
Gideon D.P.A. Aschwanden (Melbourne School of design)
Diana Contreras Suárez (Melbourne Institute)
Arezou Zaresani (Melbourne Institute)

Preliminary - work in progress

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Motivation

- One in three American adults have gone online to figure out a medical condition (Fox and Duggan 2013).
- In recent years, diffusion of high speed internet has made information more accessible for both providers and consumers (Goldfarb and Prince, 2008).
  - Decrease in information asymmetry.
- Access to more information should lead to better choices in many markets but not necessarily in healthcare.
  - Complexity of a doctors’ task.
  - Quality of health information online and capacity of users to make use of it (Eysenbach et al. 2002).
  - Uncertain nature of health information.
Possible underlying mechanisms in healthcare market

Demand side:
- Exposure to more information may result in healthier choices (i.e. eating healthy food, doing more physical activities) $\Rightarrow$ demand ↓
- Exposure to more information may shift patients’ demand (i.e. new drugs and procedures).

Supply side:
- Doctors obtain more health related information.
  - Doctors face incentives to adopt new technologies to stay competent in the market.
  - Doctors also have to keep up the quality of their outcomes and avoid adverse outcomes.

The overall effects of more information through internet on individuals’ behaviour is not conclusive and empirical analysis is needed.
The impact of internet access on:

- Economic growth (Czernich et al., 2011)
- Political participation, voting behaviour and polarization (Czernich, 2012; Falck et. al, 2014; Campante et. al, 2018; Poy and Schuller, 2016; Lelkes et al., 2017)
- Social Capital (Bauernschuster et al., 2014)
- Crime (Bhuller et al., 2013; Nolte, 2016)
- Housing prices (Mang, 2016; Ahlfeldt et al., 2017)
- Employment and job search (Hjort and Poulsen, 2017; Görtzgen et al., 2018)
- Education and transition to college (Dettling et al., 2018)
Previous research II

The impact of internet on health outcomes:

- Childbirth procedures (Amaral-garcia et al., 2017)
- Fertility (Billari et al., 2017; Guldi and Herbst, 2017)
- Sleep (Billari et al., 2018)
- Children subjective wellbeing (McDool et al., 2018)
- Health outcomes (DiNardi et al., 2017; Wichert, 2017)
Investigate how broadband Internet affects social capital.

Endogeneity and reverse causality issues.

Identification strategy: Instrumental Variable (IV) approach exploiting historical peculiarities in the layout of the pre-existing voice telephony network that cause exogenous variations in high-speed Internet access.

- Initial OPAL technology is not compatible with the new DSL technology.

Data: German Socio-Economic Panel.

Findings: no evidence of negative effects of the Internet on several aspects of social capital. In fact, the effect on a composite social capital index is significantly positive.
Investigate the effects on voting behaviour of information disseminated over the Internet.

Identification strategy: IV approach exploiting German OPAL-DSL quasi-experiment.

Data: municipal level data on internet access and election outcomes.

Findings: negative effects of Internet availability on voter turnout.

- Relate to a crowding-out of TV consumption and increased entertainment consumption.
- No evidence that internet systematically benefits specific parties, suggesting ideological self-segregation in online information consumption.
Estimate effect of broadband infrastructure on growth in OECD countries.

Identification strategy: IV approach exploiting pre-existing voice telephony and cable TV network.


- Broadband penetration is measured as the number of subscribers per 100 inhabitants.

Finding: 10 percentage point broadband penetration raised annual per capita growth by 0.9-1.5 percentage points.
Investigate whether internet use trigger sex crime.

Identification strategy: IV approach exploiting a public program with limited funding rolled out broadband access point in 2000-2009 in Norway.

- For each municipality and every year, instrument the fraction of households with broadband internet subscription with the fraction of households that are covered by broadband infrastructure in the previous year.

Data: administrative police report register.

Findings: direct effect of internet on sex crime propensity is positive and non-negligible.
Effect of internet diffusion on mothers’ childbirth procedures choice.


- **Treatment group:** women with faster internet connection (closer distance to a hub)
- **Control group:** women with slower internet connection (further from a hub).

Data: all childbirth cases in the UK.

Findings: internet access increased elective C-sections, specially for first time mothers.
Effects of access to high-speed Internet on sleep.

Identification strategy: IV approach exploiting German OPAL-DSL quasi-experiment.

Data: German Socio Economic Panel.
  - Detailed information of sleep time and technology use.

Finding: access to high-speed Internet reduces sleep duration and sleep satisfaction.
  - Results are driven by individuals who face work or family time constraints.
Examine the relationship between increased broadband access and teen fertility.

Identification strategy: explore differential access to broadband internet across space (i.e., counties) and time (i.e., years) using a DD framework.

Data: birth certificate data in the US from 1999 to 2007 and county level internet access data.

Finding: Increased broadband access explains at least 7% of the decline in the teen birth rate between 1999 and 2007.

- High-speed internet influence teens’ fertility decisions by changing the size of the social market.
- High speed internet increasing the information available to teens.
Examine the effect of children’s digital social networking (time spent chatting on social websites) on their subjective wellbeing.

Identification strategy: IV approach using information on local broadband speeds.

Data: UK Household Longitudinal Study from 2012 to 2016 (10-15 years old).

Findings: One standard deviation increase in the time spent using social media leads to a 0.3 standard deviation reduction in how happy children feel about their life overall.
Current status of NBN roll out in Australia

Source: NBN website
Current status of NBN roll out in Melbourne

Source: NBN website
Current status of NBN roll out at the University of Melbourne area

Source: NBN website
Variation in access to NBN across Australian doctors in 2016
Variation in access to NBN across Australian doctors in 2016
Research question

- How access to more information through better and faster internet connection affects physician’s practice behaviour?
  - Prescribing new drugs.
  - Prescribing opioid.
Using time and geographical variation in NBN roll out using a DD framework.

- Treatment group: doctors with NBN access in their office.
- Control group: doctors without NBN access in their office.

Data:

- MABEL: has doctors’ individuals characteristics including the exact address of their office.
- Medicare (MBS and PBS) data linked to MABEL.
- NBN historic roll out data linked to doctors’ address in MABEL.
  - NBN availability date.
  - NBN activation date.
  - Type of other connections.
  - Speed of connection.
Identification strategy

We use a generalized DD model:

\[ y_{ist} = \beta_0 + \beta_1 NBN_i \times Post_{it} + \beta_2 X'_{it} + \beta_3 Z'_{st} + \lambda_i + \lambda_s + \lambda_t + \epsilon_{ist} \]

- \( i, s \) and \( t \) respectively denote doctor, suburb and time.
- \( y_{ist} \): outcome variable
- \( NBN_i \): a dummy switching on for doctors with active NBN connection.
- \( Post_{it} \): a dummy switching on at years with active NBN connection.
- \( X_{it} \): a vector of doctors’ time varying characteristics.
- \( Z_{st} \): a vector of time varying suburb characteristics.
- \( \lambda_i, \lambda_s \) and \( \lambda_t \): doctor, suburb and time fixed effects.
- \( \epsilon_{ist} \): error term.
- \( \beta_1 \): coefficient of interest.
Our model is similar to Dettling et. el, The Review of Economic Studies, 2018.

- Examines whether high-speed internet affects students’ college application.
- Links the diffusion of residential broadband in the US to the testing and application outcomes of PSAT and SAT takers.
- Finds that students with broadband in their postal code perform better on the SAT and apply to a higher number and more expansive set of colleges.
- The effects are higher among high Socio-Economics status students.
- Suggests that the new technology may have increased pre-existing inequities.
Interpretation of our estimates

- Our estimate reflects the effects of potential access and not use. We measure the effects of local availability of NBN on doctors’ prescription behaviour rather than using the internet solely for medical purpose.

- Our estimates are Intent to Treat effects rather than Treatment on Treated effects.
  - Intent-to-Treat effects are more relevant for policy:
    - How well NBN availability translates into effective use depends on how individuals use the internet, all factors that cannot be controlled through policy or even reliably measured.
    - Our estimates do not represent the effect that NBN has on doctors who use it, but rather the effect of making NBN more readily available.
Our contributions

- Examine the effects of more information on supply side of healthcare sector.
  - Doctors’ practice behaviour.

- Recent data.
  - Previous work explored mostly Germany in 90s.

- Individual level variation in access to internet (vs municipality/county level).

- Might be able to do Regression Discontinuity Design (RDC) exploring the geographical variation in NBN roll out.
  - Ideally comparing two next door doctors one with NBN and one without NBN.
Thanks!
Ideas and suggestions are very welcome.
a.zaresani@gmail.com