

# Methods for Extremely Large Scale Media Experiments and Observational Studies

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- Largest ever experimental study of media effects (>50 media sites)
- To prepare: predict experimental outcomes with observational analyses

## Treatment: The Media

### Explanatory Variable

- Observational framework: News articles that get published
- Experimental framework: Articles we choose to publish

### Interventions

- Large number of media outlets agreed to work together to write and run stories on the same topic at the same time (e.g., immigration, abortion)
- Five experiments so far; each produced several articles, cross-published on cooperating sites:
  - We funded outlets to produce content
  - We chose topics and timing of articles
  - Median participating outlet: 2.88 million page views, 1.72 million user sessions in 2013
  - Media participants given confidentiality (for now)

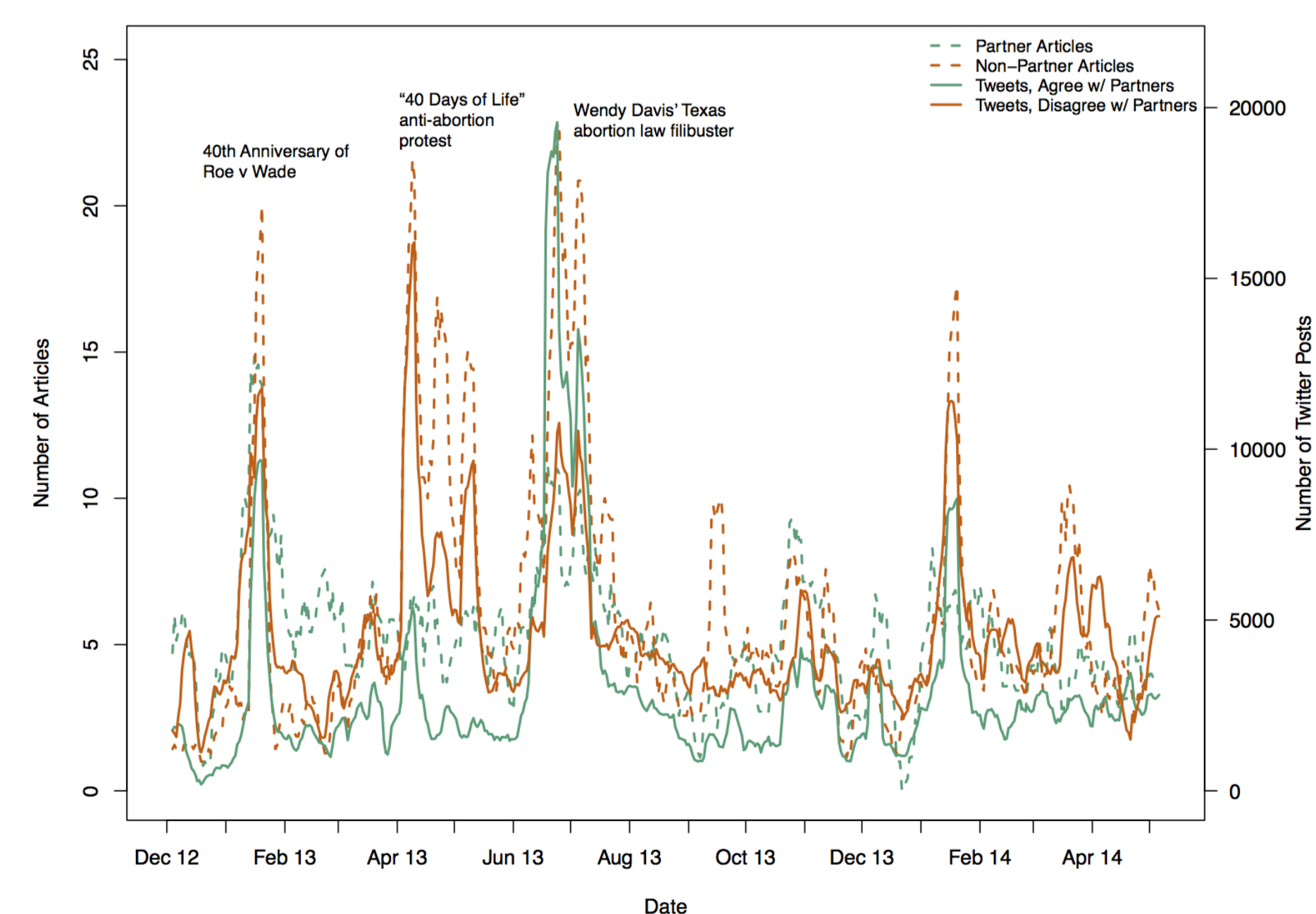
## The Effect of the Media – on what?

- **Passive Opinion:** Traditional surveys elicit opinions regardless of engagement
- **Activated Public Opinion:** People express themselves publicly (petitions, protests, letters)
  - The goal of media outlets (and our study) is activated opinion
  - Goal: influence “the conversation”: people engaging with others, trying to influence politics
  - Social media is of direct interest, highly representative of activated opinion and important on its own—and available in massive numbers (~500M/day)



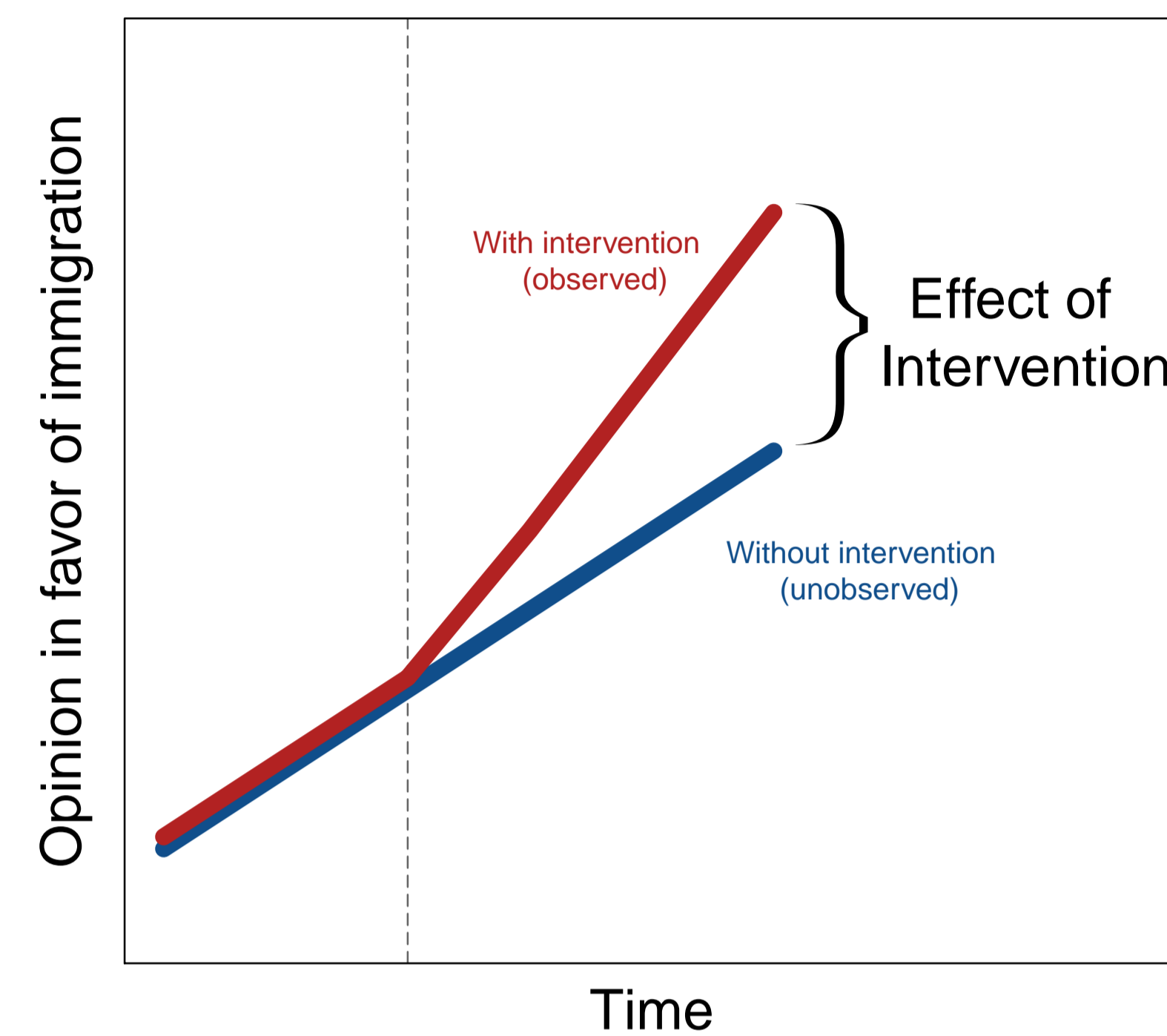
## (Big) Data

- Download many thousands of articles
- Download tens of millions of tweets
- Track specific issues
- Characterize using ReadMe.
- Download media site analytics (through unprecedented access)



Abortion Media Coverage and Twitter Discussion

## Quantity of Interest: Change in Twitter Volume



We compare what actually happened after the intervention to what would have happened without it.

We never observe both potential outcomes, so we predict what would have happened using a model based on past data.

## Modeling Twitter Volume

We model opinion  $P_{it}$  as a function of past media coverage  $M_{it}$  and past opinion. After much experimentation, an ARMAX(1,1) model predicted best.

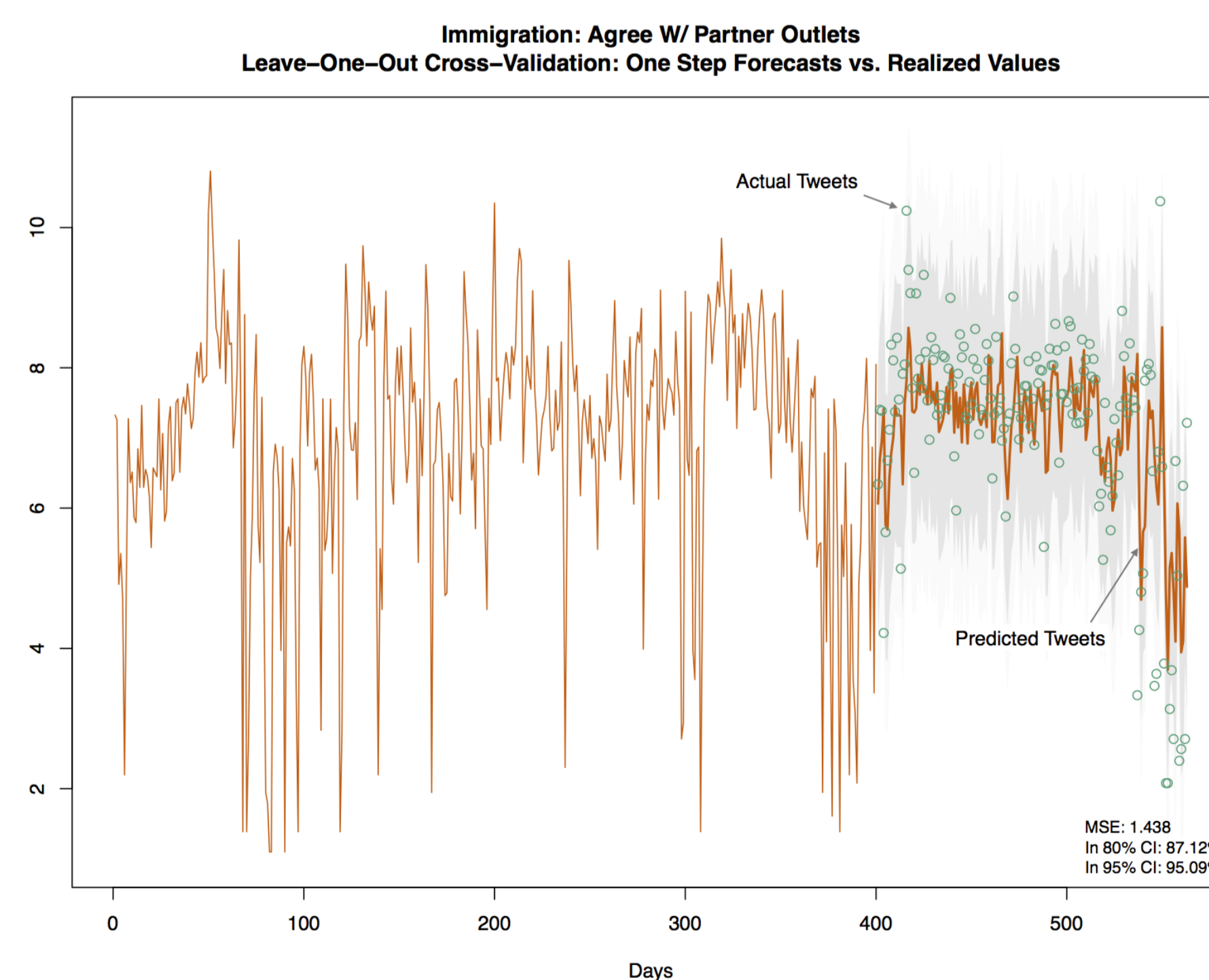
$$P_{it} = \alpha + \sum_{n=0}^k M'_{it-n}\beta + u_{it}$$

$$u_{it} = \rho_1 u_{it-1} + \theta_1 \varepsilon_{it-1} + \varepsilon_{it}$$

$$\varepsilon_{it} \sim N(0, \sigma_i^2)$$

$$M_{it} = \begin{pmatrix} \text{Collaborators}_{it} \\ \text{Non-Collaborators}_{it} \\ \text{NYT/WSJ}_{it} \end{pmatrix}$$

$i$  indexes issue and  $t$  indexes day. (Equation is non-linear in the parameters—estimated by maximum likelihood.)



Predicting Immigration Tweets With Past Media and Twitter Activity

Predictions capture even large shifts in opinion

Prediction intervals are accurate for observed outcomes

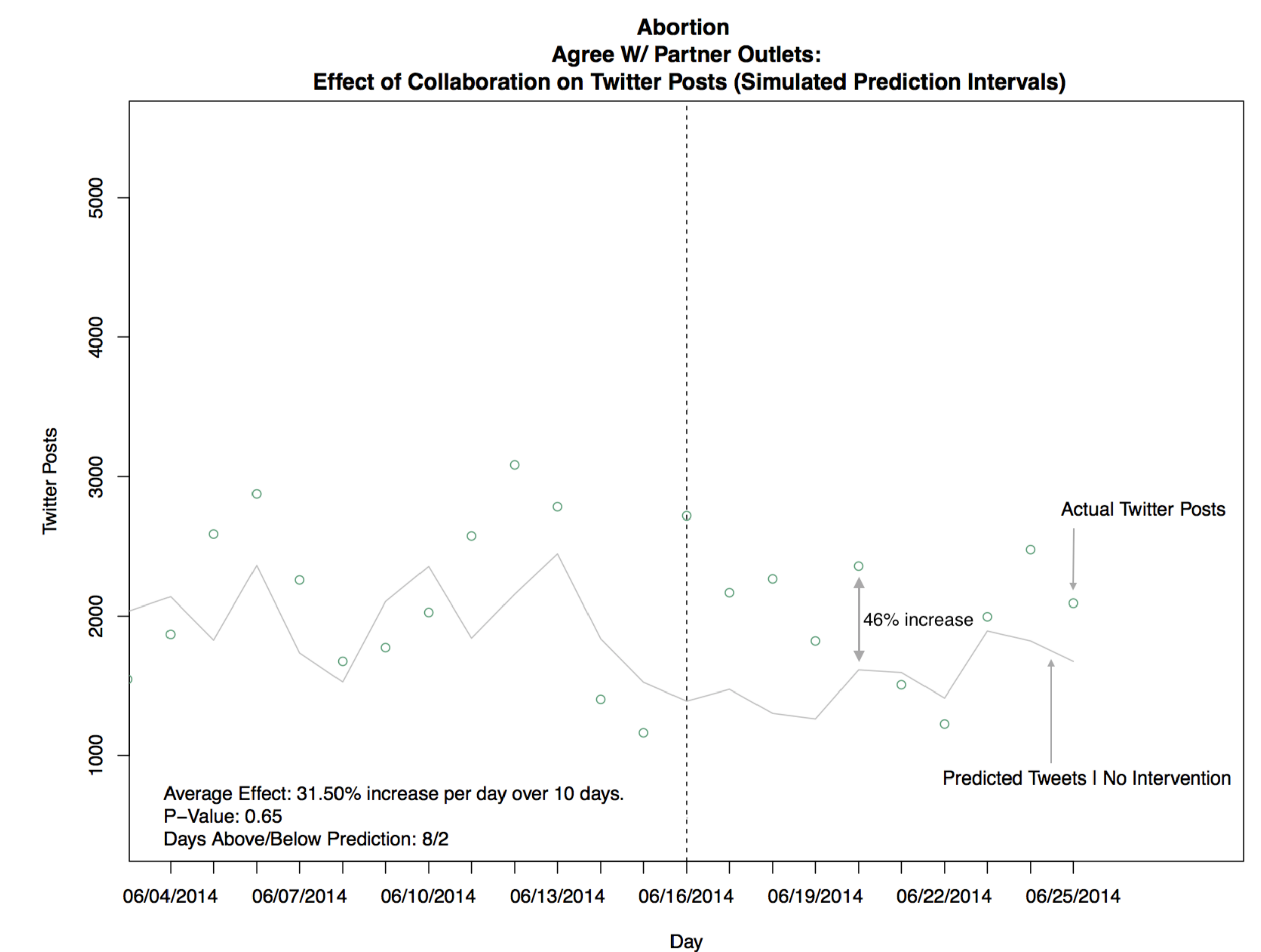
## Key Challenges for Experiments

- The defining component of an experiment: *Investigator control of intervention*
  - Rules out endogeneity
  - Guaranteed *exogenous* increase in coverage
- Assignment mechanism (a new type of “N of 1” experiment)
  - Our (indivisible) unit of analysis is the entire nation
  - Each (huge) run of our experiment produces 1 observation
  - We must run the entire experiment many times

## Experimental Results

### Experimental Example: Abortion

- Five outlets cooperated to write/publish several news articles on abortion
- Estimated causal effect: 32% average increase per day in twitter posts agreeing with partner outlets
- However, conclusions need to await more observations so we can obtain reliable estimates of uncertainty



Results of Intervention on Abortion

## Next Steps

- More experiments underway
- Estimate the effect of different types of interventions (across different issues, different types of collaborations, different times)