How the News Media Activate Public Expression and Influence National Agendas¹

Institute for Quantitative Social Science Harvard University

University of Minho, 10/21/2019

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

Introduction

Research Design

Results

Supporting Analyses

Implications

Introduction

• Statistical Problems

- Statistical Problems
 - Randomization: usually impossible

- Statistical Problems
 - Randomization: usually impossible
 - Endogeneity: media outlets compete for readers

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

- 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)

- 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

- 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

- 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

- 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...

- 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

- 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

- 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

- 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

· What we'd do without constraints

- · What we'd do without constraints
 - · Sign up many news media outlets

- · What we'd do without constraints
 - · Sign up many news media outlets
 - · Randomize news content and timing for each

- · 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

- · 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?

- · 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

- · 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

- · 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)

- · 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,

- · 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, technical infrastructure for large scale collaboration & data collection,

- · 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, technical infrastructure for large scale collaboration & data collection, extensive coordination,

- · 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, technical infrastructure for large scale collaboration & data collection, extensive coordination, high levels of trust

- · 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, technical infrastructure for large scale collaboration & data collection, extensive coordination, high levels of trust
- More specifically, to 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, technical infrastructure for large scale collaboration & data collection, extensive coordination, high levels of trust
- More specifically, to randomize
 - Journalists require:

- · 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, technical infrastructure for large scale collaboration & data collection, extensive coordination, high levels of trust
- More specifically, to randomize
 - · Journalists require: total control over what's published & when

- · 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, technical infrastructure for large scale collaboration & data collection, extensive coordination, high levels of trust
- More specifically, to randomize
 - · Journalists require: total control over what's published & when
 - Scientists require:

- · 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, technical infrastructure for large scale collaboration & data collection, 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

Our Approach:

Our Approach: Let's Randomize

Build trust: 5 years of negotiating & communicating

- Build trust: 5 years of negotiating & communicating
- Develop *incentive compatible* research design:

- Build trust: 5 years of negotiating & communicating
- Develop *incentive compatible* research design: both get 100%, no compromises;

- Build trust: 5 years of negotiating & communicating
- Develop *incentive compatible* research design: both get 100%, no compromises; → solve a political problem technologically

- 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

- 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)

- 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

- 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

- 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

- 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

- 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

- 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

- 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

• Individual-level Effects

Individual-level Effects

Collective Effects: Impact on the national conversation

- Individual-level Effects
 - Outcome variable: individual knowledge and opinion

Collective Effects: Impact on the national conversation

- Individual-level Effects
 - · Outcome variable: individual knowledge and opinion
 - Effects: Persuasion, attitude formation, diffusion, gatekeeping, priming, issue framing,
- Collective Effects: Impact on the national conversation

- 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

- 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

- 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

- 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

- 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.

- 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/day

- 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/day
 - Target population: different than survey research!

- 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/day
 - Target population: different than survey research!
 - Surveys: pop quizzes of everyone, even uninformed & inactive

- 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/day
 - Target population: different than survey research!
 - Surveys: pop quizzes of everyone, even uninformed & inactive
 - · Social media: counts only activated opinion

- 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/day
 - 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

- 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/day
 - 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

Introduction

Research Design

Results

Supporting Analyses

Implications

Research Design

Research Design

• Signup 48 small media outlets (& > 12 others just for info)

- Signup 48 small media outlets (& > 12 others just for info)
 - 17 for trial runs, 33 in experiment, 2 in both

- 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

- 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
 - Examples:





Kalanya Autoca a Michaelia Criteri From Mel Margina Vivek Bald American Distributari Africele Gastewez & Marias Franco A Dakiegue Gastes Basador Coole Women Tastray Kim Immignati Workers Units Anjai Kanat The Meni inthe Middle Ngal & Downel Kanstroom Obama's Executive Juster PURS

David Bell on the French Dilemm



- 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
 - Examples:



• Establish 11 broad policy areas

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
 - Examples:



- Establish 11 broad policy areas
 - Rules: (a) major national importance; (b) interest to outlets

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
 - Examples:



- 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

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
 - Examples:



- 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

• We choose a *policy area* (1 of 11)

- We choose a *policy area* (1 of 11)
- Outlets volunteer for a *pack* of 2–5 (with our approval), following "project manager" protocol (e.g., Panama Papers)

- We choose a *policy area* (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 choose a *policy area* (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 choose a *policy area* (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

- We choose a *policy area* (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)

- We choose a *policy area* (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

- We choose a *policy area* (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.

- We choose a *policy area* (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.
- Outlets Publish Simultaneously: (following usual procedures)

- We choose a *policy area* (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,
- Outlets Publish Simultaneously: (following usual procedures)

- We choose a *policy area* (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 Simultaneously: (following usual procedures)

- We choose a *policy area* (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 Simultaneously: (following usual procedures)
 - · One article on subject per pack member

- We choose a *policy area* (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 Simultaneously: (following usual procedures)
 - One article on subject per pack member
 - Distribute via website, print, video, podcast, etc.

- We choose a *policy area* (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 Simultaneously: (following usual procedures)
 - One article on subject per pack member
 - Distribute via website, print, video, podcast, etc.
 - · Promote via Google adwords, social media, email lists, SEO...

- We choose a *policy area* (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 Simultaneously: (following usual procedures)
 - One article on subject per pack member
 - Distribute via website, print, video, podcast, etc.
 - · Promote via Google adwords, social media, email lists, SEO...
 - · Co- and cross-promote with outlets in same pack

Matched Pair Randomization

Select pair of weeks: matched on similarity of predicted news

SEPTEMBER 2015										
Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday				
25	1	2	3	4	5	6				
7	8	9	10	11	12	13				
14	15	16	17	18	19	20				
21	22	23	24	25	26	27				
28	29	30	1	2	3	4				
5	6	7	8	9	10	11				

- Select pair of weeks: matched on similarity of predicted news
- One coin flip: which week is treatment and which control

SEPTEMBER 2015										
Monday	Tuesday	Wednesday		Friday	Saturday	Sunday				
25	1	2	3	4	5	6				
7	8	9	10	11	12	13				
14	15	16	17	18	19	20				
21	22	23	24	25	26	27				
28	29	30	1	2		4				
5	6	7	8	9	10	11				

- · 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)



- · 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



- · 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



- · 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



- 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)

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)

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:

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;

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;

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)

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)

- 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

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)

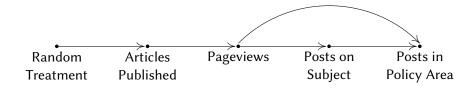
- Cf. complete randomization: more power, efficiency, & "political" robustness; less bias, model dependence, & research costs; SEs as much as 600% smaller (Imai, King, Nall 2008)
- · Few experiments/outlet: Less interference; more heterogeneity
- Nation as unit of treatment: no spillover, more cost

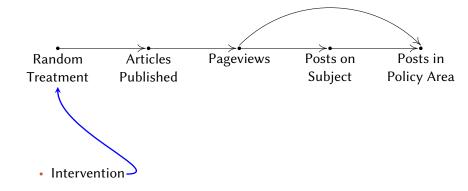
Matched Pair Randomization

- 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)

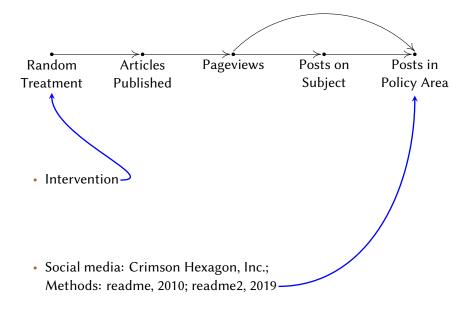
- Cf. complete randomization: more power, efficiency, & "political" robustness; less bias, model dependence, & research costs; SEs as much as 600% smaller (Imai, King, Nall 2008)
- · Few experiments/outlet: Less interference; more heterogeneity
- Nation as unit of treatment: no spillover, more cost
- (Ex post: Automated text analysis & qualitative evidence: indistinguishable from normal publications & practices; no outlet received a single complaint)

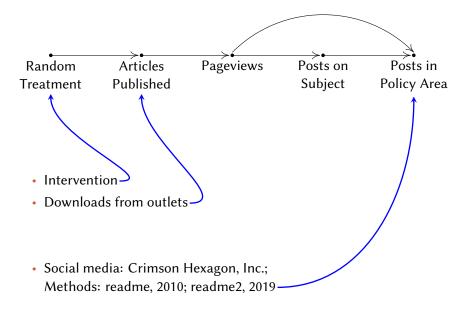
Research Design

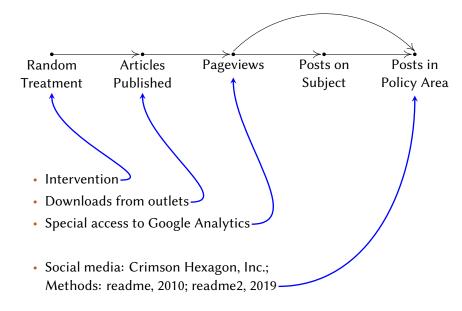


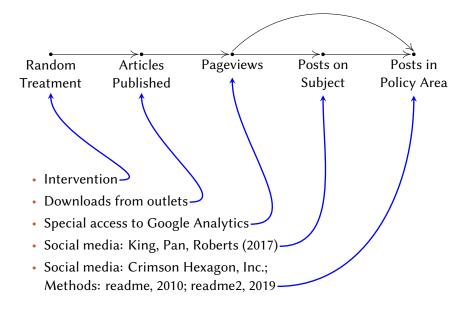


Research Design









• Most analysts: fix *n*, run experiment, discover *p*-value

- Most analysts: fix *n*, run experiment, discover *p*-value
 - If *n* is too large: waste time & resources

- 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

- 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
 → neither is acceptable with such massive logistical costs

- 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
 → neither is acceptable with such massive logistical costs
 - Power calculations: require knowing QOI!

- 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
 ~> neither is acceptable with such massive logistical costs
 - Power calculations: require knowing QOI!
- Better: fix *p*-value, run experiment sequentially, discover *n*

- 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
 ~> 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

- 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
 ~> 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?)

- 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
 ~> 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

- 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
 → 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)

- 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
 → 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)
 - · Need to check sensitivity to priors and models

- 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
 ~> 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)
 - · Need to check sensitivity to priors and models
 - We introduce new methods to:

- 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
 ~> 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)
 - · Need to check sensitivity to priors and models
 - We introduce new methods to:
 - Evaluate robustness under frequentist theory

- 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
 → 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)
 - · Need to check sensitivity to priors and models
 - We introduce new methods to:
 - Evaluate robustness under frequentist theory
 - Remove parametric assumptions

Introduction

Research Design

Results

Supporting Analyses

Implications

• Our Stopping Rule:

- Our Stopping Rule:
 - $p \le 0.05$,

- Our Stopping Rule:
 - $p \le 0.05$, joint test: day 1,2,3, policy, subject;

- Our Stopping Rule:
 - $p \le 0.05$, joint test: day 1,2,3, policy, subject; for n, n 1, & n 2

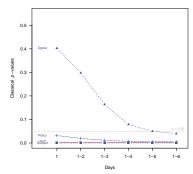
- Our Stopping Rule:
 - $p \le 0.05$, joint test: day 1,2,3, policy, subject; for n, n 1, & n 2
 - recognizing more data is better

- Our Stopping Rule:
 - $p \le 0.05$, joint test: day 1,2,3, policy, subject; for n, n 1, & n 2
 - recognizing more data is better
 - and logistics are complicated (they might stop us!)

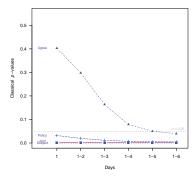
- Our Stopping Rule:
 - $p \le 0.05$, joint test: day 1,2,3, policy, subject; for n, n 1, & n 2
 - recognizing more data is better
 - and logistics are complicated (they might stop us!)
- Empirical result:

- Our Stopping Rule:
 - $p \le 0.05$, joint test: day 1,2,3, 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)

- Our Stopping Rule:
 - $p \le 0.05$, joint test: day 1,2,3, 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)



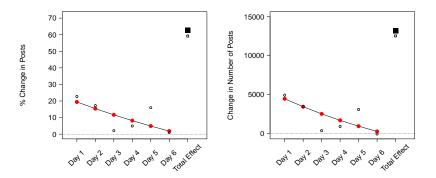
- Our Stopping Rule:
 - $p \le 0.05$, joint test: day 1,2,3, policy, subject; for n, n 1, & n 2
 - recognizing more data is better
 - and logistics are complicated (they might stop us!)
- Empirical result: *n* = 70 (35 experiments)

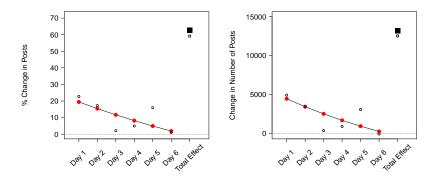


• Frequentist validation: extensive [non]parametric tests

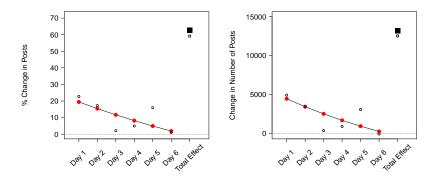
Main Causal Effect: Public Expression in Policy Areas

Main Causal Effect: Public Expression in Policy Areas

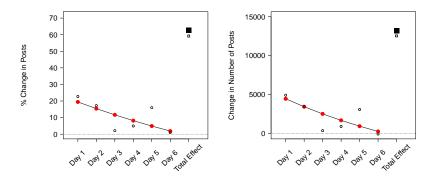




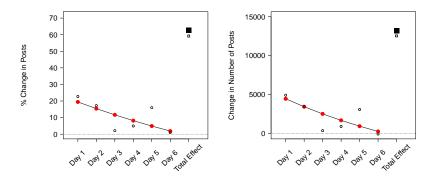
• Red Dots: model-based estimate (assumes linearity over days)



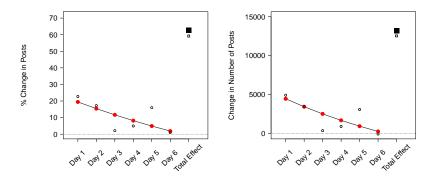
- Red Dots: model-based estimate (assumes linearity over days)
- Open circles: model-free estimate (no model, higher variance)



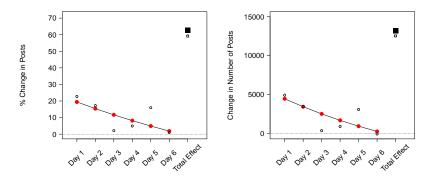
- Red Dots: model-based estimate (assumes linearity over days)
- Open circles: model-free estimate (no model, higher variance)
- Causal effects:



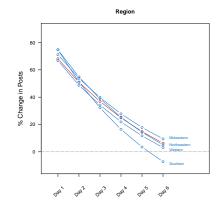
- Red Dots: model-based estimate (assumes linearity over days)
- Open circles: model-free estimate (no model, higher variance)
- Causal effects: 1st day: 19.4% increase,

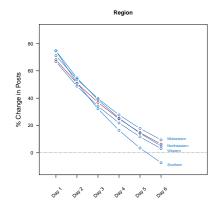


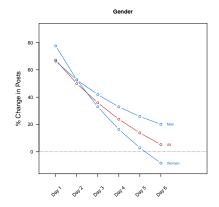
- Red Dots: model-based estimate (assumes linearity over days)
- Open circles: model-free estimate (no model, higher variance)
- Causal effects: 1st day: 19.4% increase, Total: 62.7% increase

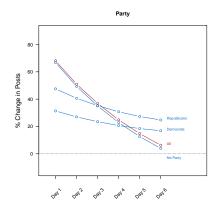


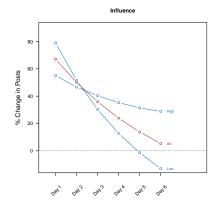
- Red Dots: model-based estimate (assumes linearity over days)
- Open circles: model-free estimate (no model, higher variance)
- Causal effects: 1st day: 19.4% increase, Total: 62.7% increase
- Context: 3 small media outlets have huge effect on the national conversation



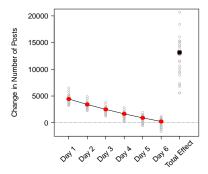




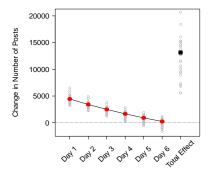




Jackknife Estimation on Policy Area Effects

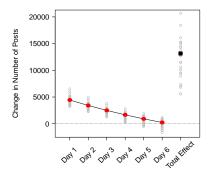


Jackknife Estimation on Policy Area Effects



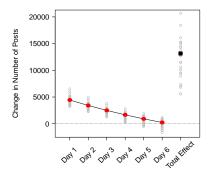
• Red Dots: Original (model-based) estimates

Jackknife Estimation on Policy Area Effects



- Red Dots: Original (model-based) estimates
- · Open circles: same, with one outlet dropped from any packs

Jackknife Estimation on Policy Area Effects



- Red Dots: Original (model-based) estimates
- · Open circles: same, with one outlet dropped from any packs
- · Results: no dominant outlet; high heterogeneity

Introduction

Research Design

Results

Supporting Analyses

Implications

- # Articles published by pack in policy area
 - What's the goal? Average # media outlets per pack:

- # Articles published by pack in policy area
 - What's the goal? Average # media outlets per pack: 3.1

- What's the goal? Average # media outlets per pack: 3.1
- Causal effect on # articles:

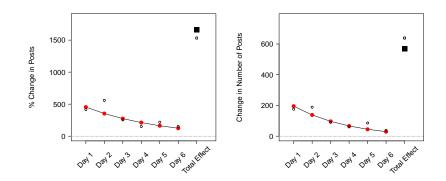
- What's the goal? Average # media outlets per pack: 3.1
- Causal effect on # articles: 2.94

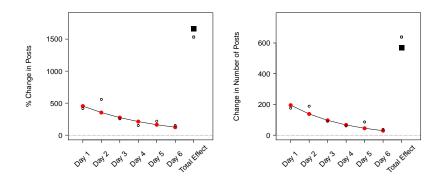
- What's the goal? Average # media outlets per pack: 3.1
- Causal effect on # articles: 2.94
- \implies high compliance

- # Articles published by pack in policy area
 - What's the goal? Average # media outlets per pack: 3.1
 - Causal effect on # articles: 2.94
 - \implies high compliance
- Pageviews (on subject of articles, relative to a day's volume)

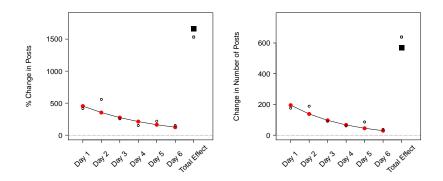
- # Articles published by pack in policy area
 - What's the goal? Average # media outlets per pack: 3.1
 - Causal effect on # articles: 2.94
 - \implies high compliance
- Pageviews (on subject of articles, relative to a day's volume)
 - Causal effect on # pageviews: 969.6% (52,223 views) increase

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

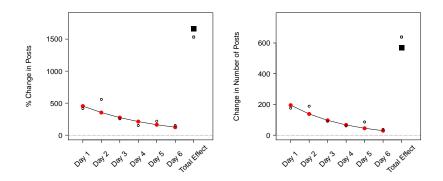




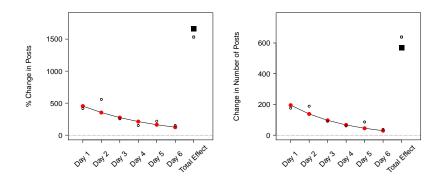
• Red Dots: model-based estimate (assumes linearity over days)



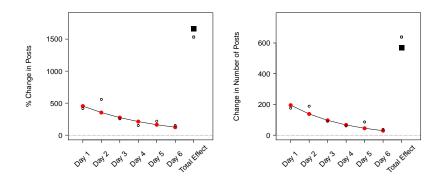
- Red Dots: model-based estimate (assumes linearity over days)
- Open circles: model-free estimate (no model, higher variance)



- Red Dots: model-based estimate (assumes linearity over days)
- Open circles: model-free estimate (no model, higher variance)
- Causal effects:



- Red Dots: model-based estimate (assumes linearity over days)
- Open circles: model-free estimate (no model, higher variance)
- Causal effects: 1st day: 454% increase,



- Red Dots: model-based estimate (assumes linearity over days)
- Open circles: model-free estimate (no model, higher variance)
- Causal effects: 1st day: 454% increase, Total: 1,666% increase

Other Supporting Analyses

- More Results
 - Opinion change: 2.3% change in direction of article opinion

- Opinion change: 2.3% change in direction of article opinion
- Large news media outlets: Observational evidence, >15x effect

- Opinion change: 2.3% change in direction of article opinion
- Large news media outlets: Observational evidence, >15x effect
- Robustness checks

- Opinion change: 2.3% change in direction of article opinion
- Large news media outlets: Observational evidence, >15x effect
- Robustness checks
 - # of unique authors: little change from effect on posts

- Opinion change: 2.3% change in direction of article opinion
- Large news media outlets: Observational evidence, >15x effect
- Robustness checks
 - # of unique authors: little change from effect on posts
 - · Removing bots, retweets: No real change

- Opinion change: 2.3% change in direction of article opinion
- Large news media outlets: Observational evidence, >15x effect
- Robustness checks
 - # of unique authors: little change from effect on posts
 - Removing bots, retweets: No real change
 - Week 1 to 2 spillover, noncompliance: No evidence

- Opinion change: 2.3% change in direction of article opinion
- Large news media outlets: Observational evidence, >15x effect
- Robustness checks
 - # of unique authors: little change from effect on posts
 - Removing bots, retweets: No real change
 - · Week 1 to 2 spillover, noncompliance: No evidence
 - Treatment articles: representative of all on complexity, type

Introduction

Research Design

Results

Supporting Analyses

Implications

Implications

• Summary

• Summary

Implications: for individual journalists

• Summary

- Implications: for individual journalists
- Implications: for ecosystem of media outlets

• Summary

- Implications: for individual journalists
- Implications: for ecosystem of media outlets

- Summary
 - Small outlets: very large average effects

- Implications: for individual journalists
- Implications: for ecosystem of media outlets

- Summary
 - Small outlets: very large average effects

- Implications: for individual journalists
- Implications: for ecosystem of media outlets

- Summary
 - Small outlets: very large average effects on pageviews,
- Implications: for individual journalists
- Implications: for ecosystem of media outlets

- Summary
 - Small outlets: very large average effects on pageviews, agenda (subject & policy),
- Implications: for individual journalists
- Implications: for ecosystem of media outlets

- Summary
 - Small outlets: very large average effects on pageviews, agenda (subject & policy), opinion change
- Implications: for individual journalists
- Implications: for ecosystem of media outlets

- Summary
 - Small outlets: very large average effects on pageviews, agenda (subject & policy), opinion change
 - Larger outlets: even bigger average effects
- Implications: for individual journalists
- Implications: for ecosystem of media outlets

- Summary
 - Small outlets: very large average effects on pageviews, agenda (subject & policy), opinion change
 - Larger outlets: even bigger average effects
 - · Heterogeneous effects: large, highly variable viral patterns
- · Implications: for individual journalists
- · Implications: for ecosystem of media outlets

- Summary
 - Small outlets: very large average effects on pageviews, agenda (subject & policy), opinion change
 - Larger outlets: even bigger average effects
 - · Heterogeneous effects: large, highly variable viral patterns
- · Implications: for individual journalists
 - Remarkable power; serious responsibility; not just another job
- · Implications: for ecosystem of media outlets

- Summary
 - Small outlets: very large average effects on pageviews, agenda (subject & policy), opinion change
 - Larger outlets: even bigger average effects
 - · Heterogeneous effects: large, highly variable viral patterns
- Implications: for individual journalists
 - Remarkable power; serious responsibility; not just another job
- · Implications: for ecosystem of media outlets
 - · Control over editorial boards and mastheads

- Summary
 - Small outlets: very large average effects on pageviews, agenda (subject & policy), opinion change
 - Larger outlets: even bigger average effects
 - · Heterogeneous effects: large, highly variable viral patterns
- Implications: for individual journalists
 - Remarkable power; serious responsibility; not just another job
- · Implications: for ecosystem of media outlets
 - · Control over editorial boards and mastheads
 - · Balance and diversity of outlet opinion

- Summary
 - Small outlets: very large average effects on pageviews, agenda (subject & policy), opinion change
 - Larger outlets: even bigger average effects
 - · Heterogeneous effects: large, highly variable viral patterns
- Implications: for individual journalists
 - Remarkable power; serious responsibility; not just another job
- · Implications: for ecosystem of media outlets
 - · Control over editorial boards and mastheads
 - · Balance and diversity of outlet opinion
 - Effects of fake news
- What should be next?

- Summary
 - Small outlets: very large average effects on pageviews, agenda (subject & policy), opinion change
 - Larger outlets: even bigger average effects
 - · Heterogeneous effects: large, highly variable viral patterns
- Implications: for individual journalists
 - Remarkable power; serious responsibility; not just another job
- · Implications: for ecosystem of media outlets
 - · Control over editorial boards and mastheads
 - · Balance and diversity of outlet opinion
 - Effects of fake news
 - · Impact on agendas, elections, public policy, discourse
- What should be next?

- Summary
 - Small outlets: very large average effects on pageviews, agenda (subject & policy), opinion change
 - Larger outlets: even bigger average effects
 - · Heterogeneous effects: large, highly variable viral patterns
- Implications: for individual journalists
 - · Remarkable power; serious responsibility; not just another job
- · Implications: for ecosystem of media outlets
 - · Control over editorial boards and mastheads
 - · Balance and diversity of outlet opinion
 - Effects of fake news
 - · Impact on agendas, elections, public policy, discourse
 - · Journalism jobs: 25% drop in last decade
- What should be next?

- Summary
 - Small outlets: very large average effects on pageviews, agenda (subject & policy), opinion change
 - Larger outlets: even bigger average effects
 - · Heterogeneous effects: large, highly variable viral patterns
- Implications: for individual journalists
 - · Remarkable power; serious responsibility; not just another job
- · Implications: for ecosystem of media outlets
 - · Control over editorial boards and mastheads
 - · Balance and diversity of outlet opinion
 - Effects of fake news
 - · Impact on agendas, elections, public policy, discourse
 - · Journalism jobs: 25% drop in last decade
- What should be next?
 - We wrote a paper,

- Summary
 - Small outlets: very large average effects on pageviews, agenda (subject & policy), opinion change
 - Larger outlets: even bigger average effects
 - · Heterogeneous effects: large, highly variable viral patterns
- Implications: for individual journalists
 - · Remarkable power; serious responsibility; not just another job
- · Implications: for ecosystem of media outlets
 - · Control over editorial boards and mastheads
 - · Balance and diversity of outlet opinion
 - Effects of fake news
 - · Impact on agendas, elections, public policy, discourse
 - · Journalism jobs: 25% drop in last decade
- What should be next?
 - We wrote a paper, built a platform,

- Summary
 - Small outlets: very large average effects on pageviews, agenda (subject & policy), opinion change
 - Larger outlets: even bigger average effects
 - · Heterogeneous effects: large, highly variable viral patterns
- Implications: for individual journalists
 - · Remarkable power; serious responsibility; not just another job
- · Implications: for ecosystem of media outlets
 - · Control over editorial boards and mastheads
 - · Balance and diversity of outlet opinion
 - Effects of fake news
 - · Impact on agendas, elections, public policy, discourse
 - · Journalism jobs: 25% drop in last decade
- What should be next?
 - We wrote a paper, built a platform, & showed how others can

- Summary
 - Small outlets: very large average effects on pageviews, agenda (subject & policy), opinion change
 - Larger outlets: even bigger average effects
 - · Heterogeneous effects: large, highly variable viral patterns
- Implications: for individual journalists
 - · Remarkable power; serious responsibility; not just another job
- · Implications: for ecosystem of media outlets
 - · Control over editorial boards and mastheads
 - · Balance and diversity of outlet opinion
 - Effects of fake news
 - · Impact on agendas, elections, public policy, discourse
 - · Journalism jobs: 25% drop in last decade
- What should be next?
 - We wrote a paper, built a platform, & showed how others can
 - · What experiment would you (or should we) run next?

- Summary
 - Small outlets: very large average effects on pageviews, agenda (subject & policy), opinion change
 - Larger outlets: even bigger average effects
 - Heterogeneous effects: large, highly variable viral patterns
- Implications: for individual journalists
 - Remarkable power; serious responsibility; not just another job
- · Implications: for ecosystem of media outlets
 - · Control over editorial boards and mastheads
 - · Balance and diversity of outlet opinion
 - Effects of fake news
 - · Impact on agendas, elections, public policy, discourse
 - Journalism jobs: 25% drop in last decade
- What should be next?
 - We wrote a paper, built a platform, & showed how others can
 - · What experiment would you (or should we) run next?

For more information: GaryKing.org/media

• Outcome Variable: *y*_{ped}, # social media posts in

- Outcome Variable: *y*_{ped}, # social media posts in
 - policy area *p* (*p* = 1, ..., 11)

- Outcome Variable: *y*_{ped}, # social media posts in
 - policy area *p* (*p* = 1, ..., 11)
 - $\underline{\underline{e}}$ xperiment $e (e = 1, \dots, E_p)$

- Outcome Variable: *y*_{ped}, # social media posts in
 - policy area *p* (*p* = 1, ..., 11)
 - \underline{e} xperiment $e (e = 1, ..., E_p)$
 - $\underline{d}ay \ d$ of and after intervention (d = 1, ..., 6)

- Outcome Variable: yped, # social media posts in
 - policy area *p* (*p* = 1, ..., 11)
 - \underline{e} xperiment $e (e = 1, ..., E_p)$
 - $\underline{d}ay \ d$ of and after intervention (d = 1, ..., 6)
- <u>Treatment Variable</u>: *T_{ped}*, instruction to pack (of 2-5 outlets) to write, publish, and promote articles, like a project manager

- Outcome Variable: yped, # social media posts in
 - policy area *p* (*p* = 1, ..., 11)
 - \underline{e} xperiment $e (e = 1, ..., E_p)$
 - $\underline{d}ay \ d$ of and after intervention (d = 1, ..., 6)
- <u>Treatment Variable</u>: *T_{ped}*, instruction to pack (of 2-5 outlets) to write, publish, and promote articles, like a project manager

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

- Outcome Variable: yped, # social media posts in
 - policy area *p* (*p* = 1, ..., 11)
 - \underline{e} xperiment $e (e = 1, ..., E_p)$
 - $\underline{d}ay \ d$ of and after intervention (d = 1, ..., 6)
- <u>Treatment Variable</u>: *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: $T_{pe1} = \cdots = T_{pe6} = 0$

- Outcome Variable: yped, # social media posts in
 - policy area *p* (*p* = 1, ..., 11)
 - \underline{e} xperiment $e (e = 1, ..., E_p)$
 - $\underline{d}ay \ d$ of and after intervention (d = 1, ..., 6)
- <u>Treatment Variable</u>: *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

- Outcome Variable: yped, # social media posts in
 - policy area *p* (*p* = 1, ..., 11)
 - \underline{e} xperiment $e (e = 1, ..., E_p)$
 - $\underline{d}ay \ d$ of and after intervention (d = 1, ..., 6)
- <u>Treatment Variable</u>: *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:
$$\lambda_d = \max_{p,e} [Y_{ped}(1)] - \max_{p,e} [Y_{ped}(0)]$$

- Outcome Variable: yped, # social media posts in
 - policy area *p* (*p* = 1, ..., 11)
 - \underline{e} xperiment $e (e = 1, ..., E_p)$
 - $\underline{d}ay \ d$ of and after intervention (d = 1, ..., 6)
- <u>Treatment Variable</u>: *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: $\lambda_d = \max_{p,e} [Y_{ped}(1)] \max_{p,e} [Y_{ped}(0)]$
 - Proportionate Increase: $\phi_d = \frac{\lambda_d}{\operatorname{mean}_{p,e}[Y_{ped}(0)]}$

• Model-Based Approach

- Model-Based Approach
 - Transform outcome variable for normality & homosked asticity: z_{ped} = $\ln(y_{ped}$ + 0.5)

- Model-Based Approach
 - Transform outcome variable for normality & homosked asticity: z_{ped} = $\ln(y_{ped}$ + 0.5)
 - The Model: $E(z_{ped}|T_{ped}) = \beta^0 + \beta_p + \eta_d + \gamma_d T_{ped}$

- Model-Based Approach
 - Transform outcome variable for normality & homosked asticity: z_{ped} = $\ln(y_{ped}$ + 0.5)
 - The Model: $E(z_{ped}|T_{ped}) = \beta^0 + \beta_p + \eta_d + \gamma_d T_{ped}$
 - β^0 : constant term

- Model-Based Approach
 - Transform outcome variable for normality & homosked asticity: z_{ped} = $\ln(y_{ped}$ + 0.5)
 - The Model: $E(z_{ped}|T_{ped}) = \beta^0 + \beta_p + \eta_d + \gamma_d T_{ped}$
 - β^0 : constant term
 - β_p : fixed effects for the 11 policy areas

- Model-Based Approach
 - Transform outcome variable for normality & homosked asticity: z_{ped} = $\ln(y_{ped}$ + 0.5)
 - The Model: $E(z_{ped}|T_{ped}) = \beta^0 + \beta_p + \eta_d + \gamma_d T_{ped}$
 - β^0 : constant term
 - β_p : fixed effects for the 11 policy areas
 - Assume linearity over days: $\eta_d = \eta^0 + \eta^1 d$ and $\gamma_d = \gamma^0 + \gamma^1 d$

- Model-Based Approach
 - Transform outcome variable for normality & homosked asticity: z_{ped} = $\ln(y_{ped}$ + 0.5)
 - The Model: $E(z_{ped}|T_{ped}) = \beta^0 + \beta_p + \eta_d + \gamma_d T_{ped}$
 - β^0 : constant term
 - β_p : fixed effects for the 11 policy areas
 - Assume linearity over days: $\eta_d = \eta^0 + \eta^1 d$ and $\gamma_d = \gamma^0 + \gamma^1 d$
 - Assume conditional independence over p, e, d

- Model-Based Approach
 - Transform outcome variable for normality & homosked asticity: z_{ped} = $\ln(y_{ped}$ + 0.5)
 - The Model: $E(z_{ped}|T_{ped}) = \beta^0 + \beta_p + \eta_d + \gamma_d T_{ped}$
 - β^0 : constant term
 - β_p : fixed effects for the 11 policy areas
 - Assume linearity over days: $\eta_d = \eta^0 + \eta^1 d$ and $\gamma_d = \gamma^0 + \gamma^1 d$
 - Assume conditional independence over p, e, d
- Model-Free Approach:

- Model-Based Approach
 - Transform outcome variable for normality & homosked asticity: z_{ped} = $\ln(y_{ped}$ + 0.5)
 - The Model: $E(z_{ped}|T_{ped}) = \beta^0 + \beta_p + \eta_d + \gamma_d T_{ped}$
 - β^0 : constant term
 - β_p : fixed effects for the 11 policy areas
 - Assume linearity over days: $\eta_d = \eta^0 + \eta^1 d$ and $\gamma_d = \gamma^0 + \gamma^1 d$
 - Assume conditional independence over p, e, d
- Model-Free Approach:
 - Drop linearity & conditional independence assumptions

- Model-Based Approach
 - Transform outcome variable for normality & homosked asticity: z_{ped} = $\ln(y_{ped}$ + 0.5)
 - The Model: $E(z_{ped}|T_{ped}) = \beta^0 + \beta_p + \eta_d + \gamma_d T_{ped}$
 - β^0 : constant term
 - β_p : fixed effects for the 11 policy areas
 - Assume linearity over days: $\eta_d = \eta^0 + \eta^1 d$ and $\gamma_d = \gamma^0 + \gamma^1 d$
 - 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

- Model-Based Approach
 - Transform outcome variable for normality & homosked asticity: z_{ped} = $\ln(y_{ped}$ + 0.5)
 - The Model: $E(z_{ped}|T_{ped}) = \beta^0 + \beta_p + \eta_d + \gamma_d T_{ped}$
 - β^0 : constant term
 - β_p : fixed effects for the 11 policy areas
 - Assume linearity over days: $\eta_d = \eta^0 + \eta^1 d$ and $\gamma_d = \gamma^0 + \gamma^1 d$
 - 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

- Model-Based Approach
 - Transform outcome variable for normality & homosked asticity: z_{ped} = $\ln(y_{ped}$ + 0.5)
 - The Model: $E(z_{ped}|T_{ped}) = \beta^0 + \beta_p + \eta_d + \gamma_d T_{ped}$
 - β^0 : constant term
 - β_p : fixed effects for the 11 policy areas
 - Assume linearity over days: $\eta_d = \eta^0 + \eta^1 d$ and $\gamma_d = \gamma^0 + \gamma^1 d$
 - 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)