How the News Media Activate Public Expression and Influence National Agendas

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1Based on joint work with Benjamin Schneer and Ariel White (Science 2017)
2GaryKing.org
Introduction

Research Design

Main Results

Supporting Analyses

Implications
Statistical Problems: We Can’t Randomize

• Statistical Problems
• Randomization: usually impossible
• Endogeneity: media outlets compete for readers
• Spillover: 1 intervention may affect all potential subjects

• Clever Research Designs (trying to approximate randomization)
• New TV tower. Some behind hill, in radio shadow
• Before/after studies of “surprise” media events
• Roll out of Fox News to some towns and not others
• Many others…

• But we still can’t randomize
• Assumptions: better, but unavoidably dubious
  ⇝ “Profound biases,” > 600% difference from truth
• Estimands: different, of sometimes questionable relevance
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Political Problems: They Won’t Let Us Randomize

What we’d do without constraints

• Sign up many news media outlets
• Randomize news content and timing for each
• Control collaboration to induce cross-outlet correlations

Why is this plan so hard for media outlets?

• Need to take actions few (if any) have ever before agreed to
• Outlets are competitors: trying to scoop each other
• Must share information with us (even if not with each other)
• Need numerous agreements, bandwidth for large scale collaboration, extensive coordination, high levels of trust

More specifically, to randomize

• Journalists require: total control over what’s published & when
• Scientists require: total control over what’s published & when
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Our Approach: Let’s Randomize

• Build trust: 5 years of negotiating & communicating

• Develop incentive compatible research design: both get 100%, no compromises; ⇝ solve a political problem technologically

• Convince 48 media outlets to let us experiment on them

• Whenever possible, choose realism (even if inconvenient)

• Stick close to outlets’ standard operating procedures

• Embed treatment within ordinary routines

• ⇝ More expensive, logistically complicated, and time-consuming, but more generalizable

• Goal: Build platform to continue experiments

• A work of: political science
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Types of News Media Effects

- **Individual-level Effects**
  - **Outcome variable:** individual knowledge and opinion
  - **Effects:** Persuasion, attitude formation, diffusion, gatekeeping, priming, issue framing, etc.
  - **Measurement:** survey research

- **Collective Effects:** Impact on the national conversation
  - **Outcome variable:** activated public opinion, views of all those trying to express themselves publicly about policy and politics
  - **Classic definition of public opinion,** predating survey research
  - **Measurement**
    - Previously: hallway conversations, "water-cooler events", soapbox speeches in public squares, editorials, etc.
    - Now: 750M public social media posts/year
  - **Target population:** different than survey research!
    - Surveys: pop quizzes of everyone, even uninformed & inactive
    - Social media: counts only activated opinion

- **Democracies:** Can ignore individuals, but collective expression sets agendas
- **Autocracies:** Ignore criticism, but censor expression about collective action
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  - **Classic definition of public opinion,** predating survey research
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    - **Previously:** hallway conversations, “water-cooler events”, soapbox speeches in public squares, editorials, etc.
    - **Now:** 750M *public* social media posts/year
  - **Target population:** different than survey research!
    - **Surveys:** pop quizzes of everyone, even uninformed & inactive
Types of News Media Effects

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Introduction

Research Design

Main Results

Supporting Analyses

Implications
Setup

• Signup 48 small media outlets (& > 12 others just for info)
  • 17 for trial runs, 33 in experiment, 2 in both
  • Median size: The Progressive, 50,000 subscribers
  • Other examples: Dissent Magazine, Truthout, Ms. Magazine, Yes!

• Establish 11 broad policy areas
  • Rules: (a) major national importance; (b) interest to outlets
  • race, immigration, jobs, abortion, climate, food policy, water, education policy, refugees, domestic energy production, and reproductive rights
  • Using 11 rather than 1: more representative; larger 𝑛 needed
  • Repeat the following as many times “as needed”:

New methods to determine (described shortly)

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We choose policy areas (1 of 11). Outlets volunteer for a pack of 2–5 (with our approval), following "project manager" protocol (e.g., Panama Papers). The pack chooses subject for articles. We approve: If rejected outlets can publish outside experiment. Requirement: No breaking news (stories may be held for weeks). Options: large investigations, interview-based journalism, opinion pieces, or others normally published by pack members. Example. Policy area: technology policy. Subject: what Uber drivers think about driverless cars, or how a trade agreement affects hiring in Philadelphia. Outlets Publish: (following normal procedures) One article on subject per pack member. Distribute via website, print, video, podcast, etc. Promote via social media, Google adwords, email lists, SEO… Co- and cross-promote with outlets in same pack.
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Example.

Policy area:

Technology policy.

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Matched Pair Randomization

• Select pair of weeks: matched on similarity of predicted news
• One coin flip: which week is treatment and which control
• Treatment week: publish & promote articles (usually Tuesday)
• Control week: no compensation or special actions

(Ex post: Predictions accurate; flips, news shocks uncorrelated)

Reasoning
• Cf. complete randomization: more power, efficiency, & "political" robustness; less bias, model dependence, & research costs; SEs as much as 600% smaller (Imai, King, Nall 2008)
• Few experiments/outlet: Less interference; more heterogeneity
• Nation as unit of treatment: no spillover, more cost
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Random Treatment → Articles Published → Pageviews → Posts on Subject → Posts in Policy Area
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Research Design
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Most analysts: fix $n$, run experiment, discover $p$-value

If $n$ is too large: waste time & resources

If $n$ is too small: waste the entire experiment

$\Rightarrow$ neither is acceptable with such massive logistical costs

Power calculations: require knowing QOI!

Better: fix $p$-value, run experiment sequentially, discover $n$

Collect only as much data as you need

(Why should you be in grad school longer than necessary?)

Valid statistically under likelihood or Bayes
(Careful of misinformation in some applied literatures)

We introduce new methods to:

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  - **Power calculations:** require knowing QOI!

- **Better:** fix $p$-value, run experiment sequentially, discover $n$
  - Collect only as much data as you need
    (Why should you be in grad school *longer* than necessary?)
  - **Valid statistically** under likelihood or Bayes
Determining $n$ via Sequential Hypothesis Testing

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• **We introduce new methods to:**
  • Evaluate robustness under frequentist theory
  • Remove parametric assumptions
Main Results
Results from Sequential Hypothesis Tests

• Our Stopping Rule: $p \leq 0.05$

• Joint test: 3 days, policy, subject; for $n, n-1, & n-2$

• Recognizing more data is better and logistics are complicated (they might stop us!)

Empirical result: $n = 70$ (35 experiments)

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![Graph showing classical p-values over days for different conditions](image)
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Main Causal Effect: Public Expression in Policy Areas
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- Red Dots: model-based estimate (assumes linearity over days)
- Open circles: model-free estimate (no model, higher variance)
- Causal effects: 1st day: 19.4% increase, Total: 62.7% increase

Main Results
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Causal Effect: Indistinguishable Across Subgroups
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Effect on the national conversation in major policy areas is national
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Causal Heterogeneity: Leave-One-Outlet-Out

Main Results

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Causal Heterogeneity: Leave-One-Outlet-Out

Jackknife Estimation on Policy Area Effects
Causal Heterogeneity: Leave-One-Outlet-Out
Jackknife Estimation on Policy Area Effects

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Jackknife Estimation on Policy Area Effects

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- **Open circles**: same, with one outlet dropped from any packs
- **Results**: no dominant outlet; high heterogeneity
Introduction

Research Design

Main Results

Supporting Analyses

Implications
High Experimental Compliance

• # Articles published by pack in policy area
• What's the goal?
  • Average # media outlets per pack: 3.1
  • Causal effect on # articles: 2.94
    ⟹ high compliance
• Pageviews (on subject of articles, relative to a day's volume)
  • Causal effect on # pageviews: 969.6% (52,223 views) increase
    ⟹ high compliance

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Causal Effect on Subject of Articles

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  - 1st day: 454% increase,
  - Total: 1,666% increase
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    - 2.3% change in direction of article opinion
  - Cross-experiment causal heterogeneity:
    - Large
- Robustness checks
  - # of unique authors:
    - Little change from effect on posts
  - Removing bots, retweets:
    - No real change
  - Leave-one-out Jackknife:
    - No one outlet dominant
  - Week 1 to 2 spillover, noncompliance:
    - No evidence
  - Treatment articles:
    - Representative of all on complexity, type
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• News media effects on the national conversation
  • Small outlets: very large average effects on pageviews, agenda (subject & policy), opinion change
  • Larger outlets: even bigger average effects
  • Heterogeneous effects: unpredictable viral patterns

• Implications for individual journalists
  • Remarkable power; serious responsibility; not just another job

• Issues and Implications for the ecosystem of media outlets
  • Control over editorial boards and mastheads
  • Balance and diversity of outlet opinion
  • Effects of fake news
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• What should be next?
  • We wrote a paper, built a platform, & showed how others can
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For more information: GaryKing.org/media
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Notation and Quantities of Interest

- **Outcome Variable:** $y_{ped}$, number of social media posts in policy area $p$ ($p = 1, \ldots, 11$)
- **Experiment:** $e$ ($e = 1, \ldots, E$)
- **Day of and after intervention:** $d$ ($d = 1, \ldots, 6$)

- **Treatment Variable:** $T_{ped}$, instruction to pack (of 2-5 outlets) to write, publish, and promote articles, like a project manager

- **Treated weeks:** $T_{ped1} = \ldots = T_{ped6} = 1$
- **Control weeks:** $T_{ped1} = \ldots = T_{ped6} = 0$

- **Quantities of Interest**
  - **Absolute Increase:** $\lambda_d = \text{mean}_{t, e}(y_{ped}(1)) - \text{mean}_{t, e}(y_{ped}(0))$
  - **Proportionate Increase:** $\phi_d = \frac{\lambda_d}{\text{mean}_{t, e}(y_{ped}(0))}$
Notation and Quantities of Interest

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- **Treatment Variable**: $T_{ped}$, instruction to pack (of 2-5 outlets) to write, publish, and promote articles, like a project manager

- **Treated weeks**: $T_{pe1} = \cdots = T_{pe6} = 1$

- **Control weeks**: $T_{pe1} = \cdots = T_{pe6} = 0$

- **Quantities of Interest**
  - Absolute Increase: $\lambda_d = \text{mean}_{p,e}[Y_{ped}(1)] - \text{mean}_{p,e}[Y_{ped}(0)]$
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  • policy area $p$ ($p = 1, \ldots, 11$)
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Estimation Approaches

- **Model-Based Approach**
  - Transform Outcome Variable: \( z_{ped} = \ln(y_{ped} + 0.5) \)
  - The Model:
    \[
    E(z_{ped} | T_{ped}) = \beta_0 + \beta_p T_{ped} + \eta_d + \gamma_d T_{ped}
    \]
    - \( \beta_0 \): constant term
    - \( \beta_p \): fixed effects for the 11 policy areas
    - Assume linearity over days:
      \[
      \eta_d = \eta_0 + \eta_1 d
      \]
      \[
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      \]
    - Assume conditional independence over \( p, e, d \)

- **Model-Free Approach**
  - Drop linearity & conditional independence assumptions
  - Regress \( z_{ped} \) on \( T_{ped} \) separately for each \( d \)
    - Equivalent to difference in means for each day
      (perhaps with policy fixed effects)
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and

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