FLS 6415 - Causal Inference for the Political Economy of Development

Week 6 - Social Accountability, Information & Instrumental Variables

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September 2017

Instrumental Variables

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- What can we do when the treatment assignment mechanism is not 'as-if' random?
- Natural experiments focus on a specific **part** of treatment assignment that is 'as-if' random
- An 'instrument' is a variable which assigns treatment in an 'as-if' random way
  - Or at least in a way which is 'exogenous' - not related to confounders
  - Even if other confounding variables **also** affect treatment

Instrumental Variables

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- We can use the instrument to isolate 'as-if' random variation in treatment, and use that to estimate the effect of treatment on the outcome
- NOT the effect of the instrument on the outcome

Instrumental Variables

- Example Instruments:
  - Rainfall for conflict
  - Sex-composition for effect of third child
  - Distance from the coast for exposure to slave trade

Instrumental Variables

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  - **Strong First Stage:** The Instrument must **affect** the treatment
  - We can test this with a simple regression: $Treatment \sim Instrument$
  - The instrument should be a significant predictor of treatment
  - Rule-of-thumb: $F-statistic > 10$

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  - Formally,
    $cov(Instrument,$ errors in main regression Y $\sim D) = 0$
  - **We cannot test or prove this assumption!**
  - Theory and qualitative evidence needed to argue that the instrument is not correlated with any other factors affecting the outcome
  - Sometimes, the exclusion restriction may be more credible if we include controls

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     - Estimate how the predicted values affect the outcome: $Y \sim \hat{D}$
     - Interpret the coefficient on $\hat{D}$

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  - 'Local' to the units whose treatment status actually changed
- Remember, those 'Local' units are not representative so we can't generalize

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  1. **Confounded Regression:** The mistaken regression: $Y \sim D$
  2. **First-Stage Regression:** Checking the instrument is valid: $D \sim IV$
  3. **IV Regression:** All-in-one estimate of the effect of treatment on the outcome: $Y \sim D|IV$
  4. **2-Stage Least Squares:** Two linear regressions: correct coefficient, wrong p-value: $D \sim IV, Y \sim \hat{D}$
  5. **Reduced-Form Regression:** Estimate of the Instrument on the Outcome, ignoring treatment mediation: $Y \sim IV$

Instrumental Variables

- Instruments for Non-compliance

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  - With an instrument and treatment we can divide our units into four types:

Treatment Status if Instrument=0	**Treatment Status if Instrument=1**	**Unit Type**
0	1	Complier
0	0	Never-taker
1	1	Always-taker
1	0	Defier

- LATE just means we don't learn anything about Never-takers and Always-takers from Instrumental Variables
  - Because the instrument doesn't do anything to affect treatment for these units
- We also need to **assume** Defiers don't exist
- So LATE = Causal Effect for Compliers

Instrumental Variables

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Instrumental Variables

- Instruments for Non-compliance in Experiments
  - Normally we analyze experiments based on randomized treatment
  - But what if **assignment** to treatment is different from **taking** the treatment?
    - Eg. If government implementation failed in some places

Instrumental Variables

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- Instruments for Non-compliance in Experiments
  - We can still use randomization as an instrument for treatment
  - The causal effect estimate of our experiment is now LATE
    - These estimates are **internally valid** for compliers
    - But they are NOT **externally valid** for non-compliers
    - Since whether you accepted treatment is probably confounded/subject to self-selection
  - We can also estimate the Intention-to-Treat effect, the effect of the instrument itself
    - But this will be **conservative**, i.e. less than the LATE estimate

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  - 'External' to our model is not the same as 'Exogenous', and we can't test exogeneity

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  - LATE causal estimates are not a good guide to policy effects
  - 'External' to our model is not the same as 'Exogenous', and we can't test exogeneity
  - Where the instrument is an arbitrary rule, there is often sorting as people re-adjust

Social Accountability & Information

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- Citizens can also exert **direct** pressure to change decision-making
  - Protests, lobbying
  - Checks and Balances through participatory institutions and the judiciary
  - The short-route of accountability: Client power in demanding public service improvements

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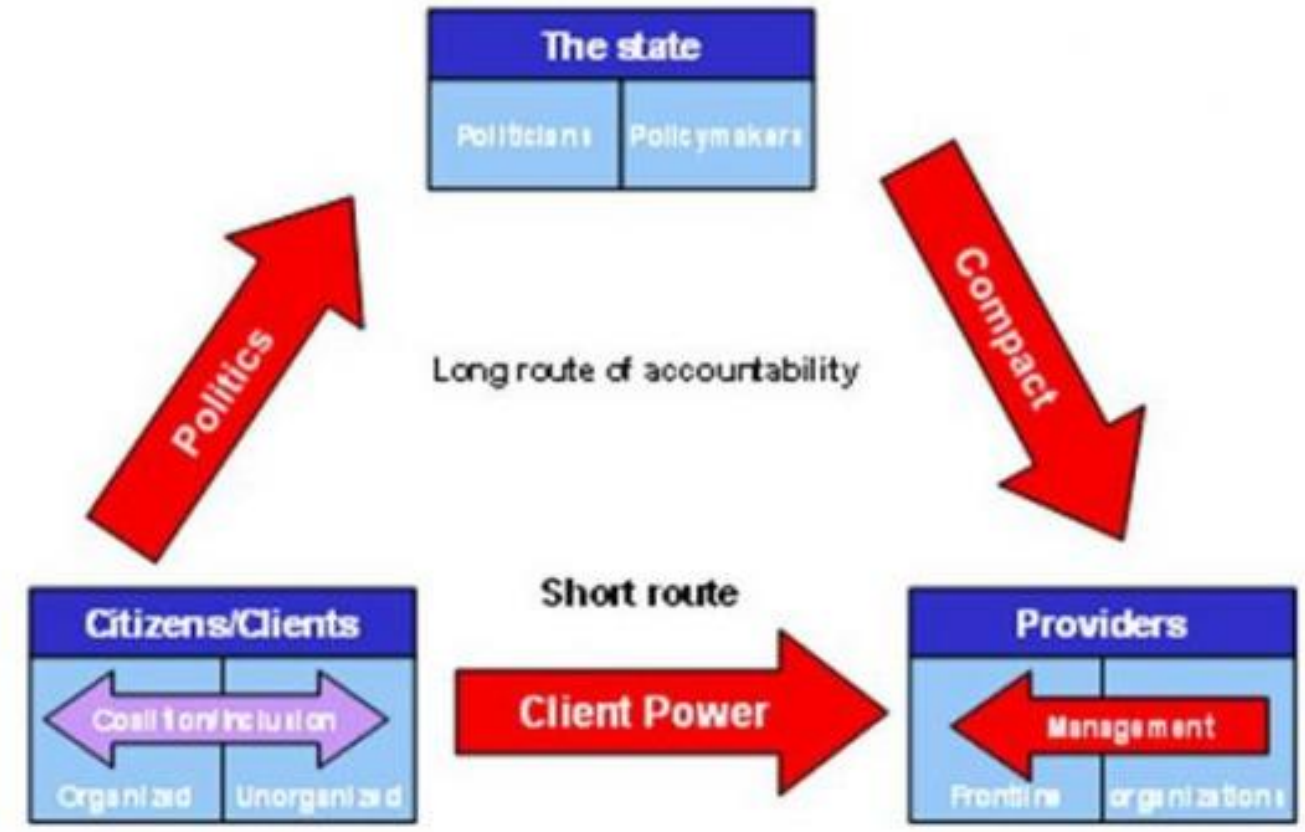
  - The short-route of accountability: Client power in demanding public service improvements
- Information & Media also influence electoral accountability

Social Accountability



Social Accountability & Information

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  - 1995: Only 24% of grants to schools arrive
  - 2002: 82% of grants to schools arrive

Social Accountability & Information

- Reinikka and Svensson (2005)
  - 1995: Only 24% of grants to schools arrive
  - 2002: 82% of grants to schools arrive
- This wasn't elite corruption, but diversions within the bureaucracy (centre -> district -> school)
- What changed? A Government newspaper campaign to publicize grants

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  - What is the challenge to inference here?
  - Information is not randomly assigned; eg. checks and balances on the bureaucracy may also be stronger in places where headteachers have more information

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- **Treatment Assignment Mechanism:** Messy! Influenced by confounders and instrument

Social Accountability & Information

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Social Accountability & Information

- Instrumental Variables Assumptions:
  - **First-Stage:** Distance of school to newspaper seller -> - Headteacher knowledge of grant amount/timing
    - Verifiable
  - **Exclusion Restriction:** Distance to newspaper seller ONLY affects grant access and learning through information, not directly
    - Unverifiable
    - But more likely when we include controls for distance to nearest bank, district headquarters etc.
- They actually combine this with a difference-in-differences method to look at *changes* in information and grant receipt over time.

Social Accountability & Information

- Methodology:
  - $Information_i = \alpha + \beta_0 Distance\_to\_Newspaper_i + \epsilon_i$
  - $Grant\_Received_i = \alpha + \beta_1 \hat{Information}_i + \epsilon_i$

Social Accountability & Information

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  - $Information_i = \alpha + \beta_0 Distance\_to\_Newspaper_i + \epsilon_i$
  - $Grant\_Received_i = \alpha + \beta_1 \hat{Information}_i + \epsilon_i$
  - Alternative:
  - $Grant\_Received_i = \alpha + \beta_0 Distance\_to\_Newspaper_i + \epsilon_i$
  - $Enrolment = \alpha + \beta_1 \hat{Grant\_Received}_i + \epsilon_i$

Social Accountability & Information

- Results:

Social Accountability & Information

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- A one standard deviation increase in information leads to
  - 44.2% points more funding received
  - 297 students per school
  - 6% better in exams

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  - Lots of other education system changes at the same time
    - Enrollment doubled in 1997 when school became free
    - WB support conditional on better systems, transparency
    - Grants were also displayed on 90% of school notice-boards

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  - Lots of other education system changes at the same time
    - Enrollment doubled in 1997 when school became free
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    - Grants were also displayed on 90% of school notice-boards
  - Where did these headteachers gain the political power to demand their grants?

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- What is the inference problem?

Social Accountability & Information

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  - Russia: Does watching NTV encourage voting against pro-governemnt 'Unity'?
- What is the inference problem?
- People who watch NTV might be more anti-government in the first place
- Or NTV may choose to broadcast in anti-government areas

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  - **Outcome:** Vote-share for each government/opposition party

Social Accountability & Information

- Instrumental Variables Assumptions:
  - **First Stage:** Availability of signal clearly correlated with watching NTV
  - **Exclusion Restriction:** Availability of the signal only affects voting through watching NTV

Social Accountability & Information

- Exclusion Restriction Supporting Evidence:
  - **History:** The transmitters were located for a Soviet education channel, not chosen by the opposition
  - **Controls:** Transmitters are correlated with socioeconomic characteristics, but we can control for this (urban, population, wage)
  - **Placebo:** If the instrument only operates through treatment, it should have no effect when treatment is impossible, eg. in 1995

Social Accountability & Information

- Estimate signal availability using Irregular Terrain Model and transmitter power/frequency

Social Accountability

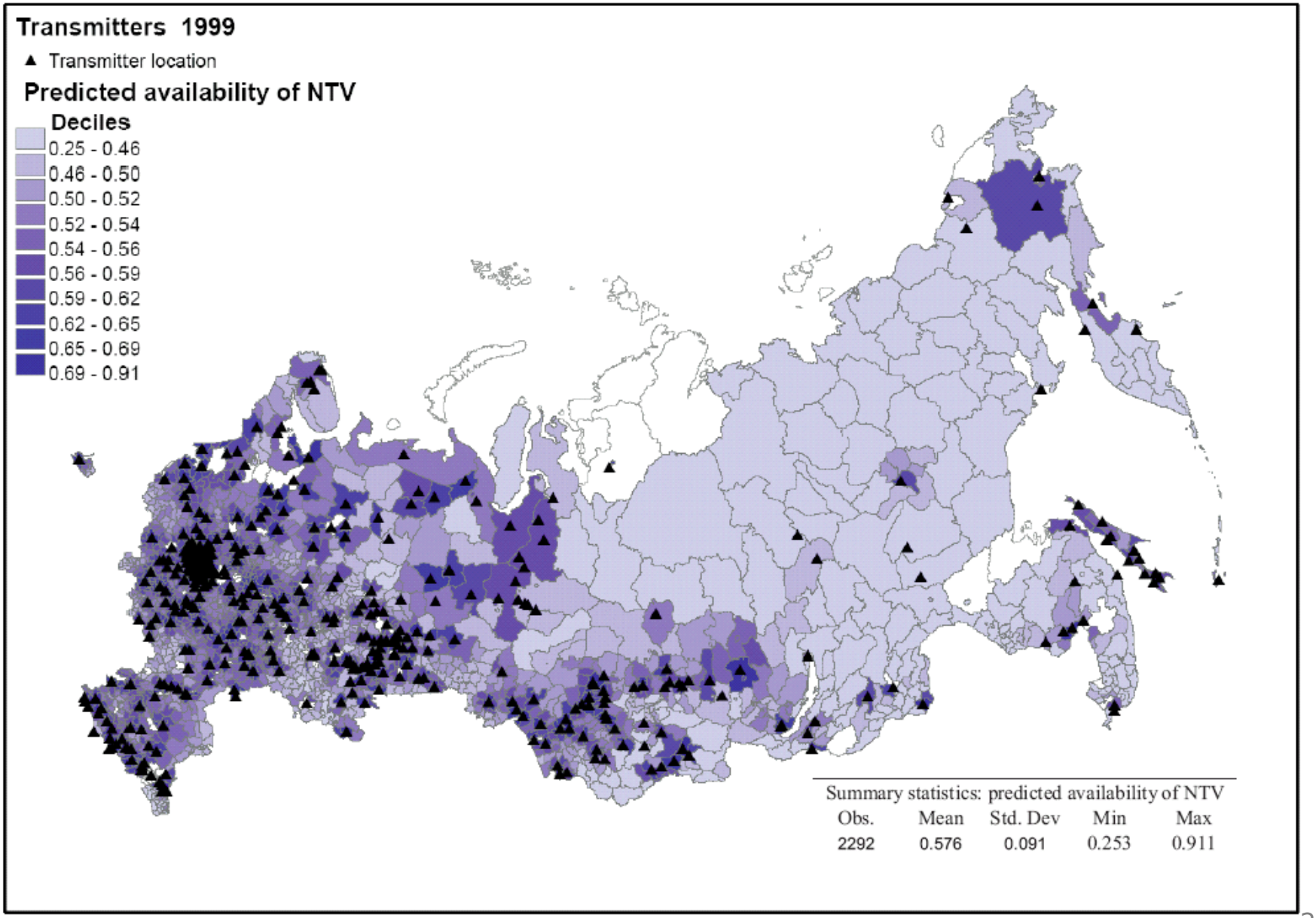

Figure A1. Predicted probability that NTV is available in 1999 by sub-region and the location of NTV transmitters

Social Accountability

- **Aggregate Level Data (effect of NTV availability):**
  - $Predicted\_NTV\_available_i = \alpha + \beta_0 + Signal\_Strength_i + \epsilon_i$
  - $vote_i = \alpha + \beta_1 Predicted_N\hat{T}V_available_i + \beta_2 X_i + Region\_FEs + \epsilon_i$

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  - $vote_i = \alpha + \beta_1 Predicted_N\hat{T}V_available_i + \beta_2 X_i + Region\_FEs + \epsilon_i$
- **Individual Level Data (effect of watching NTV):**
  - $Watch\_NTV_i = \alpha + \beta_0 Predicted\_NTV\_Available_i + \epsilon_i$
  - $vote_i = \alpha + \beta_1 \hat{Watch}\_NTV_i + \beta_2 X_i + Region\_FEs + \epsilon_i$

Social Accountability & Information

- Results:

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  - NTV broadcast availability reduces pro-government ’Unity’ voting by 8.9% points (official results)
  - NTV broadcast availability reduces turnout by 3.8% points (official results)
  - Watching NTV broadcast reduces pro-government ’Unity’ voting by 26% (survey results)

Social Accountability & Information

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  - Extractive vs. Settler Institutions
  - Colonial Strategy -> Institutions -> Growth
- What is the inferential problem here?

Social Accountability & Information

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- **Outcome:** Growth rates in 1995

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- Instrumental Variables Assumptions:
  - **First Stage:** Settler Mortality explains Current Institutions
  - **Exclusion Restriction:** Settler Mortality only affects growth through institutions

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Social Accountability & Information

- Exclusion Restriction Supporting Evidence:
  - Disease environment doesn't affect human capital/growth directly because locals have adapted
  - Control for possible correlates - geography, climate,

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- Methodology:
  - $Institutions_i = \alpha + \beta_0 Settler\_Mortality_i + \epsilon_i$
  - $Growth_i = \alpha + \beta_1 \hat{Institutions}_i + \epsilon_i$

Social Accountability & Information

- Results: Improving Nigeria's institutions to Chile's level would raise GDP 7-fold

Social Accountability & Information

- ’Social’ Accountability can dramatically affect public services, voting behaviour and growth
  - Client Power to demand more from government
  - Exposure to information/Media
  - Checks and Balances on expropriation