications

- **Digital targets:** urban areas pass a cost-benefit test, not sub-urban and rural areas
- Urban areas? Where is the problem?
 - Broadband rent appropriated by landlords, not by ISPs
 - Co-ordination problem among landlords
 - **Public delivery of broadband** to undersupplied areas combined with levies charged to home owners
- Not a strong economic case for Digital Targets in rural areas

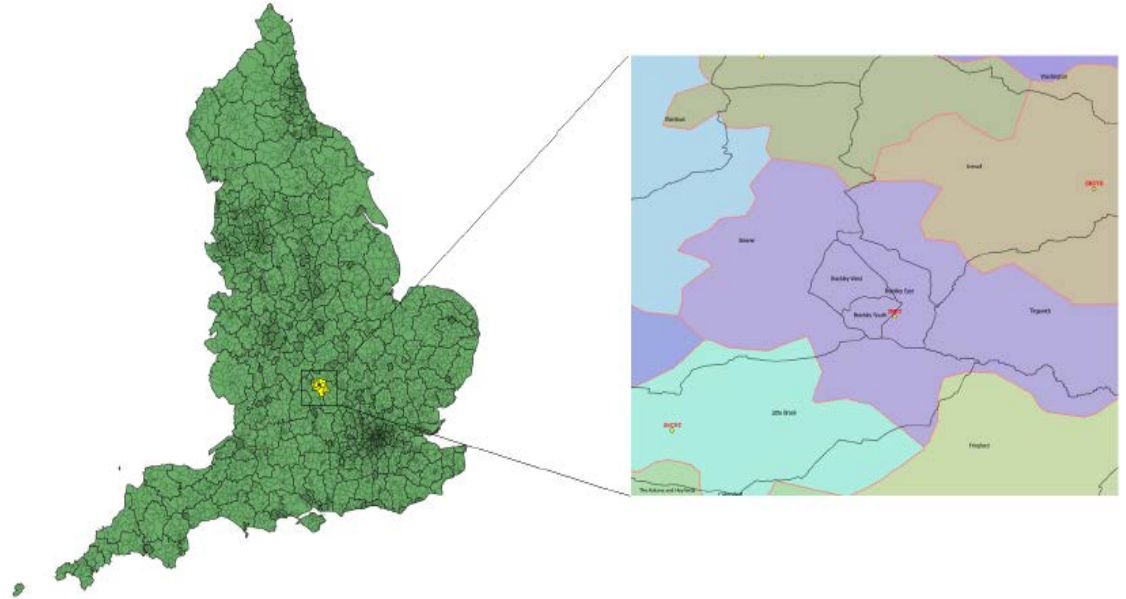
3. Politics and policy

- Internet not necessarily good:
 - Internet makes us **'shallower'**: “When we're constantly distracted and interrupted, as we tend to be online, our brains are unable to forge the strong and expansive neural connections that give depth and distinctiveness to our thinking.” Carr (2011).
 - Internet decreases **civic engagement**: Putnam (2000).
 - Internet increases ideological **polarization**: “People restrict themselves to their own points of view.” Sunstein (2001, 2007).
 - Internet increases government **corruption**: Starr (2009).

Nardotto, Gavazza and Valletti (2015)

QUESTIONS:

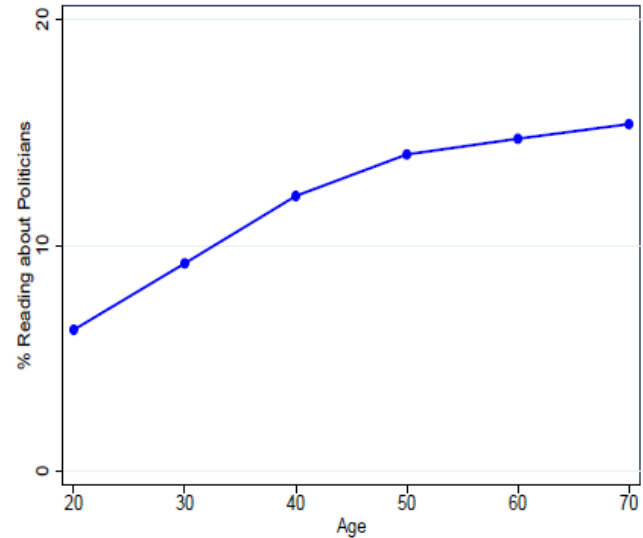
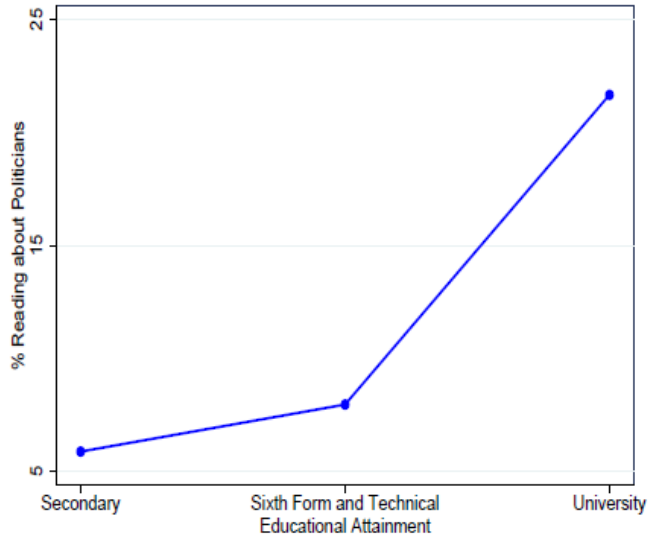
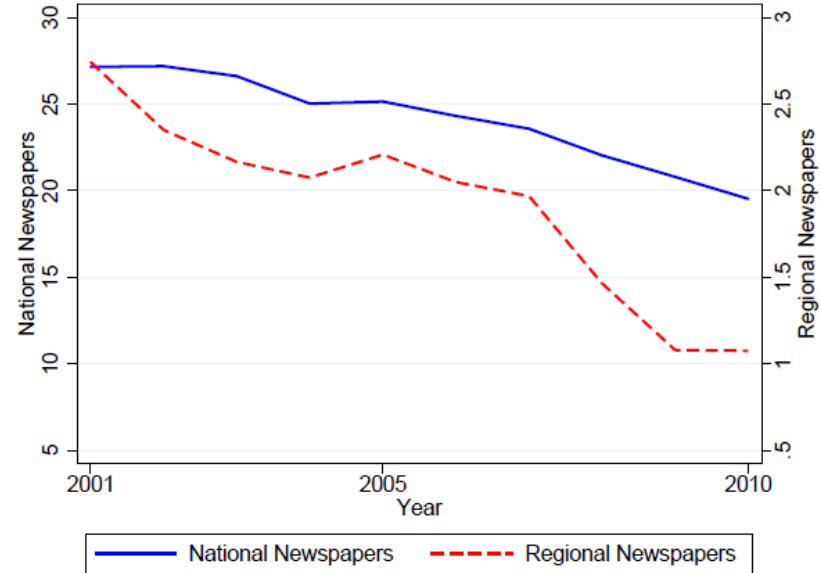
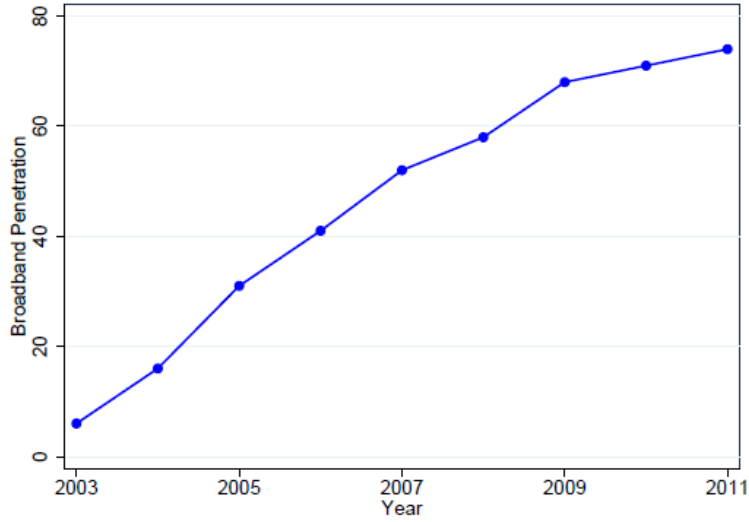
- How does the Internet affect **elections**?
- How does the Internet affect **government policy**?



SETTING

- UK **local** elections and **local** governments

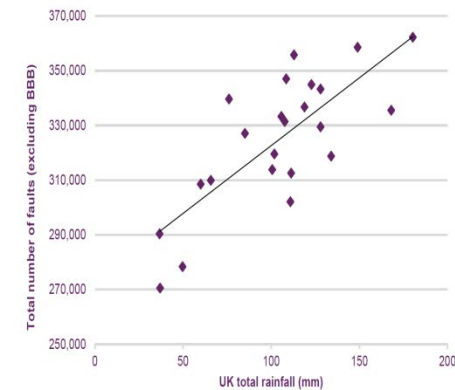
Trends



Identification

- Falling from the sky...
- **IV: rain**. Broadband technology has problems when a lot of rain falls on the LE.
 - Lower perceived quality for the user
 - Higher costs for the ISP which may not invest
- Ofcom emphasizes the role of rainfall and floods on costs and quality of service
- Rainfall for each location from **UK Met Office**:
 - rain is lagged (e.g., rain from Jan to Dec 2005 to instrument for penetration and elections in 2006), plus control for the rain at the election
 - Useful to perform **falsification** tests

Figure A31.16 Correlation between rainfall and fault report volumes¹³³⁰



Findings and implications

- Strong evidence that Internet affects elections: **decreased turnout**
- Evidence that Internet affects policies: **lower taxes and lower expenditures**
- In line with the “**Only the Poor Get Poorer Hypothesis**”:
 - Highly educated use the internet to get information and vote, less educated use the internet mainly for entertainment, become less politically involved, vote less.
 - Politicians then implement policies more in favour of high educated voters.
- Wider implications:
 - Internet **harmful to the less politically engaged**
 - **Digital divide vs. political divide**

What others did on broadband

- Correlated with **GDP growth** (Czernich et al., 2011)
- Can improve **productivity**, but effects not always positive, **not necessarily large** (Kolko, 2012)
- Can increase the **number of businesses**, either because it increases entry or because it helps with survival (Kim and Orazem, 2013)
- Very **heterogeneous effects on employment** (more studies here)

Falck et al. (2014)

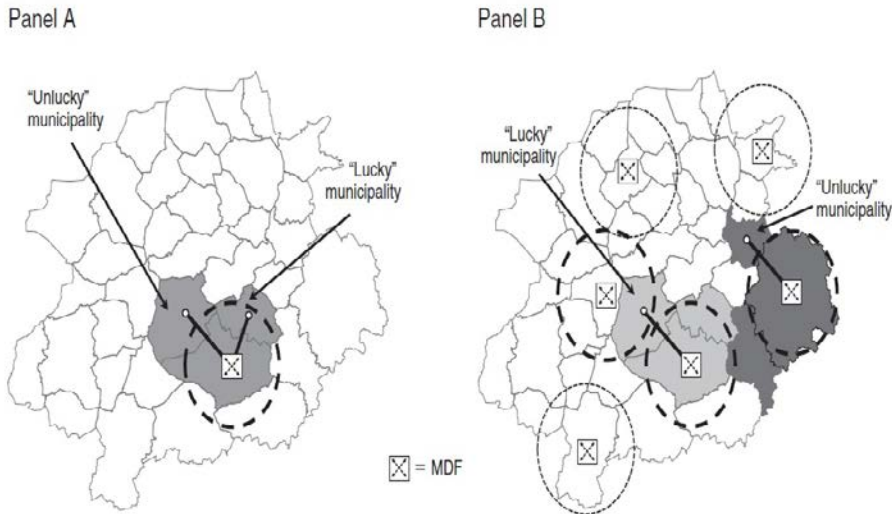


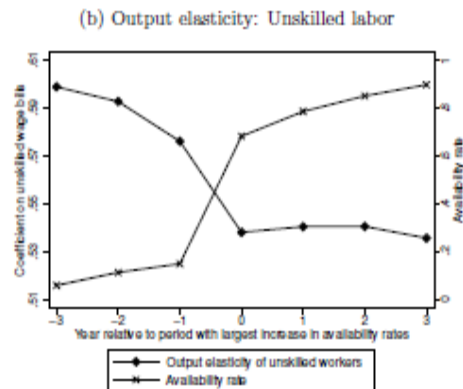
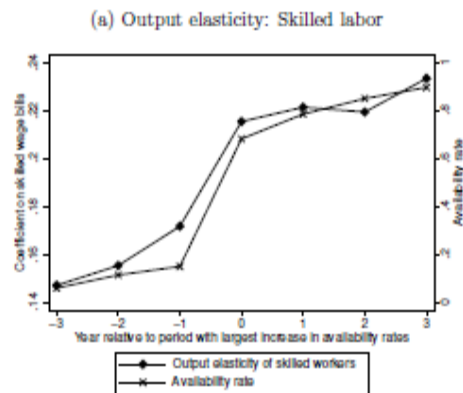
FIGURE 2. GRAPHICAL ILLUSTRATION OF THE DISTANCE INSTRUMENTS

Notes: In panel A, the three gray-shaded West German municipalities are served by the same MDF. The circle represents the 4,200 m threshold around the MDF. While large parts of the northwestern municipality without an own MDF lies above the threshold, large parts of the northeastern municipality without an own MDF lies below the threshold. As a result, technical DSL availability is higher in the northeastern municipality than in the northwestern municipality. In panel B, the map illustrates the catchment areas (light gray and dark gray shaded) of two different West German MDFs. The circles represent the 4,200 m threshold around an MDF. In both catchment areas, large parts of the northwestern municipalities lie above the threshold. However, while for the light gray shaded northwestern municipality a significantly closer MDF is available, the actual MDF is also the closest MDF for the dark gray shaded northwestern municipality. As a result, technical DSL availability is higher in the light gray shaded northwestern municipality that can be reconnected to a closer MDF than in the dark gray shaded northwestern municipality lacking this option.

- DSL availability in German municipalities is explained by “*technological peculiarities of the traditional public switched telephone network, which affect the possibility to provide DSL in certain municipalities*”.
- **Distance to the MDF**
- **Lucky vs. Unlucky municipalities:** some cities have an alternative MDF at shorter distance
- **OPAL:** deployed in many East-German municipalities. This technology turned out to be a curse

Akerman et al. (2015)

Figure II: Output elasticities and skill premiums, pre and post the largest increase in availability rates (period 0)



- Norway: a (national) **public program** of *broadband rollout* turned out to have some problems... **limited funding**, so firms in some areas got the technology sooner than others.
- Exogenous variation in the availability of broadband internet in firms.
- Results: broadband internet **improves** (**worsens**) the labour market outcomes and productivity of **skilled** (**unskilled**) workers.
- **Mechanism**: broadband adoption complements skilled workers in executing non-routine abstract tasks, and substitutes for unskilled workers in performing routine tasks.

What needs to be done

- Confusion between **take up and availability**
- Little evidence on impact on **working patterns**
- **Policy evaluations** (voucher schemes vs direct provision or PPPs)
- **Firm/sector targeting**: SME-targeted vouchers
- **Other internet technologies** (mobile internet)

THANK YOU!

www.imperial.ac.uk/people/t.valletti

DANKE SHÖNE!