

# Media Power

Andrea Prat

Columbia University

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# Media Power

- The media industry is different: large externality on politics
- Fear that media organizations can manipulate the democratic process
- “Through clever and constant application of propaganda, people can be made to see paradise as hell.” (Hitler, 1923)
- Some evidence of strong influence:
  - Della Vigna and Kaplan (2007): effect of Fox News sequential entry into different media markets (nationally 0.5% more to Reps)
  - Enikolopov, Petrova and Zhuravskaya (2011): Effect of entry of NTV into selected Russian regions = -8.9% for government parties
  - Martin-Yurukoglu (2014): additional hour/week of Fox News (MSNBC) increases R's (D's) vote likelihood by more than 10 pct points.
- What should society do?

# Media Regulation?

- Unregulated or poorly regulated media is vulnerable to large-scale capture
- Regulation of content increasingly difficult (and undesirable)
- Regulation of ownership and concentration
- High levels of concentration in most countries (Djankov et al 2003). High concentration linked to low political turnover and high levels of corruption.
- FCC Review (2010), Ofcom Review (2012)

# Existing Regulation

- 1 Platform-specific media rules
  - Increasingly arbitrary and irrelevant in a world with media convergence
- 2 Standard competition policy: ability to affect prices/quantities within appropriately defined market
  - Misses key point: political risk (Polo 2005, Ofcom 2012)
  - US media industry has low concentration by all standard IO measures (Noam 2009)
  - Difficulty assessing media mergers

# Research Question

- Some way of measuring the potential influence of a media organization on politics
- Linked to citizen welfare
- Implementable with existing data

# Challenge #1: Multiple Platforms

- Citizens receive their information from multiple sources operating on multiple platforms: tv, press, radio, internet, etc.
- Platforms are separate markets (eg zero cross-elasticity between tv and newspapers)
- Content on platform may not be news (eg tv entertainment)
- How do we aggregate power across platforms?
- Existing measures are platform-centric:
  - They first aggregate within markets/platforms, then across markets/platforms (eg FCC's failed Media Diversity Index)

# Challenge #1: This Paper's Approach

- Minds, not markets.
- This paper reverses the aggregation order:
  - 1 For each individual, determine what media sources (of all platforms) influence his/her voting behavior
  - 2 Aggregate power: what share of the electorate can a media organization swing?

## Challenge #2: Measure Potential Influence

- How much can a media source affect the political views of citizens?
- Depends on whether citizens:
  - are sophisticated in understanding the intentions of media owners
  - are able to process/remember a large number of news items
  - are able to cross-check different sources
  - will switch to different media if they detect bias
  - ...
- Depends on whether media owners:
  - are partisan
  - care about journalistic independence/reputation
  - care about profits
  - ...



## Challenge #2: Measure Potential Influence

- Empirical media economics (Prat-Stromberg 2013)
- Influence: Della Vigna and Kaplan (2007), Enikopolov et al (2011), Gentzkow et al (2011), etc
- Bias: Durante-Knight 2006, Gentzkow-Shapiro 2010.
- Naivete: Chiang-Knight 2006

## Challenge #2: Measure Potential Influence

- No simple model of voter/owner behavior appears to be consistent with all available evidence.
- Yet, any form of regulation depends on what we assume re voter behavior
- Sophisticated voters → lower influence
- Naive voters → higher influence
- Picking one model is risky
- **What if we look at a large set of models and identify the lower and upper bounds?**

# Challenge #2: Upper Bound Approach

- 1 **Compute and estimate theoretical bounds to media power**
- 2 **Calibrate theoretical bounds on the basis of existing estimates**

# Challenge #2: Two Possible Approaches

- 1 Compute and estimate theoretical bounds to media power**
  - Theory: Set of possible assumptions about voter behavior
  - Robust design: Chassang (2011), Madarasz and Prat (2011), Carroll (2013), Chassang and Padro i Miquel (2013)
  - Bounds to media power → simple to compute media power index
  - Estimates for US media based on Pew Data
- 2 Calibrate theoretical bounds on the basis of existing estimates**
  - Use model above
  - Assume Della Vigna-Kaplan and/or Chiang-Knight/Gentzkow et al estimates are valid for all US media
  - Estimates for US media based on Pew Data

# Results

- 1 Methodology: A way to map your assumptions about media/voters into a media power index
- 2 Empirics: Under all specifications, common patterns in the distribution of media power.

# Model: Candidates and Voters

- Candidates:  $A$  and  $B$
- $\sigma \sim U[0, 1]$ : relative quality of candidate  $B$
- Mass of voters with utility  $\frac{1}{2}$  if they elect  $A$  and  $\sigma$  if they elect  $B$
- If informed, voters would vote for  $B$  if  $\sigma \geq \frac{1}{2}$

# Model: Media

- Set  $\mathbb{M}$  of media outlets
- Voters differ in the subset of media they consume
- Let  $q_M$  be the share of voters that consume  $M \subset \mathbb{M}$
- The *attention share* of an outlet is

$$a_m = \sum_{M \text{ s.t. } m \in M} \frac{q_M}{|M|}.$$

# Example

Segment	Share	Tv1	Tv2	Np1	Np2	Np3	Web1	Web2
1	10%	■						
2	10%	■						
3	10%	■		■				
4	10%			■				
5	10%		■					■
6	10%		■		■		■	■
7	10%		■		■		■	
8	10%		■			■	■	
9	10%					■	■	■
10	10%				■	■	■	■
Reach		30%	40%	20%	30%	30%	50%	40%
Attention		25%	14.1%	15%	8.3%	9.1%	15%	16.6%



# Model: Unbiased Reporting

- Given candidate quality  $\sigma$ , media outlet  $m$  observes a vector of  $N$  binary news items

$$x_m = (x_{m1}, \dots, x_{mN})$$

with  $\Pr(x_{mi} = 1|\sigma) = \sigma$ .

- Each item is favorable to either  $A$  or  $B$ .
- Conditional on  $\sigma$ ,  $x$  is iid across news items and outlets
- For now, **focus on unbiased media**
- Assume that unbiased outlets report all the news items they receive

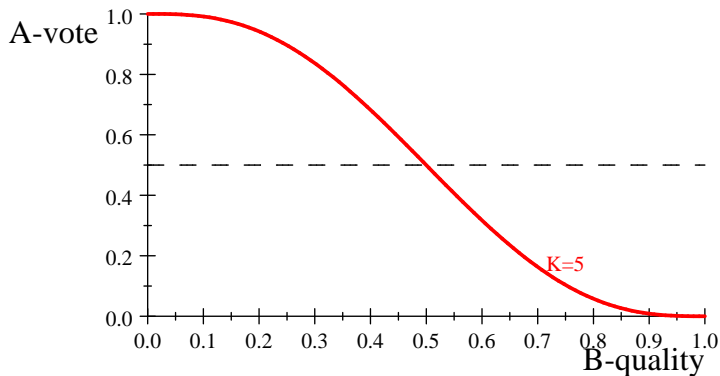
# Model: Information Absorption by Voters

- Voters in segment  $M$  have bandwidth  $K_M$ .
- A voter in  $M$  is exposed to  $N \times |M|$  news items, but he observes/recalls  $K_M$  of them.
- The  $K_M$ -subset is independently drawn from the  $N \times |M|$  news items voters are exposed to.
- Voters do not observe the number of items reported (important for later)

# Voting under Unbiased Media

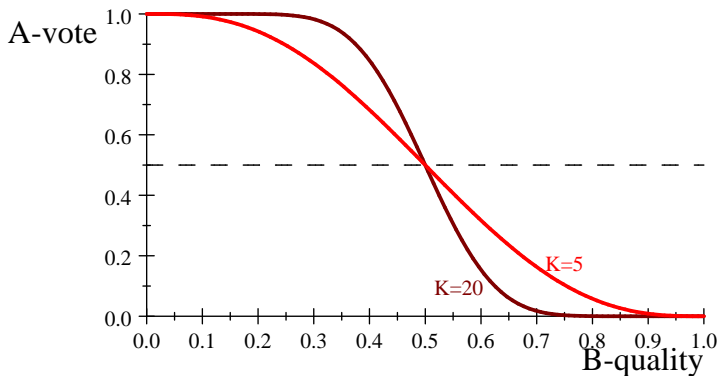
- Voter  $i$  who observes  $K$  binary news items computes average  $s^i$
- Best unbiased estimator of  $\sigma$ , given  $i$ 's information.
- Voter  $i$  prefers  $B$  if  $E[\sigma] \geq \frac{1}{2}$ .
- $s_m$ : average of the  $N$  signals received by outlet  $m$ .
- As  $N \rightarrow \infty$ ,  $B$  is elected if and only if  $\sigma \geq \frac{1}{2}$ .
- From now on focus on very large number of potentially reportable items:  $N \rightarrow \infty$ .

## Voting in a Segment with Unbiased Media Only



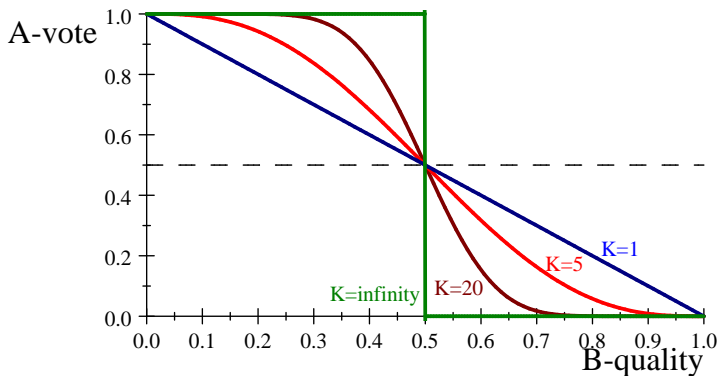
A's vote share in segment as a function of quality  $\sigma$

# Voting in a Segment with Unbiased Media Only



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## Voting in a Segment with Unbiased Media Only



A's vote share in segment as a function of quality  $\sigma$

# Biased Media: Reporting by Media

- Suppose that a set  $G$  of media is controlled by a potentially biased owner
- Each outlet can report selectively
- Given that  $N$  is unbounded, this is equivalent to choosing the proportion of news items that are favorable to  $A$ :

$$s_m(\sigma) \in [0, 1]$$

# Biased Media: Worst-Case Owner

- Owner of media subset  $G$  wants  $A$  to be elected.
- No media-related motive: journalistic reputation, commercial profit, etc
- Voters assign belief  $\beta > 0$  to the event that the owner is evil and take it into account when processing news
- Belief may be different from objective probability
- Evil owner chooses reporting strategy  $s_m(\cdot)$  to maximize election chance of  $A$
- All other sources are unbiased



# Biased Media: Worst-Case Voter

- Does not switch to different media
- How does he respond to potential bias?
  - Naivete?
  - Attention patterns?

# Information Updating

Voter in segment  $M$  receives a  $K_M$ -sized vector  $y_i$  of news items.

$N_0(G)$       number of items favorable to  $A$  from potentially biased media

$N_1(G)$       number of items favorable to  $B$  from potentially biased media

$N_0(M/G)$     number of items favorable to  $A$  from unbiased media

$N_1(M/G)$     number of items favorable to  $B$  from unbiased media

Probability of realization  $y_i$

$$\begin{aligned} & \Pr(y^i = Y | \sigma, s(\cdot)) \\ = & (1 - \beta) \sigma^{N_1(M/G) + N_1(G)} (1 - \sigma)^{N_0(M/G) + N_0(G)} \\ & + \beta \sigma^{N_1(M/G)} (1 - \sigma)^{N_0(M/G)} s(\sigma)^{N_1(G)} (1 - s(\sigma))^{N_0(G)} \end{aligned}$$

# Information Updating

- Posterior on candidate quality computed by voter  $i$ :

$$E [\sigma | y^i = Y, \hat{s}(\cdot)] = \frac{\int_0^1 \Pr(y^i = Y | \sigma, \hat{s}(\sigma)) \sigma d\sigma}{\int_0^1 \Pr(y^i = Y | \sigma, \hat{s}(\sigma)) d\sigma}$$

where  $\hat{s}(\cdot)$  is the strategy that the voter *believes* the evil voter would use.

- Difficult to characterize because it must be solved together with evil owner's maximization problem.
- But we are looking for the worst-case...

# Bound on Posterior for a Given Voter

- Find lower bound on posterior
- Minimize over  $\hat{s}(\cdot)$ ,  $N_1(G)$ ,  $N_0(G)$  and obtain:

## Lemma

The voter posterior  $E[\sigma | Y, \hat{s}]$  is bounded below by

$$\frac{\int_0^1 \sigma^{N_1(M/G)} (1 - \sigma)^{N_0(M/G) + K_G} \sigma d\sigma}{\int_0^1 \sigma^{N_1(M/G)} (1 - \sigma)^{N_0(M/G) + K_G} d\sigma}.$$

- Voter prefers A if posterior below 1/2

# Aggregate over Voters in Segment

- Mass of voters in segment  $M$
- Items from unbiased media are distributed according to binomial with parameter  $\sigma$
- Voter posterior  $E[\sigma|Y, \hat{s}]$  is a random variable
- The share of votes for  $A$  in the segment is bounded above by:

$$\Pr \left[ E[\sigma|Y, \hat{s}] < \frac{1}{2} \right]$$

# Bound on Segment Vote Share

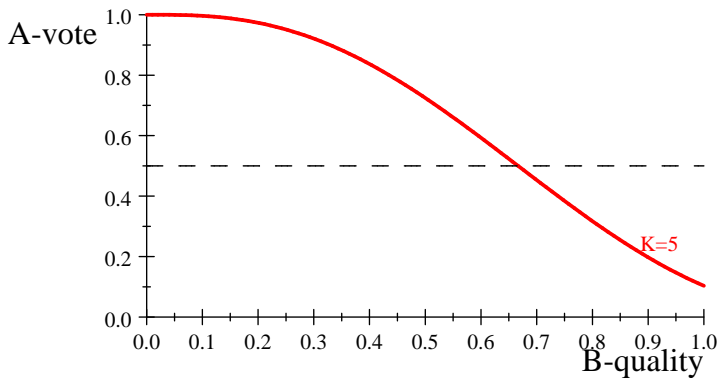
## Proposition

Given  $g_M$ ,  $K_M$ ,  $\sigma$ ,  $A$ 's vote share in segment  $M$  is bounded above by:

$$p_A(g_M, K_M, \sigma) = \sum_{k=0}^{\lceil K_M/2 \rceil - 1} \binom{K_M}{k} ((1 - g_M)\sigma)^k (1 - (1 - g_M)\sigma)^{K_M - k}$$

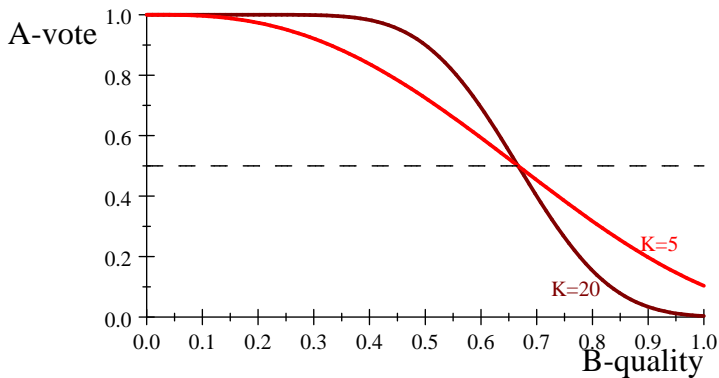
- Is the bound actually achieved?
- Yes. The worst case correspond to a vanishing voters' belief on bias:  $\beta \rightarrow 0$ .

## Segment Where Evil Owner Controls One of Three Outlets



A's vote share in segment as a function of quality  $\sigma$

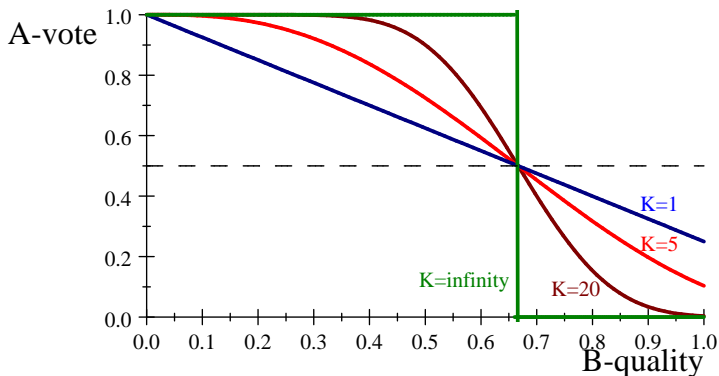
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A's vote share in segment as a function of quality  $\sigma$

# Power Index

- Power of an evil owner = capacity to persuade voters to elect a candidate they would not like if they had full information
- Power index = worst  $A$ -candidate that gets elected
- Find highest  $\bar{\sigma}$  such that  $A$ 's overall vote share is at least  $1/2$ .
- Define power as lost welfare:

$$\Pi = \bar{\sigma} - (1 - \bar{\sigma}) = 2\bar{\sigma} - 1$$

## Proposition

For a given vector  $K = (K_M)_{M \subset \mathbb{M}}$ , the power of group  $G$  is  $\Pi(K) = 2\bar{\sigma}(K) - 1$ , where  $\bar{\sigma}(K)$  is the largest  $\sigma$  smaller than 1 such that:

$$\sum_{M \subset \mathbb{M}} q_M \sum_{k=0}^{\lceil K_M/2 \rceil - 1} \binom{K_M}{k} ((1 - g_M) \sigma)^k (1 - (1 - g_M) \sigma)^{K_M - k} = \frac{1}{2}$$

# Extreme Case: Minimal Bandwidth

- Suppose  $K_M = 1$  in all segments
- A's overall vote share:

$$1 - (1 - a_G) \sigma$$

where  $a_G = \sum_{M \in \mathbb{M}} q_M g_M$  is the attention share of media group  $G$ .

- Power index:

$$\bar{\sigma}(1) = \min \left( 1, \frac{1}{2(1 - a_G)} \right)$$

# Worst Case

- Study worst-case scenario under any attention pattern vector
- Pick the vector  $K = (K_M)_{M \in \mathbb{M}}$  that maximizes the threshold  $\bar{\sigma}(K)$ .
- Key observation: for a *particular* segment  $M$  and a *particular* valence  $\sigma$ , maximal power obtains either with minimal bandwidth  $K_M = 0$  or maximal bandwidth  $K_M \rightarrow \infty$

Segment	Share	Tv1	Tv2	Np1	Np2	Np3	Web1	Web2
1	10%	■						
2	10%	■						
3	10%	■		■				
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$\Pi(1)$								
$\Pi(\infty)$								
$\bar{\Pi}$								

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Attention		25%	14.1%	15%	8.3%	9.1%	15%	16.6%
$\Pi(1)$		0.333	0.164	0.176	0.090	0.101	0.176	0.152
$\Pi(\infty)$		0	0	0	0	0	0	0
$\bar{\Pi}$		0.429	0.481	0.250	0.333	0.333	0.500	0.154

# Ideology?

- Allow voters to receive ideological signal before they observe media signals



# Empirics: Media Power in the US

- Data Description
- Worst-case media power indices
- Calibration on DellaVigna-Kaplan (2007)
- General patterns

# Data Requirement: Media Consumption Matrix

Voter	Tv1	Tv2	Np1	Np2	Np3	Web1	Web2
1	■						
2	■						
3	■		■				
4			■				
5		■					■
6		■		■		■	■
7		■		■		■	
8		■			■	■	
9					■	■	■
10				■	■	■	■

# Pew Survey

- Media Consumption Survey, conducted by the Pew Research Institute every two years since 1994. Here: 2000-2012 surveys.
- In 2012: 3003 US residents interviewed; 103 questions.
- Focus on news consumption, not entertainment
  - specific questions, eg “ABC World News with Diane Sawyer”
  - “regularly, sometimes, hardly ever, or never”

# Pew Survey

- 2000: Limited set of radio and tv news sources
- 2002: Big Three added
- 2004: Daily newspapers added (as one source)
- 2006: Daily Show and Rush Limbaugh
- 2008: Websites (open question – three top sites)
- **2010:** Specific dailies: NY Times, WSJ, Washington Post, USA Today
- **2012:** Minor modifications

# Media Consumption Matrix

- ① Daily version
  - Sources that are updated continuously or daily
  - Assign 1 to respondents who follow them regularly and 0 to all others
- ② Daily and Weekly version
  - Sources that are updated continuous, daily, or weekly
  - Assign 1 to respondents who follow
    - continuous/daily sources regularly or sometimes
    - weekly sources sometimes
  - Assign 1 to respondents who follow them regularly and 0 to all others
- A news source can be followed in its native platform or through its website, eg Fox TV or [www.foxnews.com](http://www.foxnews.com).

# Media Ownership

- The owner of a news source is the entity that owns the source name used in the survey: Rush Limbaugh Show (owned by Mr Limbaugh) vs Colbert Report (owned by Comedy Central).
- A media organization is defined on the basis of ultimate ownership. Three conglomerates:
  - News Corp (Fox News and Wall Street Journal)
  - Comcast (NBC and MSNBC)
  - Time Warner (CNN, Comedy Central, Time Magazine).

# Questions

- Relative power of different media organizations.
- Differences between worst-case power index and minimal-bandwidth power index (easy to compute)?
- Differences over time?
- Adding ideology
- State-level power
- Calibration exercise

Figure 7: Worst-Case Power and Minimal-Bandwidth Power

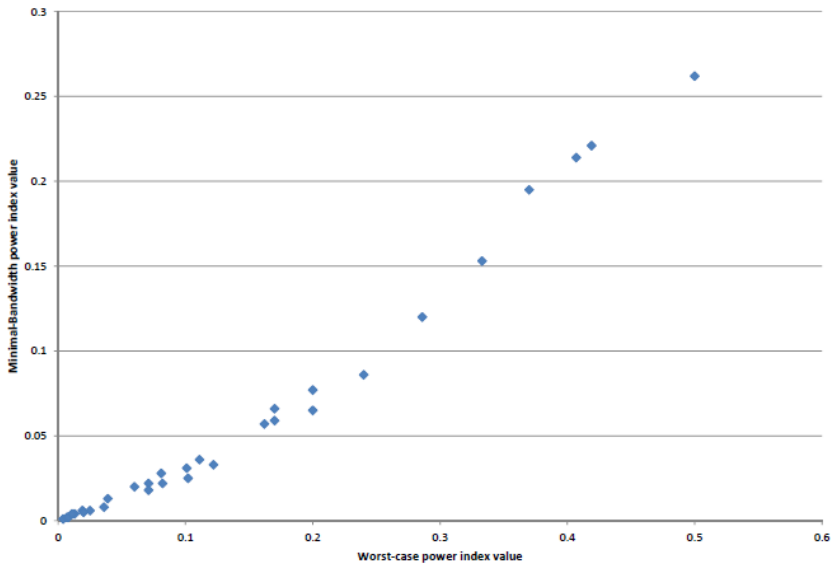




Figure 6: Minimal Bandwidth Power Index: Daily Sources, 2012

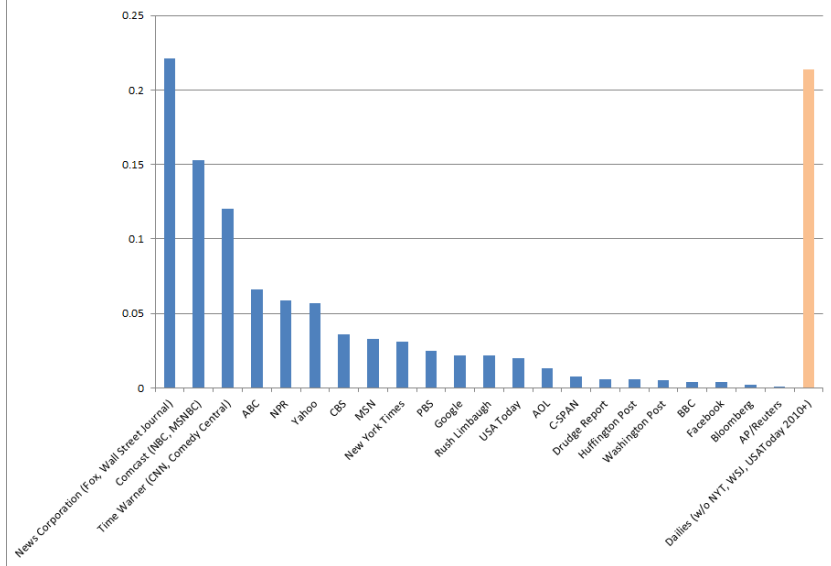
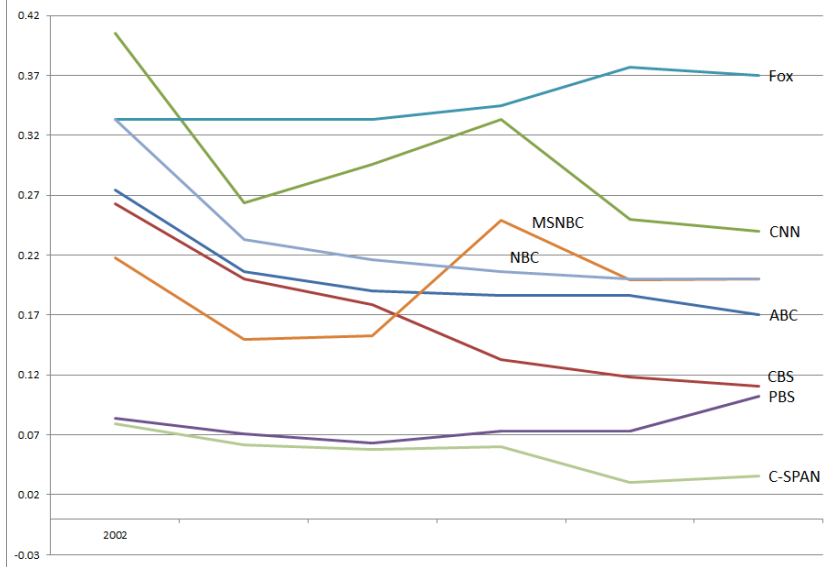
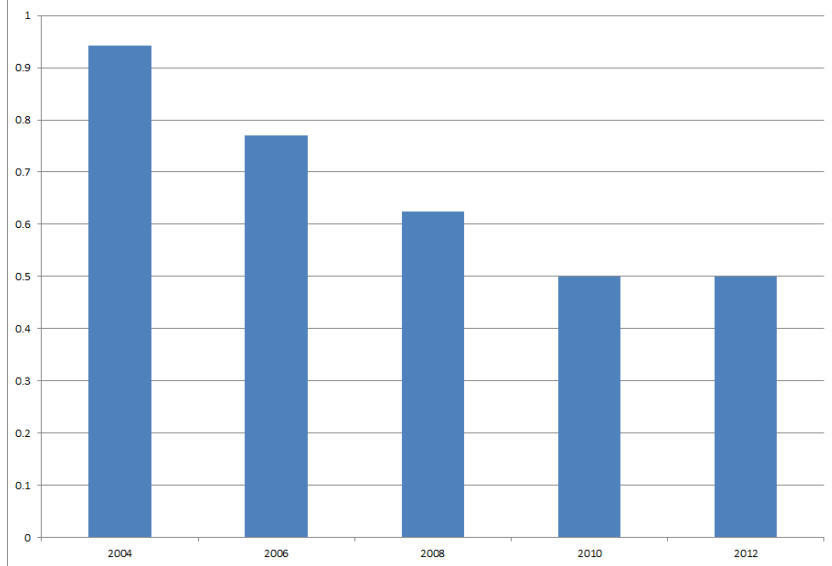


Figure 11: Evolution of TV Power (2002-2012)



**Figure 12: Evolution of the Power of Daily Newspapers (2004-2012)**

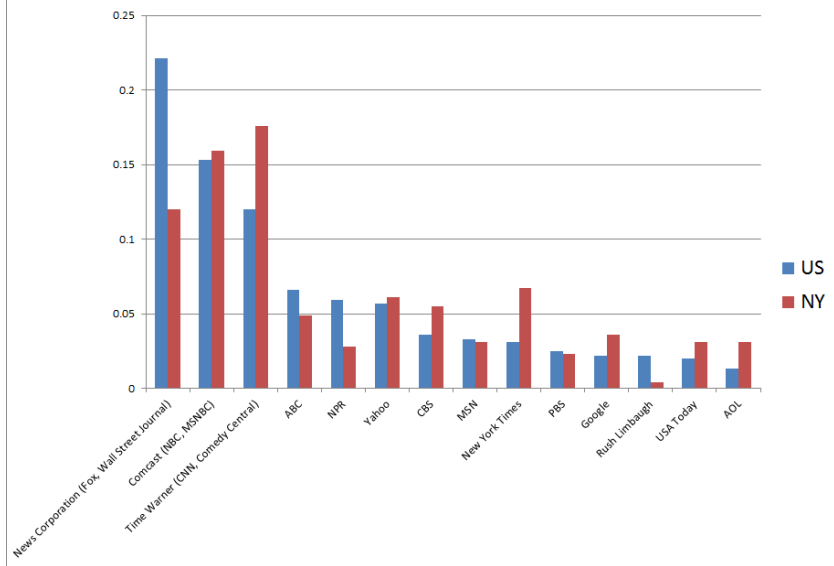
# Four Extensions

- Media power at a regional level
- Ideological voters
- Abstention
- Age stratification

# 1. Regional Media Power

- As we defined media power in electoral terms, the index depends on what elected office we consider:
  - Federal (note that I disregarded the role of the Electoral College)
  - State
  - City
  - etc
- In each case, just restrict attention to relevant electorate

Figure 13: New York State: Minimal Bandwidth, Daily Sources, 2012



## 2. Ideology

- The model can be extended to encompass voter ideology
- Before being exposed to the media, voters in segment  $M$  receive a certain number of ideological signals in favor or against candidate  $A$ .
- Extreme case: three types of voters:
  - Those who received an infinite number of signals in favor of  $A$  (registered Dems?)
  - Those who received an infinite number of signals in favor of  $B$  (registered Reps?)
  - Those who did not receive ideological signals (Indeps?)

<b>Company</b>	<b>Inds</b>	<b>All</b>
Bloomberg	0.004	0.002
ABC	0.053	0.066
CNN	0.082	0.086
Fox	0.180	0.195
MSNBC	0.049	0.065
NBC	0.076	0.077
NPR	0.073	0.059
New York Times	0.028	0.031
Wall Street Journal	0.030	0.018
Yahoo	0.058	0.057
<b>Conglomerates</b>		
Time Warner	0.125	0.120
News Corporation	0.222	0.221
Comcast	0.132	0.153



### 3. Abstention

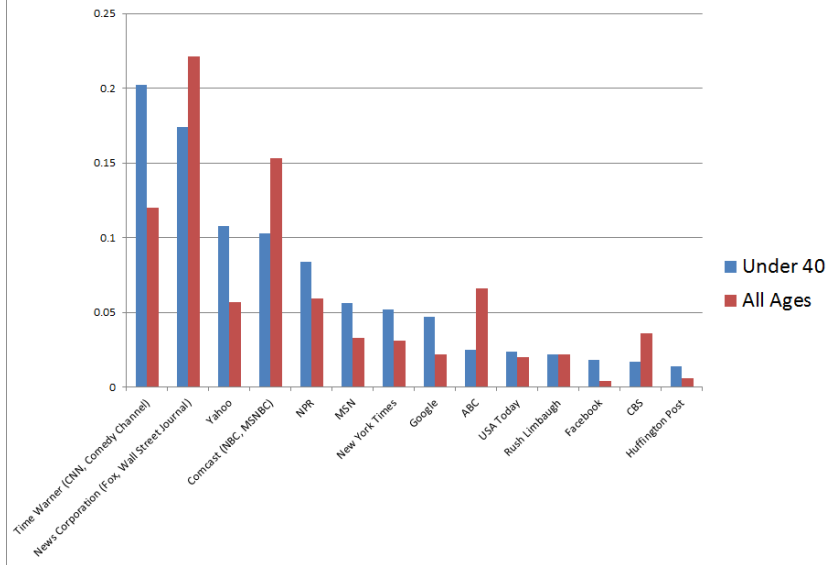
- A large fraction of Americans do not vote
- Turnout rates are related to socioeconomic factors that determine media consumption
- We incorporate abstention by correcting attention shares by turnout rates
- Media sources with followers who are more likely to vote become more powerful
- Respondents are asked whether they are registered voters

<b>Company</b>	<b>All</b>	<b>Regs</b>
Bloomberg	0.002	0.002
ABC	0.066	0.066
CNN	0.086	0.081
Fox	0.195	0.199
MSNBC	0.065	0.066
NBC	0.077	0.083
NPR	0.059	0.061
New York Times	0.031	0.032
Wall Street Journal	0.018	0.018
Yahoo	0.057	0.047
 <b>Conglomerates</b>		
Time Warner	0.120	0.111
News Corporation	0.221	0.225
Comcast	0.153	0.161

## 4. Age (A Peek into the Future?)

- Media consumption depends on age: younger people are more likely to use new media.
- Can this give us a sense of how media power will evolve in the coming decades?
- Assume that only people below age 40 are present.

Figure 14: Media Power by Age, Daily Sources, 2012



# Calibration Exercise

- Assume a share  $b$  of voters are completely sophisticated and a share  $1 - b$  completely naive
- Under minimal attention, the power index of media organization  $G$  given  $b$  is

$$\hat{\Pi}(b) = \frac{(1 - b) a_G}{1 - (1 - b) a_G},$$

# DellaVigna-Kaplan

- Estimated influence of Fox News in 2000 US presidential elections
- Exploited gradual introduction across US: diff-in-diff approach controlling for trends
- Introduction increased Republican vote share by 0.4-0.7 percentage points. 0.7 corresponds to a power index  $\hat{\Pi}(b) = 0.014$
- In turn, that is rationalized by an 8.5% share of naive voters.  
**Assume that is the upper bound for any news source.**

## Calibration (2012, Daily)

<b>Media organization</b>	$\Pi(1)$	Swing Proba
News Corporation	0.0156	0.1029
Comcast	0.0114	0.0752
Time Warner	0.0092	0.0604
ABC	0.0053	0.0347
NPR	0.0048	0.0314
Yahoo	0.0046	0.0303
CBS	0.0038	0.0251
New York Times	0.0025	0.0167
PBS	0.0020	0.0135

# DellaVigna-Kaplan + Chiang-Knight/Gentzkow-Shapiro-Sinkinson

- Zero estimated effect of newspapers on voters, implying a 0% share of naive readers.
- Assume that “viewers” conform DVK while “readers” conform to CKGSS.
- All readers are perfectly sophisticated even they watch tv (hence immune from tv bias)
- In both scenarios Fox News has the same power. This means pure viewers must be more naive



## Calibration (2012, Daily)

Media organization	DVK		DVK + CKGSS	
	$\Pi(1)$	Swing Proba	$\Pi(1)$	Swing Proba
News Corp	0.0156	0.1029	0.0140	0.0924
Comcast	0.0114	0.0752	0.0082	0.0538
Time Warner	0.0092	0.0604	0.0075	0.0496
ABC	0.0053	0.0347	0.0055	0.0362
NPR	0.0048	0.0314	0.0039	0.0258
Yahoo	0.0046	0.0303	-	-
CBS	0.0038	0.0251	0.0028	0.0186
New York Times	0.0025	0.0167	-	-
PBS	0.0020	0.0135	0.0016	0.0103

# Patterns

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## ① **Relative power rankings consistent across specifications**

Focus on minimal-attention specification, which is straightforward to compute:

$$\frac{1}{2(1 - a_G)}$$

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Focus on minimal-attention specification, which is straightforward to compute:

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## ② **Three conglomerates stand out: News Corp, Comcast, Time Warner**

Can swing US elections under conceivable scenarios.

# Patterns

## 1 Relative power rankings consistent across specifications

Focus on minimal-attention specification, which is straightforward to compute:

$$\frac{1}{2(1 - a_G)}$$

## 2 Three conglomerates stand out: News Corp, Comcast, Time Warner

Can swing US elections under conceivable scenarios.

## 3 TV still rules

Newspapers and new media less powerful

# Last Slide

- 1 #1: Minds, not markets
- 2 #2: Worst-case case index + calibration
- 3 Some robust patterns in media power

To-do list:

- Theory/Data: Attention measures
- Data: International comparison