Bias in Cable News: Persuasion and Polarization[†]

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We measure the persuasive effects of slanted news and tastes for like-minded news, exploiting cable channel positions as exogenous shifters of cable news viewership. Channel positions do not correlate with demographics that predict viewership and voting, nor with local satellite viewership. We estimate that Fox News increases Republican vote shares by 0.3 points among viewers induced into watching 2.5 additional minutes per week by variation in position. We then estimate a model of voters who select into watching slanted news, and whose ideologies evolve as a result. We use the model to assess the growth over time of Fox News influence, to quantitatively assess media-driven polarization, and to simulate alternative ideological slanting of news channels. (JEL D72, L82)

The 24-hour cable news channels—CNN, the Fox News Channel, and MSNBC—are frequent targets of allegations of media bias. In this paper, we address several questions about cable news. First, how much does consuming slanted news, like the Fox News Channel, change individuals' partisan voting preferences in presidential elections, if at all? Second, how intense are consumer preferences for cable news that is slanted toward their own ideology? After measuring these forces, we ask: how much could slanted news contribute to increases in ideological polarization? And, what do these forces imply for the optimal editorial policy of channels that wish to maximize viewership, or alternatively to maximize electoral influence?

The answers to these questions are key inputs for designing optimal public policy—such as merger policy—for the media sector, which has attracted blame for the rise in polarization in the United States (Gentzkow 2016). If consumers simply prefer news that resonates with their pre-existing ideology, and the consumption of such news does not have any associated social or political externalities, then the news media sector should be treated like any other consumer product. However, if consuming news with a slant alters the consumer's political behavior,

as in DellaVigna and Kaplan (2007), then the existence of slanted news could lead to a polarizing feedback loop: an "echo chamber" where partisans can reinforce and strengthen their initial biases.[1] Furthermore, an interested party could influence the political process by controlling media outlets, as in Prat (2014).[2] Such concerns led the Federal Communications Commission (FCC) to condition approval of the merger of Comcast Corporation and NBC Universal in 2010 on the requirement that Comcast take steps to promote independent news services.[3]

The central new results in this paper are that the Fox News effect in presidential elections grew from 2000 to 2008 because of a combination of increasing viewership and increasingly conservative slant on Fox News; and that the cable news channels can explain an increase in political polarization of similar size to that observed in the US population over this period. We also find that the dispersion in partisan slant across cable channels increased from 2000 to 2012; that Fox News's viewership-maximizing slant is much more centrist than its observed slant; that the cable-news-driven increase in polarization relies on consumers' taste for like-minded news; and that we can confirm the approximate magnitude of the finding in DellaVigna and Kaplan (2007) for the effect of Fox News on the 2000 election using a new dataset.

To generate these results, we first propose a new instrument for exposure to media bias to complement estimates based on news channel availability: the channel positions of news channels in cable television lineups. The channel position is the ordinal position of news channels in the cable lineup. The assertion is thus that the Fox News Channel will be watched more when it is channel position 25 instead of channel position 65. We demonstrate that a one-standard-deviation decrease in Fox News's channel position is associated with an increase of approximately 2.5 minutes per week in time spent watching Fox News. We estimate that watching the Fox News Channel for this additional 2.5 minutes per week increases the vote share of the Republican presidential candidate by 0.3 percentage points among voters induced into watching by variation in channel position. The corresponding effect of watching MSNBC for 2.5 additional minutes per week is an imprecise zero.

As with any instrumental variables design, it is critical that the channel positions for Fox News and MSNBC are not chosen to accord with local political tastes. Empirically, we show that Fox News channel position does not predict pre-Fox News political outcomes, including 1996 county-level Republican voting and 1996 political contributions to Republican candidates. Additionally, Fox News cable positions are not negatively correlated with the predictable-from-demographics component of either Republican voting or Fox News viewership. In other words, in areas where demographics would predict the Republican vote share to be high, Fox News is not

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[1] Gentzkow and Shapiro (2008) detail the complexities in designing optimal regulatory policy for media markets. Gentzkow and Shapiro (2011) indicate that media consumption tends to be balanced across slanted sources.

[2] Existing evidence from Gentzkow and Shapiro (2010) shows that owner partisanship is not an important determinant of newspaper slant. The sample size is too small to test this hypothesis in the case of cable news.

[3] The condition required that Comcast move "independent" news channels such as Bloomberg Television into "news neighborhoods." This effectively required Comcast to move Bloomberg next to channels such as MSNBC and CNN in their channel lineups. The FCC justified the condition "in accordance with the special importance of news programming to the public interest," and did not place any such conditions on nonnews programming. See Federal Communications Commission, MB Docket No. 10-56, paragraph 122 (2011), https://apps.fcc.gov/edocs_public/attachmatch/FCC-11-4A1.pdf.

systematically located in lower channel positions. And in areas where demographics would predict Fox News viewership to be high, Fox News is not systematically located in lower channel positions. Furthermore, Fox News's local cable channel position does not predict local viewership of Fox News by satellite subscribers, who see a different, nationwide channel lineup.

We then quantify the preference for like-minded news by adapting the method of Gentzkow and Shapiro (2010), who estimate this quantity in the context of newspapers. We measure the relationship between changes in a text-based slant measure over time and the characteristics of viewers of these channels. A key source of variation in this exercise is MSNBC's change in business strategy toward offering more liberal content. Our ideology estimates pick up this format switch; MSNBC closely tracks CNN in the early 2000s, but then moves left following the format switch in 2006. We estimate that Fox News's ideology has been moving further to the right in the most recent years.

We combine the analysis of the influence of slanted news with the demand for slanted news in a structural model that allows the quantification of polarization dynamics and media power. The model features consumer-voters who choose how much time to spend watching the cable news channels; whether to subscribe to cable, satellite, or no pay television service; and for whom to vote in presidential elections. Consumers' allocation of time to television channels is governed by their preferences for the channels (which are a function of their ideology, the channels' ideologies, and their demographics), and the availability of the channels (whether the cable operator carries them and, if so, the positions they occupy on the channel lineup). Consumers' ideologies evolve from their initial position depending on how much time they allocate to watching channels of different ideologies. This process culminates in a presidential election in which consumers choose for whom to vote.

We estimate the parameters of the model by simulated indirect inference. The criterion function is the distance between two-stage least squares estimates of voting on demographics and minutes watched of each channel, using channel positions as instrumental variables, in the actual data and in data simulated from the model. In addition to matching the second stage regression coefficients, we also match the first-stage (viewership equation) regression coefficients and the OLS regression coefficients.

We use the estimated model to quantitatively assess the degree of ideological polarization induced by cable news; the effect of the entry of Fox News prior to the 2000 presidential election; and the degree of "media power" (Prat 2014) possessed by each of the news channels individually as well as a hypothetical conglomerate under unified ownership. We find that cable news does increase ideological polarization among the viewing public. The increase in polarization predicted by our model is comparable in magnitude to the estimated decade-long increase in polarization derived from the General Social Survey. In absolute terms, however, this increase is fairly small, consistent with existing research in political science (Ansolabehere, Rodden, and Snyder 2006; Fiorina, Abrams, and Pope 2008; Bafumi and Herron 2010) showing that ideological polarization among the public is much lower than among their elected representatives, in both levels and recent growth rates.

In other results, we estimate that removing Fox News from cable television during the 2000 election cycle would have reduced the overall Republican presidential vote

share by 0.46 percentage points. The predicted effect increases in 2004 and 2008 to 3.59 and 6.34 percentage points, respectively. This increase is driven by increasing viewership on Fox News as well as an increasingly conservative slant. Finally, we find that the cable news channels' potential for influence on election outcomes would be substantially larger were ownership to become more concentrated.

This paper contributes to the empirical literature on the relationship of news media to political outcomes.[4] The closest papers to this study are by DellaVigna and Kaplan (2007) and Gentzkow and Shapiro (2010).

DellaVigna and Kaplan (2007) study the effects of Fox News by comparing vote shares in locations with and without cable access to Fox News by November 2000. Our contributions to this strand of the literature are to introduce a new identification strategy based on channel positions, and to update their availability-based estimates using more accurate data from Nielsen on Fox News availability.[5] Channel position variation allows a researcher to examine the effects of cable news in later years where there is negligible variation in availability of these channels, and could be useful for studying the effects of media consumption in other contexts. We confirm, using Nielsen viewership data, that the availability of Fox News has a large and statistically powerful relationship with viewership of Fox News. In terms of results, we estimate a Fox News effect that is statistically positive and quantitatively large as in the DellaVigna and Kaplan (2007) analysis. Indeed, our estimated counterfactual effect of removing Fox News on the change in year 2000 election Republican vote share is 0.46 percentage points, which resonates well with the updated DellaVigna and Kaplan (2007) estimate range of 0.26 to 0.36 percentage points.

Our approach follows Gentzkow and Shapiro (2010) in several dimensions, including the use of text analysis to measure media outlets' slant. Like Gentzkow and Shapiro (2010), we treat ideological slant as a characteristic over which consumers have heterogeneous tastes when choosing media consumption levels. Our contribution is to model media consumption together with voting, to separately measure tastes for like-minded news and the influence of slanted media consumption on consumer ideology. The influence effect also interacts with the existence of tastes for like-minded news. Consumers for whom both effects are present can be induced into a feedback loop in which they consume slanted media, their ideologies then evolve in the direction of the slant, their taste for that slanted media increases, and so on. In this sense, this paper combines the literature on the persuasive effects of the media with the literature on self-selection into consumption of slanted media to explore media-driven polarization and to counterfactually simulate alternative ideological slant strategies by the cable news outlets.

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[4] A number of papers have demonstrated that media usage or availability affects behavior. Among others, Chiang and Knight (2011) find positive effects of unexpected newspaper endorsements on vote shares for the endorsed candidate. Gentzkow (2006) finds decreased voter turnout from television access. Gerber, Karlan, and Bergan (2009) find positive effects of newspaper exposure, regardless of slant, on Democratic vote shares in the 2005 Virginia gubernatorial elections. Enikolopov, Petrova, and Zhuravskaya (2011) find that viewing an independent news channel in Russia increased vote shares for the opposition parties and decreased overall turnout in 1999. Lim, Snyder, and Strömberg (2015) find that media coverage can affect criminal sentencing decisions for judges.

[5] In online Appendix D, we document that Fox News availability in DellaVigna and Kaplan (2007) is measured with error. Nearly 40 percent of the "control group," the locations that they consider as not having cable access to Fox News in 2000, did in fact have cable access to Fox News. Twenty-five percent of the control group had Fox News availability since 1998.

I. Institutional Overview

During our study period of 1998–2008, most American households had three options for television service: a wire-based cable package, a satellite package, or over-the-air broadcast signals.[6] In 2000, most pay television subscribers were cable subscribers, but by 2008, satellite providers had a market share of about 30 percent. The set of channels on cable varies both across providers and within providers across locations. Each of the two nationwide satellite providers, DirecTV and the Dish Network, have their own packages and lineups that are common to *all* locations nationwide. Cable content is produced by media conglomerates such as Viacom, News Corporation, ABC-Disney, or NBC Universal. The cable and satellite providers contract with these firms to offer their content to subscribers.

The foci of this study are the cable news channels. CNN began broadcasting in 1980 as one of the earliest cable channels of any genre. The Fox News Channel (FNC) and MSNBC both entered the market in the mid 1990s. FNC quickly gained a reputation for being slanted to the right (Rutenberg 2000). FNC is now one of the most highly rated cable channels across all genres. MSNBC began as a joint venture between NBC and Microsoft. For its first ten years, MSNBC did not have any obvious slant and featured show hosts from across the political spectrum. MSNBC changed its business strategy starting around 2006 to provide news with a more liberal slant, as detailed in Sanneh (2013), culminating in adopting the slogan "Lean Forward" in 2010.

The channel lineup, or the numerical ordering of channels, that cable subscribers encounter varies by local cable system. The first channel positions are generally allocated to over-the-air broadcast affiliates; for example, NBC4 occupies position four in the Washington, DC area. After the over-the-air channels, the cable channels begin. We assert in this paper that the ordering of a channel in the lineup can have significant effects on the viewership of news channels (though the significant relationship between channel position and viewership holds for all genres, not just news).

Figure 1 plots the relationship between the residual component of ratings—the portion that is not explained by viewer demographics and channel-specific state-year fixed effects—and channel position for a set of 34 channels, including both the news channels and other channels that tend to occupy similar positions in cable line-ups. There is a clear negative, and very nearly linear, relationship between position and ratings over the range of positions which the news channels typically occupy. Table A1 in online Appendix G documents the own-position coefficients on ratings for each of these channels; all are negative and almost all are statistically significant.

The obvious empirical concern is that a channel might be placed in lower positions in localities with high tastes for the channel. We later examine and reject that concern empirically in a variety of ways. Describing the process by which channel positions were determined historically provides additional support for the claim that channel positions are valid instruments.

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[6] Some households, for example households in remote rural areas, did not have a cable option. Some households which did not have a direct line of sight due to physical obstructions like tall buildings, trees, or steep slopes, did not have a satellite option. And some households, mostly in urban areas, had two wire-based cable operators. In 2004 about 85 percent of US zip codes, accounting for about 67 percent of the total population, were served by a single monopolist wire-based cable operator.
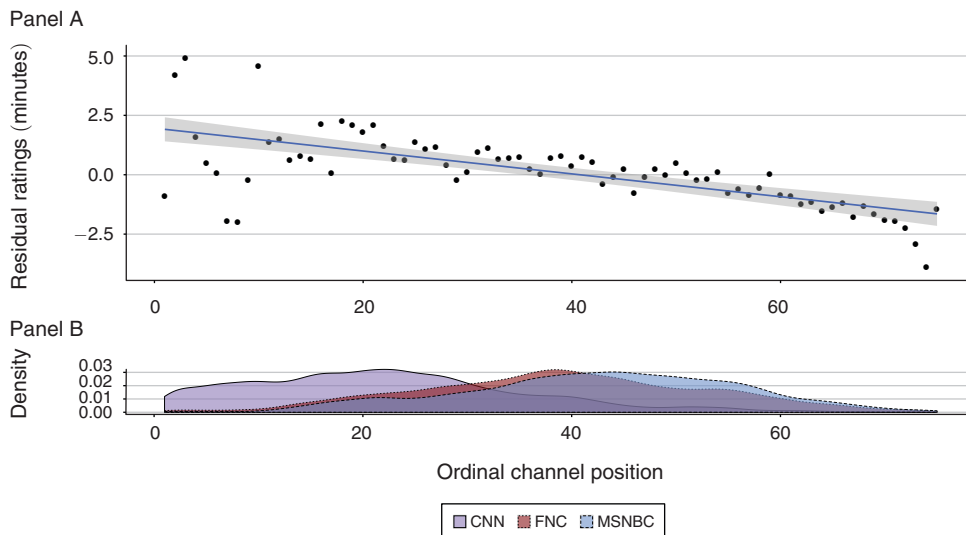
Panel A

Panel B

FIGURE 1. CHANNEL POSITIONS AND VIEWERSHIP

Notes: Panel A shows the relationship between the residual component of minutes watched and channel position, in a set of 34 comparable cable channels whose median positions across cable system-years are between 30 and 60 and thus typically occupy similar positions to FNC and MSNBC. Residuals are constructed by regressing minutes watched per week (in the Mediamark individual-level dataset) on the full set of individual demographics plus state-year fixed effects. The predicting regressions are estimated separately for each channel, such that demographic effects and state-specific time trends are allowed to vary by channel. The points in the figure are averages of these residual minutes across all channels located at a given ordinal position. The line is the least-squares fit. Panel B shows the density of the three news channels' ordinal positions across system-years for comparison.

The mid-1990s, during which FNC and MSNBC were rolling out, was a tumultuous time for the cable industry. This period saw many systems upgrade from analog to digital equipment, expanding the number of channels cable operators were able to offer. Coincident with this technical advance, a wave of new channels entered cable lineups alongside first-generation channels like CNN, ESPN, and HBO. New channels were often allocated positions sequentially, in the order in which they joined a system.[7] As a result, the channel positioning of FNC or MSNBC on a given local system depended on the timing of that system's bilateral negotiations with multiple new channels as well as its decision of when to upgrade. On capacity constrained systems owned by the multiple-system operator TCI in 1996, FNC was reported to have replaced one of as many as 12 different channels (Dempsey 1996). Combined with the desire to limit changes in positions so as to not confuse customers, these chaotic factors generated persistent cross-system variation in the positioning of FNC and MSNBC.[8]

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[7] In online Appendix G, we show that channel positions correlate with the best available position in the year before a channel was added.

[8] Some systems have shuffled positions over time as channels went out of business, as channel capacity expanded, and as new channels came online. Some local managers pursued a strategy of moving channels with similar content or in the same genre together into "neighborhoods," when possible. In general, however, the ordering of cable channels is highly persistent from year to year: the autoregressive coefficient in a regression of channel position in year t on channel position on the same system in year $t - 1$ ranges from 0.94 (MSNBC) to 0.97 (CNN).

II. Data

We use nine categories of datasets: (i) Nielsen FOCUS data on cable channel lineups by zip code by year; (ii) precinct-level voting data from the 2008 Presidential election; (iii) individual survey data on intent to vote Republican in 2000, 2004, and 2008 US Presidential elections; (iv) Nielsen viewership data at the zip code level for the cable news channels from 2005 to 2008; (v) individual survey data on cable news viewership for 2000 to 2008; (vi) county-level presidential election vote share data; (vii) US census demographics by zip code, 1996 political donation data by zip code from the Federal Elections Commissions, and the 2010 religious adherence data by county from the Religious Congregations and Membership Study (RCMS); (viii) broadcast transcripts of cable news from Lexis-Nexis; and (ix) the Congressional Record. In online Appendix A, we provide details on how we cleaned and joined the datasets. Online Appendix B provides summary statistics.

A. *Cable Lineups: Nielsen FOCUS*

The Nielsen FOCUS database consists of yearly observations of cable systems. The key variables in this dataset are, for each system and year, the availability of CNN, FNC, and MSNBC, the channel positions of CNN, FNC, and MSNBC, when available, and the zip codes served by the system. In Figure 2, we document the availability of each of these news channels by year. CNN was already near-universal by 1998; FNC and MSNBC expanded over the early part of the sample period, reaching the vast majority of cable subscribers by 2002.

B. *Zip Code Level Voting Data and Demographics*

We use the "Precinct-Level Election Data" from Ansolabehere, Palmer, and Lee (2014) which provides votes cast in the 2008 Presidential election for each party, by voting precinct. We aggregate these precinct-level totals up to the zip code level, and compute the two party vote share for each zip code. We combine these with demographic data from the US census for 2010. These data are summarized in online Appendix B, Table A1.

C. *Individual Voting Data: NAES and CCES*

The National Annenberg Election Study (NAES) is a large-scale phone survey conducted each presidential election cycle. We use data from the 2000, 2004, and 2008 election cycles, including the confidential zip code field. The key variables are demographic variables such as race, age, and income; zip code; and actual or online intent to vote in the current presidential election. These data are summarized in online Appendix B, Table A2. For 2008, we add data from the Cooperative Congressional Election Study (CCES) on the same variables that we use from the NAES. In all years, NAES/CCES individuals were matched to their corresponding news channel availability and positioning using their zip code of residence to identify their local cable provider in the Nielsen FOCUS data.
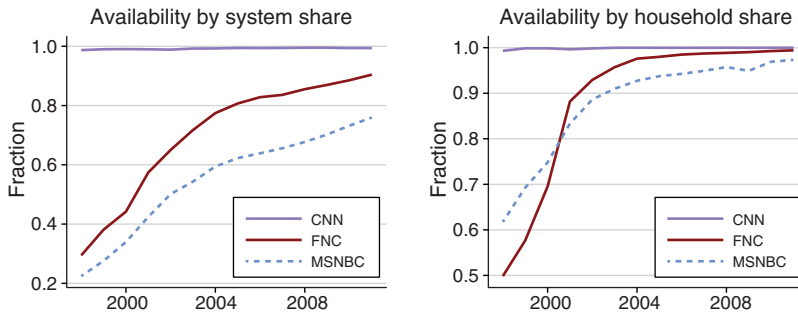
FIGURE 2. AVAILABILITY OF CABLE NEWS CHANNELS BY YEAR

Notes: Availability of cable news channels by year. The left panel lines represent the fraction of cable systems which carry the news channels. The right panel lines represent the fraction of cable subscribers for whom the news channel was carried on their system.

D. *Zip Level Viewership Data: Nielsen*

Nielsen measures television viewership from a rotating panel of households. We acquired zip code level ratings for CNN, FNC, and MSNBC from the Nielsen Local TV (NLTV) database for the years 2005 through 2008. The Nielsen data also report viewership conditional on being a cable subscriber and conditional on being a satellite subscriber. The measurements come in the units of rating points which indicate what fraction of persons were tuned in to each channel in a given time period. We convert to average hours per week by multiplying this fractional rating by 168, the total number of hours in a week. These data are summarized in online Appendix B, Table A3.

E. *Individual Viewership Data: Mediamark and Simmons*

Mediamark and Simmons are two commercial data vendors who survey individuals on their usage of different brands, including media usage. We use Mediamark for 2000 to 2007, and Simmons for 2008. The key variables for our study are year, zip code, individual demographics, whether the respondent subscribes to cable, satellite, or neither, and the reported number of hours watched per week of CNN, FNC, and MSNBC. These data are summarized in online Appendix B, Table A4.

F. *County-Level Vote Shares and Demographics*

We use county-level presidential vote shares for the Presidential election in 1996 from the Voting and Elections Collection Database maintained by *Congressional Quarterly*. We also use zip code level demographic statistics from the 2010 US census. We construct county-level distributions of household income, age, race, education, and initial ideology, for use in the model in Section IV. We also use this data to condition on the pre-Fox News county-level Republican vote share in some of our regression specifications.

G. *Broadcast Transcripts and Congressional Record*

To quantify the slant of each news channel in each year, we follow Groseclose and Milyo (2005) and Gentzkow and Shapiro (2010) in comparing the language that the channels use to language that congresspeople use. This procedure is designed to capture the connotations that a politician or media outlet can imply by using differences in language to describe the same program or policy, e.g., "personal accounts" versus "private accounts" or "war in Iraq" versus "global war on terror." It cannot, however, pick up all forms of slant present in television news—for instance, the use of quotations or clips from an opponent's speech in order to satirize or mock the opponent's views—and thus likely underestimates the dispersion in slant among the slanted outlets.

We obtained broadcast transcripts for CNN, FNC, and MSNBC from the Lexis-Nexis database for the sample period 1998–2012 by downloading all transcripts in each year for each identifiable cable news program from each of the three channels. Online Appendix C details the procedure we employ.[9]

Each congressperson has a measure of their ideology, derived from roll-call votes: the DW-NOMINATE score of McCarty, Poole, and Rosenthal (1997), which places each congressperson on the interval $[-1, 1]$. More positive scores correspond to more conservative legislators. Our approach first measures the relationship of phrase usage to DW-NOMINATE ideology among members of Congress. There are many more two word phrases than congresspeople, however, and an ordinary least squares criterion is therefore useless. For each year, we run an elastic net (Zou and Hastie 2005) regularized regression of DW-NOMINATE score of frequency of phrase usage where an observation is a congressperson. Table 1 shows the most partisan phrases selected by the elastic net regression.

We use the estimated coefficients to predict the DW-NOMINATE score for each cable news channel in each year. We then apply a three period moving average smoothing filter. The results are shown in Figure 3. FNC is consistently more conservative than the other two channels. However, these differences are small compared to differences between congresspeople during the early years. One contributing factor to the channels being clustered near the center is that some major news events are not as amenable to partisan slant as political news. For example, stories about the disappearance of high school student Natalee Holloway in Aruba receive cable news coverage, but are not obviously political. MSNBC closely tracks CNN initially, and then becomes consistently more liberal—though by much less than the gap between CNN and FNC—in the mid-2000s. The estimates reveal an increasing polarization of cable news over time. In online Appendix C, we assess the robustness of our estimated channel ideologies to alternative statistical models, and to using a fixed set of phrases over the time period. We also construct a measure of slant that does not rely on phrase counts at all, using the share of time allocated to guests who are elected officials from each party. All of these variants display a similar pattern over time.

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[9] The broadcast transcripts do not include political advertisements aired on these channels. However, the amount of political advertising on cable news is small. In the 2004 presidential election, according to the Wisconsin Advertising Project, only 1,211 out of 812,091 thirty second spots (across 210 DMAs) aired on FNC. FNC airs a total of 245,280 thirty second ad spots per year, so political advertisements were a small fraction of these in 2004.

Table 1—Top 10 Partisan Phrases for Years 2000, 2004, and 2008

2000	Party	2004	Party	2008	Party
Republican leadership	D	Mai 5	R	Bush administr	D
Clinton Gore	R	Ronald Reagan	R	Strong support	D
Feder govern	R	Social justic	D	African American	D
African American	D	War Iraq	D	Cost energi	R
Civil right	D	African American	D	Pass bill	D
Gore administr	R	Reagan said	R	Will us	R
Death tax	R	fail provid	D	New refineri	R
Pass bill	R	Illeg alien	R	Civil right	D
Support democrat	D	Marriag licens	R	Work famili	D
Peopl color	D	Limit govern	R	Full time	D

Notes: These are the ten phrases which have the largest absolute magnitude coefficient among those selected by the elastic net for the corresponding year. Word variants are stemmed to their roots.
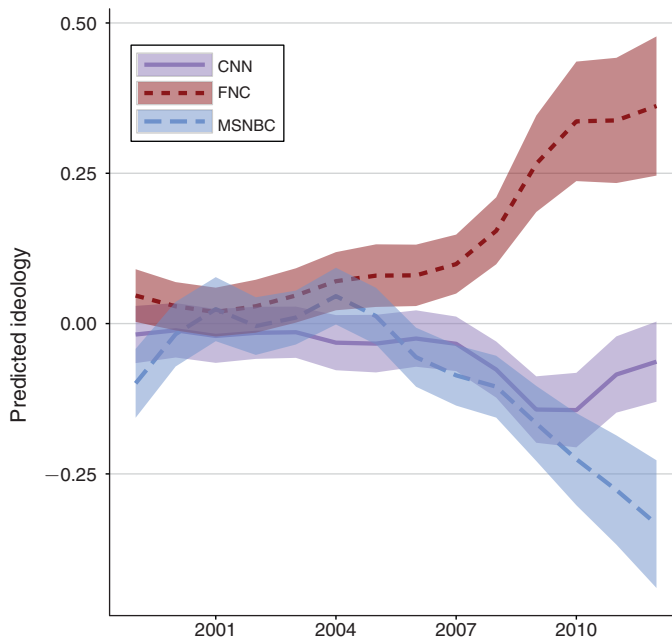
Figure 3. Estimated Ideology by Channel Year

Note: Each point corresponds to the estimated ideology of the news channels based on phrase usage as described in the text, with 95 percent confidence bounds shaded.

The text based measures produce estimated ideologies for the channels that are more moderate than the median members of each party. In the modeling to come, we allow for consumers to perceive these news channels as more or less ideologically differentiated, in proportion to these estimates. Indeed, our estimates for this scale factor put FNC very close to the median Republican member of Congress.[10]

[10] In online Appendix C, we explore using alternative prediction models such as the random forest, as well as running the prediction model on the pooled sample of Congress-years, rather than year-by-year. The general pattern of estimated slant by channel is similar in these cases.

III. Regression Analysis

This section presents the relationship between cable channel positions, watching FNC, and voting for Republican presidential candidates. These results underlie the model estimation and simulation in later sections. However, the results here do not depend on that model, and can be read as a stand-alone two-sample instrumental variables regression analysis.

A. *First Stage: Viewership and Channel Position*

The first stage describes how cable news viewers' time watched vary with channel position. The idea is that lower channel positions induce more viewership for channels such as FNC because the more popular channels tend to be in lower positions, for historical reasons.[11] Consider a viewer who just finished watching a television program, and begins to search for a new program. Their search will begin from the channel they were watching, which is likely to be in a low position. They are more likely to stop nearer to the original channel than further away.[12]

Table 2 presents first-stage estimates of Nielsen-measured FNC viewership on the position of FNC. This set of viewership data spans all states and the years 2005 to 2008. The estimating equations for a news channel c take the form

$$(1) \qquad h_{zt}^c = \delta_{ct} + a_{zct} + \alpha_c x_{zt} + \zeta_{c,FNC} p_{zt}^{FNC} + \zeta_{c,MSNBC} p_{zt}^{MSNBC} + \epsilon_{zct}^H,$$

where h_{zt}^c is the average minutes watched per week of all Nielsen households[13] in zip code z in year t; δ_{ct} are channel fixed effects, which are allowed to vary by year, state-year, or county-year depending on the specification; p_{zt}^j is the cable channel position of channel j in zip code z in year t; x_{zt} are average demographic characteristics of zip code z; and a_{zct} are dummy variables for cable availability of the cable news channels in zip code z in year t. We weight the observations by the number of Nielsen respondents in the zip code-year. This weighting improves efficiency as the variance of the left hand side ratings estimate is decreasing in the zip code-year sample size. In particular, a handful of zip codes have sample sizes of one and ratings measurements that are six or more standard deviations from the mean. The relative importance of these zip codes is reduced when weighting by sample size. In Table A4 in the online Appendix, we drop zip codes with fewer than ten Nielsen respondents, and find similar results as with weighting.

Table 2 reports specifications with year fixed effects, state-year fixed effects, and county-year fixed effects and different sets of conditioning variables. The primary

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[11] In addition to the broadcast networks ABC, CBS, Fox, and NBC, the lower channel positions are generally occupied by the earliest cable entrants (e.g., ESPN, MTV, TNT, and USA), which also have high viewership.

[12] Bias to the top of a list or default option in search is documented in eye tracking studies for yellow pages (Lohse 1997) and survey response (Galesic et al. 2008). There is a theoretical literature in economics modeling such behavior (see Rubinstein and Salant 2006, Horan 2010, Masatlioglu and Nakajima 2013, and the literature on status-quo bias more generally).

[13] We use time among *all* households, and not only wired cable subscribers, even though the instrument can only affect cable subscribers. The reason for this is that the second stage dataset—vote totals—does not allow us to discriminate between cable and satellite subscribers. The first stage is substantially stronger when estimated on cable subscribers alone, which can be seen in Table 6.

Table 2—First-Stage Regressions: Nielsen Data

	FNC minutes per week					
	(1)	(2)	(3)	(4)	(5)	(6)
FNC position	−0.146	−0.075	−0.174	−0.167	−0.097	−0.111
	(0.043)	(0.039)	(0.028)	(0.025)	(0.033)	(0.030)
MSNBC position	0.078	0.073	0.064	0.070	0.019	0.020
	(0.036)	(0.032)	(0.025)	(0.022)	(0.034)	(0.035)
Has MSNBC only	1.904	1.137	−3.954	−2.804	−1.220	−1.562
	(3.697)	(3.713)	(4.255)	(3.416)	(6.180)	(5.397)
Has FNC only	31.423	26.526	23.460	22.011	15.141	15.069
	(2.677)	(2.546)	(2.278)	(1.864)	(2.697)	(2.314)
Has both	24.859	23.118	18.338	16.168	15.159	14.486
	(2.919)	(2.687)	(2.361)	(1.991)	(3.216)	(2.842)
Satellite FNC minutes				0.197		0.173
				(0.013)		(0.015)
Fixed effects	Year	State-year	State-year	State-year	County-year	County-year
Cable controls	Yes	Yes	Yes	Yes	Yes	Yes
Demographics	None	None	Extended	Extended	Extended	Extended
Robust F-stat	11.39	3.72	39.02	44.7	8.86	13.43
Number of clusters	5,789	5,789	4,830	4,761	4,839	4,770
Observations	71,150	71,150	59,541	52,053	59,684	52,165
R^2	0.030	0.074	0.213	0.377	0.428	0.544

Notes: Cluster-robust standard errors in parentheses (clustered by cable system). Instrument is the ordinal position of FNC on the local system. The omitted category for the availability dummies is systems where neither FNC nor MSNBC are available. In columns 4 and 6, the specification conditions on the average FNC ratings among satellite subscribers in the same zip code. Cable system controls include the total number of channels on the system and the number of broadcast channels on the system, as well as an indicator for Nielsen collection mode (diary versus set-top). Basic demographics include the racial, gender, age, income, educational, and urban/rural makeup of the zip code. Extended demographics includes the Basic set plus information on the percentage of homeowners; median housing values, sizes, ages, and property tax rates; the fraction of the population receiving food stamps; median social security income; the fraction of veterans; the fractions of married, unmarried, and same-sex couples; the share of federal campaign contributions that went to Republican candidates in 1996; the Republican presidential share of the county in 1996; and the religious composition of the county. Observations are weighted by the number of survey individuals in the zip code according to Nielsen.

covariate of interest in these regressions—FNC channel position—varies at the level of the cable system, which may span multiple zip codes. We therefore present cluster-robust standard errors in all specifications, using cable system as the cluster variable. Our preferred specification is column 3, which includes state-year fixed effects and an extensive set of demographic covariates that correlate with Republican voting and residential sorting, including measures of Republican voting and donations from 1996, effectively before FNC.

In column 3, cable positions of both FNC and MSNBC significantly predict viewership of FNC, in the expected directions. A one standard deviation increase in FNC channel position predicts a decrease in average viewership of about two and a half minutes per week. In column 5, we use county-year fixed effects and the extensive demographic set. Here, the coefficient falls in magnitude by about 40 percent, however it remains significantly different from zero. The more limited variation induced by the instrument within a county-year is one limitation of this specification. The cluster-robust F-statistic for the ordinal FNC position is 39.02 in the specification with state-year fixed effects and extensive demographics. The effect of cable access to FNC, as used in DellaVigna and Kaplan (2007), is a large and statistically precise

predictor of FNC viewership. In particular, the availability of FNC is associated with increased viewership on average of 22 minutes (with state fixed effects) and 15 minutes (with county fixed effects) with associated test statistics exceeding 10 in some specifications.

Columns 4 and 6 of the table add the minutes per week of FNC viewership among *satellite* subscribers in the same zip code. To the extent that satellite and cable subscribers in the same zip code have similar tastes for the news channels, conditioning on satellite viewership controls for unobserved variation in taste for FNC which, if it were correlated with channel position, would bias the estimates of the position effects. Comparing columns 3 with 4 and 5 with 6 reveals that the position coefficients are essentially unchanged with the addition of conditioning on same-zip code satellite minutes.

First-stage results with MSNBC viewership on the left-hand side of equation (1) are very similar, though the direction of coefficients on FNC and MSNBC positions are reversed. The power of channel positions for predicting MSNBC viewership is also similar. For brevity, we relegate these results to online Appendix F, Table A5. Online Appendix E, Tables A1 and A6 document that the same first-stage relationships are also evident in the independently sampled individual-level viewership dataset.

B. *Second Stage: Voting and Viewership*

We begin in Table 3 with the reduced form for the zip level data. The regressions take the form

$$(2) \qquad y_z = \gamma_g + a_z + \beta x_z + \zeta_{FNC} p_z^{FNC} + \zeta_{MSNBC} p_z^{MSNBC} + \epsilon_z^R,$$

where y_z is Republican vote share in zip code z, γ_g are either state or county fixed effects, a_z are indicators for availability of the channels, β are coefficients on zip code demographics and cable system characteristics x_z, and p_z^C are the ordinal cable channel positions of channel C in zip code z.

FNC position is significantly negatively correlated with zip code 2008 Republican vote share in all specifications which include demographic covariates, although the relationship is significant only at the 90 percent level in the specification with both county-year fixed effects and the extensive demographics.[14]

The MSNBC position coefficient in the reduced-form tables is generally positive but, unsurprisingly given MSNBC's substantially lower viewership, statistically indistinguishable from zero and less robust across specifications compared to the FNC reduced form. In addition, the ideological estimates in Figure 3 put MSNBC, even in 2008, at a relatively centrist position compared to FNC. Prior to 2006, MSNBC is generally to the right of CNN.

Next, we present zip code-level second stage regression results in Table 4. The regressions take the form

$$(3) \qquad y_z = \gamma_g + a_z + \beta x_z + \zeta_{MSNBC} p_z^{MSNBC} + \rho_f h_z^f + \epsilon_z^V,$$

[14] We report the reduced form for 2004 and 2012 in online Appendix F, Tables A1 and A2. While the results are similar to 2008, the samples for 2004 and 2012 are smaller because of data availability issues.

TABLE 3—REDUCED-FORM REGRESSIONS: ZIP CODE VOTING DATA

	2008 McCain vote percentage			
	(1)	(2)	(3)	(4)
FNC cable position	−0.011	0.004	−0.027	−0.015
	(0.023)	(0.020)	(0.008)	(0.008)
MSNBC cable position	0.054	0.041	0.008	0.003
	(0.019)	(0.016)	(0.005)	(0.006)
Has MSNBC only	−2.118	−0.465	0.749	1.374
	(1.585)	(1.306)	(1.002)	(1.219)
Has FNC only	7.557	5.500	2.262	1.061
	(1.175)	(0.975)	(0.547)	(0.504)
Has both	4.223	4.351	1.358	0.814
	(1.521)	(1.269)	(0.661)	(0.609)
Fixed effects	None	State	State	County
Cable system controls	Yes	Yes	Yes	Yes
Demographics	None	None	Extended	Extended
Number of clusters	6,035	6,035	4,814	4,814
Observations	22,584	22,584	17,400	17,400
R^2	0.148	0.294	0.833	0.907

Notes: Cluster-robust standard errors in parentheses (clustered by cable system). See first-stage tables for description of control variables.

where y_z is Republican vote share in zip code z, γ_g are either state or county fixed effects, a_z are indicators for availability of the channels, and β are coefficients on zip code demographics and cable system characteristics x_z. We are interested in the coefficient ρ_f on the zip code's predicted average hours watched per week of FNC, h_z^f, produced by the first stage from Table 2.

We compute standard errors by a bootstrap, as deemed appropriate in two-sample IV settings by Inoue and Solon (2010). We use a cluster-robust block bootstrap at the level of cable systems to allow for correlation across zip codes and over time within cable systems.[15] Our estimates imply that being induced to watch an additional hour per week of FNC by the channel position instrument would lead to an approximately 7.2 point increase in the probability of voting Republican in presidential elections for those induced into watching by the instrument. However, the magnitude of the variation induced by the instrument is typically much less than one hour: a one standard deviation increase in channel position induces a roughly 2.5-minute-per-week increase in FNC viewing. The implied change in probability of voting for the Republican candidate from a one standard deviation increase in FNC channel position is thus −0.3 points. With county fixed effects, the precision of the estimates goes down as the confidence intervals widen; however, the point estimates are of a similar magnitude as when using state fixed effects. Online Appendix E, Table A2 reports the second-stage results for the individual-level data, which are also very comparable in magnitude though somewhat less precise than the zip-level version.

Within Table 4, the second-stage coefficient is essentially unaffected by the inclusion of the extensive demographic set. It declines slightly, but remains positive and

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[15] We resample with replacement from the set of cable systems in the data, with independent resamples drawn for the viewership and the voting data.

TABLE 4—SECOND STAGE REGRESSIONS: ZIP CODE VOTING DATA

| | 2008 McCain vote percentage | | | |
	(1)	(2)	(3)	(4)
Predicted FNC minutes	0.152	0.120	0.157	0.098
	$(0.056, 0.277)$	$(0.005, 0.248)$	$(-0.126, 0.938)$	$(-0.121, 0.429)$
Satellite FNC minutes		-0.021		-0.015
		$(-0.047, 0.001)$		$(-0.073, 0.022)$
Fixed effects	State	State	County	County
Cable system controls	Yes	Yes	Yes	Yes
Demographics	Extended	Extended	Extended	Extended
Number of clusters	4,814	3,993	4,729	4,001
Observations	17,400	12,417	17,283	12,443
R^2	0.833	0.841	0.907	0.919

Notes: The first stage is estimated using viewership data for all Nielsen TV households. See first-stage tables for description of instruments and control variables. Observations in the first stage are weighted by the number of survey individuals in the zip code according to Nielsen. Confidence intervals are generated from 1,000 independent STID-block-bootstraps of the first and second stage datasets. Reported lower and upper bounds give the central 95 percent interval of the relevant bootstrapped statistic.

significantly different from zero, when FNC hours among satellite subscribers in the same zip code are included as a covariate. Both of these facts lend some credence to the idea that channel position is not simply picking up local variation in unobserved political tastes.[16],[17]

The OLS coefficient on FNC hours, shown in Table A3 of online Appendix F is significant and positive, as expected, but it is much smaller in magnitude than the corresponding IV coefficients. This is due to at least two factors: first, the zip code level viewership levels are estimates based on samples leading to attenuated OLS coefficients. Second, as the behavioral model makes clear, we are estimating a single coefficient in a world of heterogeneous treatment effects. The IV coefficient measures the local average treatment effect on zip codes whose viewership levels are affected by channel position. The OLS estimate averages across all zip codes in the sample, weighting most heavily those with unusually high or low Republican vote share. It is reasonable to suspect that the complier zip codes are more centrist relative to the outlier zip codes, and thus subject to larger persuasion effects: those whose choice among ideological news channels is most susceptible to influence by channel position are also likely to be those whose pre-existing ideological attachments are relatively weak.

In online Appendix F, we include an analogous specification to Table 4 where MSNBC viewership is the endogenous variable, as well as a dual-instrument version where FNC and MSNBC viewership are both instrumented by FNC and MSNBC positions. The point estimate of the second-stage MSNBC hours coefficient is negative, though smaller in magnitude than the analogous FNC coefficient, in the

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[16] In the specification with satellite hours, the coefficient on satellite hours is negative, a result that may seem counter-intuitive. The reason for this is that predicted hours are predicted *total* hours, across both cable and satellite subscribers. The negative coefficient on satellite hours implies that, *holding total FNC hours watched constant*, the effect on vote shares is smaller, the more of those hours that come from satellite.

[17] In Tables A13, A14, and A15 in the online Appendix, we report results that split the sample up by year, and separately interact the demographics with dummy variables for year.

single-instrument specification. However, the confidence intervals do not allow us to reject a zero effect of MSNBC in the analogue to our preferred FNC specification. We conclude that while there is some suggestive evidence of a MSNBC persuasive effect, it is weaker and less robust than the evidence for FNC. Accordingly, we fit the behavioral model in Section IV using only the information from the single-instrument second stage results for FNC.

C. *Instrument Validity Support*

In this section, we provide evidence on the quasi-experimental nature of the channel position. We ask: (i) In zip codes whose demographics predict that the Republican vote share should be high, is FNC systematically in lower channel positions? (ii) In zip codes whose demographics predict that the viewership of FNC should be high, is FNC systematically in lower channel positions? (iii) Is FNC in lower positions in zip codes which had higher measures of Republican-ness in 1996, before FNC? (iv) Does the FNC position in the cable lineup predict viewership for satellite subscribers in the same zip code, who do not interface with the cable lineup? The answers to questions (i)–(iv) are all negative. In online Appendix G.G4, we show additionally that FNC viewership does not correlate with FNC channel positions on nearby systems, nor future FNC channel positions on the same system. Furthermore, the 2008 McCain vote share does not correlate with FNC channel position on nearby systems.

The first two columns of Table 5 show the relationship of FNC cable position with *observable* variation in local taste for FNC. The left hand side here is predicted minutes watched of FNC per week, using only demographic information as covariates; predicted minutes per week are then regressed on FNC cable position. The relationship is positive and significant. For assessing the identifying assumption, positive estimates are re-assuring as they indicate that FNC positions are *higher* in locations with observable demographics which would predict more FNC viewing.

The next two columns of Table 5 regress the predicted voting outcome from a regression of vote preference that excludes position, on the FNC cable position. This predictable component of variation in political preference has a correlation with FNC position that is again positive, though not always significantly different from zero; i.e., FNC's position in cable territories that are expected to be more Republican given observables is, if anything, slightly worse than average. Similarly, we show in Table A3 of online Appendix G that the coefficients on FNC position in both the first-stage viewership regression and the reduced form do not change substantially as we add or remove subsets of variables that are highly predictive of both voting Republican and watching FNC. These results together say that areas which are predicted, based on demographics, to be highly Republican or to have high FNC viewership do not have lower FNC channel positions.

Columns 5 through 7 check whether FNC position is correlated with political variables that predate FNC's arrival: the share of federal campaign contributions from the zip code that went to Republican candidates in 1996, and the (county-level) Republican presidential vote share in 1996. The idea is to test the conjecture that cable position proxies for pretreatment variation in political tastes. Again, the majority of the correlations are positive (the opposite direction from the reduced form), and none differs significantly from zero.

Table 5—FNC Cable Position Placebo Tests

	Predicted viewing		Predicted voting		1996 contributions		1996 vote
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
FNC position	0.100	0.033	0.027	−0.0004	0.0002	0.001	−0.006
	(0.034)	(0.026)	(0.022)	(0.017)	(0.0002)	(0.0003)	(0.012)
Fixed effects	State-year	County-year	State-year	County-year	State-year	County-year	State-year
Demographics	Extended	Extended	Extended	Extended	Extended	Extended	Extended
Number of clusters	4,830	4,839	4,814	4,827	4,830	4,839	4,830
Observations	59,551	59,694	17,400	17,451	59,551	59,694	59,551
R^2	0.380	0.827	0.339	0.729	0.176	0.436	0.571

Notes: Cluster-robust standard errors in parentheses (clustered by cable system). Columns 1–4 regress predicted-from-demographics hours of FNC and predicted-from-demographics Republican vote share, respectively, on FNC cable position. The predicting regressions exclude FNC position but include the indicated set of demographic controls. Columns 5–7 regress indicators of pretreatment political attitudes (1996 county-level Republican presidential vote share and 1996 zip code level Republican campaign contribution share) on FNC cable position. 1996 vote data is defined at the county level, and thus there is no specification with county-state-year fixed effects for this dependent variable.

We next introduce a placebo test using satellite viewership in the same zip code. Satellite subscribers in the same zip code provide a useful placebo group because they do not interface with the local cable lineup; they see a different lineup which is set by the satellite provider at the national level, yet they look similar on observable demographic dimensions.[18] To carry out the satellite placebo test in the zip code level data, we create a dataset which has two observations for each zip code and year: the mean viewership among cable subscribers and the mean viewership among satellite subscribers. We then run the first-stage regression, but interacting the channel positions on their local cable system with an indicator for whether the observation represents viewership for cable or for satellite. If the channel positions on the local cable system are chosen in response to unobservable local characteristics, then these positions should also predict satellite subscribers' viewership.

Table 6 presents the results of the satellite placebo test. The Chow test *p*-value tests for equality between the FNC cable position coefficients. In all columns, we cannot reject that the FNC cable position interacted with satellite subscription is zero, while we reject zero strongly for FNC position interacted with cable subscription. Furthermore, we can always reject the hypothesis that these two coefficients are equal to each other.

IV. Model

We now specify a behavioral model of viewership and voting. The purpose of the model is two-fold: first, we can run counterfactual predictions, such as predicting the effect of removing FNC or quantifying the role of cable news in polarization. Second, the model helps to interpret the meaning of the IV results. Specifically, the heterogeneity in the model draws attention to the role of the IV as measuring local average treatment effects among agents who are heterogeneous in both their

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[18] Table A2 in the online Appendix regresses satellite demographics on cable demographics at the zip code level to show that satellite subscribers and cable subscribers demographics are highly correlated.

TABLE 6—SATELLITE PLACEBO FIRST STAGE: NIELSEN DATA

	FNC minutes per week			
	(1)	(2)	(3)	(4)
FNC position × cable	−0.155	−0.264	−0.151	−0.219
	(0.043)	(0.035)	(0.048)	(0.051)
FNC position × sat	0.031	−0.050	0.037	0.045
	(0.049)	(0.041)	(0.063)	(0.067)
MSNBC position × cable	0.102	0.092	0.035	0.046
	(0.036)	(0.032)	(0.049)	(0.048)
MSNBC position × sat	−0.004	−0.029	−0.029	−0.033
	(0.040)	(0.033)	(0.072)	(0.074)
Fixed effects	State-year	State-year	County-year	County-year
Cable controls	Yes	Yes	Yes	Yes
Demographics	None	Extensive	None	Extensive
Chow test p-value	0	0	0.011	0.001
Number of clusters	5,786	4,830	5,786	4,830
Observations	127,072	107,829	127,072	107,829
R^2	0.032	0.077	0.232	0.278

Notes: Cluster-robust standard errors in parentheses (clustered by cable system). Positions are the ordinal position of FNC/MSNBC on the local cable system. The omitted category for the availability dummies is systems where neither FNC nor MSNBC is available. Cable system controls include the total number of channels on the system and the number of broadcast channels on the system. All controls (including fixed effects) are interacted with a dummy for the observation corresponding to satellite viewership. Observations are weighted by the number of survey individuals in the zip code according to Nielsen.

ideological malleability and in their viewership responsiveness to channel position. These benefits come at the cost of functional form assumptions on exactly how consumers allocate their time watching cable news and how they change their ideology after watching slanted news.

The model has two stages. In the first stage, consumer-voters choose a television package, and how much time to spend watching the cable news channels. In the second stage, consumer-voters vote in the Presidential election. Between the first and second stage, consumer-voters' ideologies evolve as a function of the ideologies of and time spent watching the news channels.

A. *Voter Ideology and Presidential Vote Decision*

Consumer-voters have a latent unidimensional political ideology which determines their vote choice in presidential elections. We denote the left-right ideology of consumer-voter i in year t by r_{it}.

We specify voters' initial ideologies as a function of their county of residence and demographic attributes. Specifically, we estimate a logit model of vote choice with county dummies as explanatory variables, which matches county-level vote shares from 1996. The county-level intercepts from this model then determine the simulated consumers' initial ideologies, along with demographic effects and an i.i.d. logit error term,

$$(4) \qquad\qquad r_{ij0} = \delta_j + \beta'_V d_i + \epsilon_{ij},$$

where δ_j is the estimated county intercept for county j, consumer i's county of residence, d_i is a vector of demographic characteristics associated with consumer i, and β_V is a parameter vector to be estimated. From this starting point, the consumer's ideology evolves in response to both random shocks and the influence of the news channels he watches, according to a process described in detail later in this section.

At election time, each voter votes for the party whose candidate's announced position is closest to her own. Each presidential election has a cutpoint parameter P_t, for $t \in \{2000, 2004, 2008\}$. All voters to the left of the cutpoint (with $r_{it} < P_t$) vote for the Democratic candidate, and those to the right vote for the Republican. We do not model the turnout decision.[19]

B. *Viewership and Subscription*

The viewership time allocation and subscription portion of the model follows Crawford and Yurukoglu (2012). Given access to the news channels C_{jt} in package j in year t, consumer-voter i allocates their time among watching those channels and other activities to maximize

$$(5) \qquad v_{ij} = \sum_{c \in C_{jt}} \gamma_{ict} \log(1 + T_{ijc}),$$

where γ_{ict} is consumer-voter i's preference parameter for news channel c in year t, subject to a budget constraint that the total time available to allocate is 168 hours per week. We normalize the outside option (doing anything other than watching cable news) such that $\gamma_{i0t} = 1$ for all i, t, and parameterize the remaining vector of γ_{ict} as

$$\gamma_{it} = \chi_{it} \circ \nu_{it};$$

$$(6) \qquad \chi_{ict} \sim Bernoulli(\alpha_{0ct} + \Pi_{0c} d_i + \zeta_0 pos_{ict} - \eta((a + br_{ct}) - r_{it})^2);$$

$$(7) \qquad \nu_{ict} \sim Exp(\alpha_{ct} + \Pi_c d_i + \zeta pos_{ict}).$$

The function χ_{ict} determines whether consumer-voter i has a nonzero preference for channel c. It is a random function of demographics d_i according to parameters Π_0, a channel-year specific fixed effect α_{0ct}, the position of the channel in the lineup according to ζ_0, and the distance of consumer-voter i's one dimensional political ideology r_{it} from the channel's text based estimated ideology r_{ct} according to η. This last term represents taste for like-minded news as in Mullainathan and Shleifer (2005) and Gentzkow and Shapiro (2010). The parameters a and b scale the text based ideology measures to allow for consumers to perceive slant as a linear function of the text based slant measure. If η is positive, then increasing the ideological distance between consumer-voter i and channel c reduces the probability i watches c.

If the consumer-voter has a nonzero preference for a channel, the intensity of her preference is drawn from an exponential distribution whose parameter depends

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[19] In Table A16 of the online Appendix, we are not able to pin down a precise effect of cable news on turnout.

on α_{ct}, a channel-year specific fixed effect, demographics d_i according to parameters Π, and the channel position according to ζ. The exponential mixed with a mass at zero is inspired by the individual viewership data, which features a mass at zero and monotonically decreasing density.

The constrained maximization problem defined by (5) has an analytic solution described in online Appendix H. The indirect utility from solving this problem enters into the consumer-voter's decision of whether to subscribe to cable, satellite, or no television package at all. The conditional indirect utility from subscribing to package j is

$$u_{ij} \;=\; v_{ij}^* + \tilde{\delta}_j + \tilde{\epsilon}_{ij},$$

where $\tilde{\delta}_j$ is the mean utility of package j, $\tilde{\epsilon}_{ij}$ is an idiosyncratic logit error term, and j corresponds to cable or satellite. We also allow consumers to subscribe to no package at all which yields corresponding $u_{i0} \;=\; \log(1 + B) + \tilde{\epsilon}_{i0}$.

C. *Ideological Influence*

After watching cable news, consumer-voter i's one-dimensional political ideology evolves as a function of how much time i spends watching the news channels and the ideology of the news channels.[20] We assume that i is attracted toward the ideologies of the news channels she watches, the more so the more time i spends watching. Specifically,

$$(8) \qquad\qquad r_{it} \;=\; \frac{r_{i,t-1} + \rho \sum_c T_{ic,t-1}(a + b r_{c,t-1})}{1 + \rho \sum_c T_{ic,t-1}} + \xi_{it},$$

where $r_{i,t-1}$ is i's ideology in the previous year, r_{it} is i's new ideology, and ρ is a parameter to be estimated which controls the magnitude of news channels' influence on viewers' ideology. The ξ_{it}s are mean-zero, normally distributed random shocks.[21] This formulation implies that in the absence of watching cable news, viewers' ideologies evolve according to a random walk with zero drift.

One interpretation of ρ is as a (per-hour) rate at which viewers receive ideological signals while watching cable news. If voters treat signals from slanted outlets as true draws on the state of the world, and further, if they do not account for the correlation between repeated signals from the same source as in the model of DeMarzo,

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[20] The channel's ideology measure is the same function of the text based slant measure that enters the viewership decision problem.

[21] We calibrate the variance of the ideology shocks to match the yearly rate of party switching found in the American National Election Study's (ANES) 2008–2009 Panel Study. This study tracked and repeatedly interviewed the same group of respondents over the course of a presidential campaign, allowing an estimate of the within-individual propensity to change support from the Republican to the Democratic presidential candidate over time. Specifically, we calibrated the standard deviation to 0.4654. This magnitude implies that, when such a shock is added to a standard logistic distribution, the mass which changes sign matches the observed fraction of party switchers in ANES.

Vayanos, and Zwiebel (2003),[22] then equation (8) arises as the inverse-variance-weighted average of signals observed by viewer i in period t.[23]

The functional form here implies that a consumer-voter's attraction is governed by the same parameter (ρ), whether coming from the left or the right. This rules out that a voter might watch a slanted channel, become disgusted, and move in the opposite direction of the channel as in Arceneaux, Johnson, and Murphy (2012). Furthermore, consumer-voters are naïve about the influence effect when choosing viewing time.

V. Estimation and Results

We estimate the parameters of the model by indirect inference (Smith 1990; Gourieroux, Monfort, and Renault 1993). This implies choosing the model's parameters to generate predictions for an auxiliary model which match the auxiliary model estimated from the data. In essence, we are choosing model parameters so that they generate regression results as close as possible to those in Section III. The auxiliary model consists of 13 linear regressions that fall into four categories, plus a set of unconditional moments: (i) regressions of individual-level and zip code-level viewership of each cable news channel on demographics and channel positions (six regressions); (ii) a linear probability model of watching any positive amount of each cable news channel at the individual level on demographics and channel positions (three regressions); (iii) regressions of individual level intent to vote Republican and zip code level Republican vote share on demographics and predicted time spent watching FNC from (i) (two regressions); and (iv) OLS regressions of intent to vote Republican and zip code level Republican vote share on hours of FNC, MSNBC, or CNN watched (two regressions).[24] (i) and (iii) correspond to the two-stage least squares estimate of the effects of watching FNC on voting Republican, with the addition of analogous first-stage regressions for the other two channels. We introduce (ii) to identify the Bernoulli and exponential components of our utility specification. (iv) corresponds to the OLS regression of intent to vote Republican on viewership presented in Table A3. All regressions include state-year fixed effects. Finally, we also match (v) the actual vote shares in each presidential election, the year by year average hours watched for each channel, and the year by year fraction of nonzero viewership for each channel. We choose the model's parameters so that estimating (i)–(v) on data simulated from the model produce coefficient estimates with minimum distance to those in the data. We weight the distance metric in proportion to the inverse of the variance in the estimated relationships in the real data.

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[22] Gentzkow and Shapiro (2006) explore media consumption and endogenous slant with fully Bayesian consumers.

[23] For this interpretation to hold over a series of periods, we require that at the beginning of each period the consumer gets an ideology shock which returns the variance of his ideology to 1.

[24] The individual-level OLS regression uses, rather than hours watched, an indicator for whether FNC, MSNBC, or CNN is an individual's "most-watched" news source as the right-hand-side variable. The reason for this substitution is, as described in Section II, that we lack an individual-level dataset with information on both hours watched and voting preferences. The NAES survey asked respondents only to list which of the news channels, if any, they watched the most.

A. *Discussion of Variation in Data and Model Parameters*

Here we provide an intuitive description of what in the data helps drive estimates of the model's parameters. The parameter ρ, which determines the degree of influence, is sensitive to the coefficients on projected time in the second stage regression. The parameter η, governing the degree of tastes for like-minded news, is sensitive to coefficients in OLS regression relative to the coefficients on viewership in the second stage regressions. The OLS coefficient estimates on FNC viewership conflates tastes for like-minded news with any influence effect. We isolate the influence effect by using channel positions as instrumental variables, and choose the level of tastes for like minded news to explain the OLS coefficient conditional on the influence effect.

Increasing ζ, the parameters determining the strength of channel positions in the time allocation problem, increases the first-stage coefficients on channel positions. A similar straightforward relationship applies to the demographic factors influencing time watched and the coefficients on demographics in the first-stage regressions.

The parameters P_t, characterizing the three presidential elections in our sample period, are related to the unconditional aggregate vote share moments. These parameters allow the model to capture national trends in party preference. Parameter values β_V are sensitive to the OLS and second stage IV coefficients on demographics. They allow consumers with different demographics to have different mean preferences over party.

Separation of a and b from ρ and η is possible because there are three channels and thus seven moments to work with: the IV coefficient and three from each of the OLS regressions. The asymmetries in the channels' estimated effects relative to their text-based ideological positioning provide variation to distinguish the scaling parameters from ρ and η. The FNC OLS coefficient is more positive than the MSNBC coefficient is negative. Increasing η intensifies the magnitude of both OLS coefficients in similar proportions. Increasing b at a fixed η increases the magnitude of the FNC coefficient at a faster rate than the MSNBC coefficient, because the text-based FNC ideology is more conservative than the text-based MSNBC ideology is liberal.

B. *Model Estimates*

Table 7 shows the main parameter estimates from the model.[25] We estimate positive values for both ρ, the influence parameter, and η, the taste for like-minded news, implying a positive feedback process where voters watch slanted news, are influenced to move closer to the news channel's ideology, and subsequently have even stronger preference for that channel, due to the decreased ideological distance.

The magnitude of the estimate of the taste for like minded news parameter η implies that an ideological distance of one unit between viewer and channel reduces that viewer's probability of watching by about 2.5 percent. For reference, at our estimated scaling parameters, the ideological distance between FNC and MSNBC in 2008 is 4.3 units. Given the quadratic-loss specification of ideological tastes,

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[25] The full set of parameters additionally contains channel-year fixed effects and demographic terms, separately for the amount watched and the probability of watching any. These are omitted here for brevity. The estimated model's fit on regression coefficients is available in online Appendix I.

TABLE 7—KEY PARAMETER ESTIMATES

Parameter	Estimate	Bootstrapped standard error
Slant preference (η)	0.02473	0.0064
Ideological influence (ρ)	0.05244	0.0147
Position effect–ratings	−0.00020	0.00008
Position effect–viewership	−0.00039	0.00094
2000 R/D threshold	−0.31354	0.0368
2004 R/D threshold	0.06380	0.1421
2008 R/D threshold	0.12089	0.0398
Channel ideology intercept (a)	0.32259	0.0311
Channel ideology slope (b)	17.27089	0.0132

Note: Standard errors clustered by cable system and computed by block bootstrap.

this distance implies that an average demographic voter located at the ideological position of FNC in 2008 is about 45 percent more likely to watch FNC than she is to watch MSNBC.

The magnitude of ρ implies that a voter watching an hour per week of a news channel for a year would be influenced to a new ideological position just over 5 percent of the distance to the channel's ideology. Estimates of the channel position parameters, consistent with the data, imply that increasing channel position decreases both the probability of watching any of a channel, as well as the number of hours watched conditional on watching any. The effect on the probability of watching any—row 4 in the table—implies increasing channel position by 20 positions decreases the probability of a typical voter watching a channel by about 1 percent. The channel position effect on the number of hours watched is harder to interpret directly, as the hours-watched model is nonlinear and hence effects of changing these quantities depend on the values of all the other covariates.

Table 8 shows the relationship of viewer preference for channels to demographics. For each demographic attribute included in the viewership model, Table 8 shows the variation in simulated average hours watched of each of the three cable channels as the indicated demographic varies.[26] Some attributes move viewership in the same direction for all channels: older viewers, for instance, watch more of all three cable channels. Other attributes have differential effects: college education increases viewership of MSNBC but decreases it for FNC.

In both our raw data and in the simulations, cable news programs are consumed by agents who do not necessarily share the same ideology as the channel. This result is consistent with the analysis in Gentzkow and Shapiro (2011) who find that much of FNC's audience is composed of people who do not self-identify as conservative, and related, that self-identified conservatives watch other cable news besides FNC. The model estimates match these facts. Furthermore, such a lack of ideological segregation is a necessary precursor in this model for cable news consumption to change voter intentions.

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[26] The figures in the table are conditional means of viewership among all simulated voters with the indicated demographic attribute.

Table 8—Simulated Viewership Demographics

Demographic	CNN	FNC	MSN
Age			
Under 35	54.8	46.2	21.2
35–45	55.3	47.2	21.5
45–65	76.1	62.4	29.4
Over 65	106.5	94.2	38.8
Income			
Under 25K	69.0	73.5	28.0
25–45K	75.7	81.1	38.1
45–85K	81.4	81.2	37.5
Over 85K	85.9	29.8	14.3
Race			
White	77.3	71.4	30.5
Black	82.6	41.8	28.2
Hispanic	62.3	36.7	17.2
Other	84.5	45.0	22.4
Gender			
Female	74.2	62.4	26.6
Male	81.9	70.5	32.4
Education			
College grad	83.2	56.8	31.9
Noncollege grad	76.5	69.3	28.8

Note: Mean simulated viewership (in minutes per week) of CNN, FNC, and MSNBC by demographic group.

This incomplete segregation can be seen in Figure 4, panels A and C, which show the partisan composition of the audiences of FNC and MSNBC in our simulated data. FNC's audience is almost always the most heavily Republican, but both audiences are quite comparable in partisan composition until 2004, when they begin to diverge. By 2008, FNC's audience is about three-quarters Republican; MSNBC's is about 60 percent Democrat. For comparison purposes, Figure 4, panels B and D show the partisan composition of the channels' audiences according to the biennial Pew Media Census.[27] For each channel, we plot the fraction who identify themselves as Democrats or Republicans among respondents who say they "Regularly" or "Sometimes" watch the channel. Though the divergence happens slightly earlier for MSNBC and slightly later for FNC, the same temporal pattern is evident: prior to 2004 the audiences of the two channels are very similar, when a partisan skew in audience composition (toward Republicans for FNC, and Democrats for MSNBC) begins to appear.[28]

We find that the perception of slant for the channels is a multiple of about 17 times the text based slant measure. The text based slant measures place FNC and MSNBC in 2008 closer to the center than the median Republican or median Democratic congressman, respectively. The scaled ideology estimates place FNC to the right of the median Republican voter in 2008. MSNBC's position falls to the left of the median Democratic voter in 2008, although only slightly.

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[27] The Pew data are not used in fitting the model.

[28] Note that the levels of the two graphs do not line up because Pew asks not about vote choice but about party identification, which has three possible values: Democrat, Republican, or Independent. Until 2006, Pew also asked respondents about their votes in the previous presidential election. In those years for which we have data, the fraction of Bush voters on both channels is substantially higher than the fraction of Republican party identifiers, and similar to the level of Bush voters in the simulation.
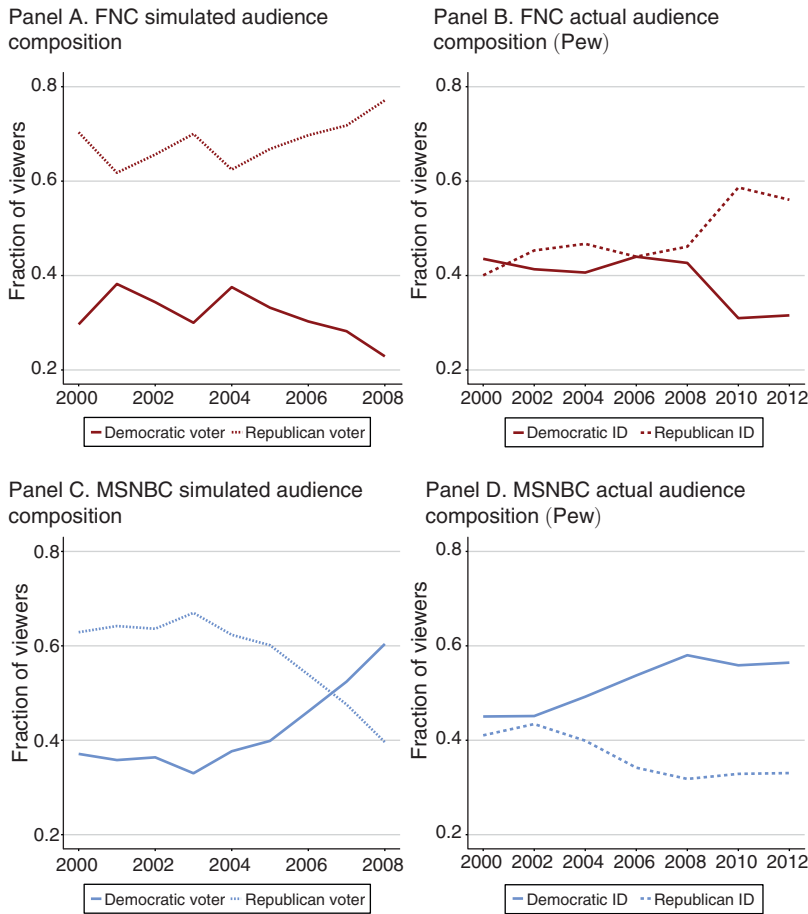
FIGURE 4. PARTISAN COMPOSITION OF VIEWERSHIP OVER TIME

Notes: Panels A and C show the partisan composition of the audience of FNC and MSNBC over time in our simulation. Solid (dashed) lines are the fraction of Democratic (Republican) presidential voters among simulated viewers who watch at least half an hour per week of the indicated channel. Panels B and D show data from the biennial Pew Media Census (not used in fitting the model) for comparison. We plot the fraction of surveyed viewers of each channel who identify with the Democratic or Republican parties in solid and dashed lines, respectively. The fractions do not add to one because Pew also allowed viewers to state their affiliation as "Independent," an option chosen by 10–15 percent of respondents; a fraction which declines over time but in any given year is similar for all three channels. Note that the simulation models only binary presidential vote choices, not party identification.

Table 9 shows the change in the probability of voting Republican with respect to watching an additional three minutes per week of each of the cable channels, again for viewers with different initial ideological types. For initially centrist voters, watching CNN has an influence on the probability of voting Republican that ranges from slightly positive to slightly negative depending on the election. The effect of MSNBC is small but positive (meaning watching MSNBC increases the likelihood of Republican voting) in 2000 and 2004, but becomes negative (at 0.57 percentage points) in 2008 after MSNBC's format switch. The effect of Fox News on centrist viewers is consistently positive, ranging from 0.42 points in 2000 to 1.0 points in 2008.

TABLE 9—VOTING EFFECTS OF VIEWERSHIP

Voter ideology	CNN	FNC	MSNBC
2000 election			
Centrist	0.150	0.421	0.089
	(0.028)	(0.083)	(0.018)
Median Republican	−0.202	−0.016	−0.244
	(0.046)	(0.010)	(0.055)
Median Democrat	0.399	0.609	0.352
	(0.079)	(0.123)	(0.070)
2004 election			
Centrist	−0.068	0.528	0.348
	(0.049)	(0.104)	(0.071)
Median Republican	−0.347	0.086	−0.044
	(0.086)	(0.022)	(0.027)
Median Democrat	0.243	0.687	0.552
	(0.049)	(0.136)	(0.109)
2008 election			
Centrist	−0.405	1.000	−0.569
	(0.085)	(0.207)	(0.119)
Median Republican	−0.595	0.449	−0.719
	(0.125)	(0.092)	(0.150)
Median Democrat	0.009	1.027	−0.108
	(0.004)	(0.215)	(0.024)

Notes: Effects of watching an additional three minutes per week of each channel on the probability of voting Republican, in percentage point terms. Standard errors, in parentheses, are computed by taking 1,000 draws from the asymptotic distribution of the parameters and recomputing the persuasion effects for each draw. We report the standard deviation of the resulting distribution of statistics.

The largest elasticity magnitudes are on individuals from the opposite ideology of the channel. Were a viewer initially at the ideology of the median Democratic voter in 2008 to watch an additional three minutes of Fox News per week, her likelihood of voting Republican would increase by 1.03 percentage points. Another pattern that emerges from the table is that Fox is substantially better at influencing Democrats than MSNBC is at influencing Republicans. This last feature is consistent with the regression result that the IV effect of Fox is greater and more consistent than the corresponding effect for MSNBC.

Finally, we computed estimates of DellaVigna and Kaplan's (2007) concept of *persuasion rates*: the success rate of the channels at converting votes from one party to the other.[29] The numerator in the persuasion rate here is the number of, for example, FNC viewers who are initially Democrats but by the end of an election cycle change to supporting the Republican party. The denominator is the number of FNC viewers who are initially Democrats. We find a persuasion rate of 58 percent in 2000, 27 percent in 2004, and 28 percent in 2008 for FNC. FNC is consistently more effective at converting viewers than is MSNBC which has corresponding estimated persuasion rates of just 16 percent, 0 percent, and 8 percent.

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[29] DellaVigna and Kaplan (2007) use a measure of FNC cable availability in 2000 to generate variation in self-reported viewership. In their case, the viewership measure is an indicator for whether the respondent reports watching 30 minutes or more in a given week. Here, we use a continuous measure, condition on demographics, and account for satellite viewership.

VI. Polarization, Media Effects, and Media Power

In this section, we perform several exercises to quantify the effects of cable news on election outcomes. First, we simulate the evolution of ideology for a group of voters over time to ask whether cable news can contribute to polarization. Second, we estimate the effect of the entry of FNC on the 2000, 2004, and 2008 presidential elections, as well as the effects of the post-2004 MSNBC format switch on the 2008 presidential election. Finally, we measure the "media power" (Prat 2014) of the individual channels as well as a hypothetical combination of the three under unified ownership.

We find that cable news can account for all of the increase in polarization as measured in the data as a statistic of the distribution of an index of policy views from the General Social Survey. We find that the estimated effect of removing FNC on Republican vote share increased in magnitude from -0.46 points in 2000 to an estimated -3.59 points in 2004, and -6.34 points in 2008 as a result of increased viewership. Finally, we find that Fox News's viewership maximizing slant is more centrist than its observed slant, while its media power maximizing slant is close to its observed slant.

A. *Polarization*

A positive ρ and a positive η together create the potential for a polarizing feedback loop, as watching a channel attracts a viewer toward that channel's ideology, which makes watching the channel more attractive, and so on. Figure 5 shows the results of a simulation of viewing and voting behavior to assess the degree of polarization that cable news viewing can generate.

A sample of 10,000 viewers in an average cable system[30] in a county with average demographic characteristics are assigned ideologies from the initial ideology distribution, conditional on their simulated demographics. We run these simulated individuals through the model over ten years.

The resulting distribution of ideologies becomes visibly more polarized as the process continues, with new right and left modes emerging from the initially approximately unimodal distribution. In addition to plotting the distribution, we show the value of the axiomatic measure of polarization of Esteban and Ray (1994) and Duclos, Esteban, and Ray (2004) in each year.[31] This value increases as time goes on, by a total of about 2.5 percent by the end of the 10-year period. The locations of the local maxima in the distribution correspond to FNC's ideological location and an intermediate location between that of MSNBC and CNN.

This increase in polarization requires a taste for like-minded news. Figure 5, panel B, shows the evolution of the ideology distribution when the taste for like-minded news is set to zero. Here, the distribution remains roughly unimodal

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[30] For purposes of this simulation, all viewers are given access to all three cable channels, at the channels' mean positions in 2008. We hold channel positioning, channel fixed-effects, and each channel's ideological slant constant at their 2008 values.

[31] There are four axioms which imply this measure. For example, the first axiom is "If a distribution is composed of a single basic density, then a squeeze of that density cannot increase polarization." We refer the reader to the original articles for full definitions and examples. We compute the measure with the parameter α set to 1.

Panel A. $\eta = 0.025$
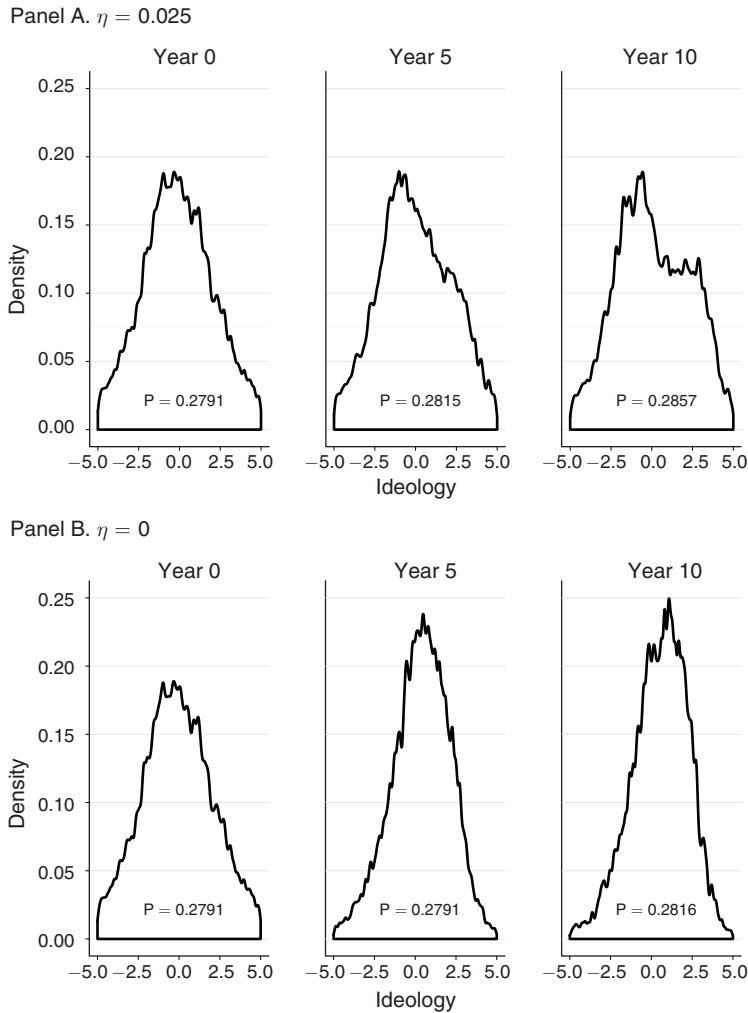

Panel B. $\eta = 0$

FIGURE 5. EVOLUTION OF IDEOLOGY DISTRIBUTIONS

Notes: Voters are initially drawn from the unconditional ideology distribution in 2008. The remaining 10 plots show the change in the ideology distribution over years. The numbers in the center of the plots are the Esteban-Ray polarization measure of the distribution.

throughout. Furthermore, the tails of the distribution thin out, as viewers from across the political spectrum are exposed to and persuaded by news from the other side. Additionally, the distribution shifts on the whole to the right, as FNC's relatively more extreme location allows it to out-persuade its relatively moderate competition. Normally, this greater potential for influence is counterbalanced by the fact that the more extreme location dissuades many left-leaning viewers from watching. But with the taste for slant disabled, viewers from across the political spectrum are exposed to Fox.

The evidence on the actual increase in polarization among American citizens during this time period is mixed. Fiorina, Abrams, and Pope (2008) find that polarization has not increased among the public through 2008. However, more

recent data suggest possible increases (Pew Research Center 2012).[32] We follow Ansolabehere, Rodden, and Snyder (2006) to create an individual ideology score from the answers to a series of questions from the General Social Survey (GSS) for 1996 to 2014. These questions ask about positions on tax and spending levels, abortion, drug and crime policy, the environment, and attitudes toward business, labor, homosexuality, and religion. For each multiple choice question, Ansolabehere, Rodden, and Snyder (2006) assign answers to be either Republican (1) or Democrat (-1). An individual's score is the sum of their answers' ideologies across questions. Each sample in the GSS has an associated distribution of ideology scores for which we compute the polarization measure.[33] The levels of the polarization measure in the GSS data are very similar to those for our simulated voters; in 2004, for example, the measure of polarization in the GSS ideology scores was 0.274. We then regress these polarization measures on a linear time trend as the limited sample sizes in GSS can create nontrivial short term variation in the polarization metric. The benchmark for a decade's worth of polarization is thus ten times the estimated linear time trend in this measure which is 0.0042.[34] This decade-long increase in polarization is of similar magnitude to that produced by our model of self-selection into watching and the influence of slanted television news. Some further suggestive evidence consistent with a moderate effect of cable news on polarization is in Boxell, Gentzkow, and Shapiro (2017). They find that increases in polarization measures during this time period have been more pronounced for older individuals, while as can be seen in Table 8, age is an important predictor of cable news viewership.

To benchmark the substantive size of this increase, we computed the polarization measure after an extreme "hollowing out" of the ideology distribution.[35] The polarization measure in this scenario more than doubles, to 0.591. As another point of comparison, we computed the Esteban-Ray measure on first-dimension DW-NOMINATE scores of members of the House of Representatives from 1996–2014. The levels of the polarization statistic are much higher here; the 108th Congress, seated from 2003–2004 and the median House by polarization score in this period, had Esteban-Ray polarization score of 0.446. To reach the typical level of the House, then, polarization among our simulated voters would have to have increased by nearly 60 percent, much more than the simulated 2.5 percent. Furthermore, the time-series increase in the House is much stronger than that measured in GSS or in our simulation: the annual trend coefficient in DW-NOMINATE

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[32] There is some additional disagreement in the political science literature stemming from inconsistent definitions of polarization. Some authors, such as Iyengar, Sood, and Lelkes (2012), define polarization in "affective" terms, meaning subjective feelings of hostility toward opposing partisans. Others, such as Levendusky (2009), focus on the correlation between ideology and party identification. The evidence is stronger that levels of these kinds of polarization have increased in recent decades, and it is possible that cable news affects these as well. As our model has no analogue to these alternative conceptualizations, however, we focus exclusively on measures of the shape of the ideology distribution among voters.

[33] Details of the calculation and a plot of the time series of GSS polarization scores are available in online Appendix J.

[34] The trend coefficient is not precisely estimated, with t-statistic of 1.6. The 95 percent confidence interval for the 10-year change is $[-0.0009, 0.009]$.

[35] Specifically, we transformed the initial distribution of ideology by assigning all Democratic simulated voters to the right of the median Democrat the median Democratic ideology, and assigning all Republican simulated voters to the left of the median Republican the median Republican ideology.

Table 10—Effects of Two Counterfactual Scenarios

	R vote share change	
Election	No Fox News	MSNBC tracks CNN
2000	−0.0046	0.0006
2004	−0.0359	−0.0124
2008	−0.0634	−0.0009

Notes: In the first, Fox News is eliminated from cable lineups. Column 2 shows the change in the Republican vote share of the presidential popular vote in the no-Fox scenario relative to the baseline. In the second, MSNBC's ideological positioning matches that of CNN throughout the 2000–2008 period. Column 3 shows the change in the Republican vote share of the presidential popular vote in the MSNBC-matching-CNN scenario relative to the baseline.

polarization is 0.005,[36] more than 10 times the analogous trend in the GSS over the same time period. We conclude that while selective exposure to cable news can plausibly explain the observed increase in ideological polarization among the US public in recent decades, this increase is nowhere near large enough to keep pace with the rate of polarization increase among their elected representatives.

B. *Fox Entry in 2000, and MSNBC Format Switch*

Next, we estimate the effect of two counterfactual scenarios aimed at measuring the aggregate influence of the cable news channels on election outcomes. First, we estimate the effect of the entry of FNC on the 2000 presidential election. We compare a base case where Fox was available to cable subscribers in the 1997–2000 period according to the observed rollout pattern to a scenario where Fox was available exclusively to satellite subscribers and not on any local cable system.

The first column of Table 10 shows the effects of eliminating Fox from cable lineups prior to the 2000 election, as well as the effect on subsequent election cycles. The population-weighted average Republican vote share falls by 0.46 percentage points under the no-Fox scenario relative to the baseline. This prediction is in line with the estimate of 0.26 to 0.36 of DellaVigna and Kaplan (2007), when updated to use more accurate data.

In subsequent cycles, the implied FNC effect increases due to two forces. First, and most importantly, overall FNC viewership approximately doubles during the period from 2000 to 2008, meaning nearly twice as many viewers are exposed to FNC in later cycles. Second, according to our ideological estimates, FNC moves well to the right over this period, increasing its persuasive effect enough to outweigh any loss in viewership due to the ideological drift.

The second column of Table 10 estimates the effects of MSNBC's switch to liberal slant. We simulated a condition where MSNBC's ideology matched that of CNN. The estimated effect in the 2008 election cycle is to decrease the Republican share by just 0.09 percentage points, an effect two orders of magnitude smaller than the estimated effect of eliminating FNC in 2008. This minimal effect derives from two sources. One, MSNBC's viewership is substantially smaller than that of FNC.

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[36] The corresponding *t*-statistic is 8.42.

Table 11—Media Power

| Election | Potential vote share swing | | | |
	CNN	FNC	MSNBC	Monopolist
2000	0.0316	0.0126	0.0082	0.0465
2004	0.1456	0.0955	0.0409	0.2123
2008	0.1862	0.1568	0.0563	0.2893

Notes: The maximum potential vote share swing that the channel could engineer, by election. The monopolist column is the maximum vote share swing attainable if all three channels were controlled by a single owner.

Second, MSNBC's estimated ideological position in the 2008 cycle is not all that far to the left of CNN, whereas FNC is well to the right.

C. *Media Power and Optimal Positioning*

Prat's (2014) notion of *media power* refers to the minimal quality candidate for whom a media owner could engineer an election victory through persuasive efforts. While our election model has no quality dimension, we can ask a similar question: how many presidential votes could the cable news channels swing from one party to the other, by changing the ideological orientation of their content? Table 11 shows the results of an exercise where we allow each channel to choose its ideological location in each year in order to maximize the vote share of the Republican candidate, and then do the same for the Democratic candidate, holding the positions of the other channels fixed. The table shows the difference in Republican aggregate vote share between these two scenarios. In the last column of the table, we show the potential influence of a combined cable news monopolist controlling all three channels.

In this time period, CNN has the highest power to swing election outcomes, due to its relatively large viewership, favorable channel positioning, and broad demographic appeal. The potential to change election outcomes are large—the achievable vote share swing of a cable news monopolist exceeds 25 percent by 2008—and increasing over time. The time trend is a result of the accumulation of influence over time, as the cumulative reach of the channels grow with each passing year.

The preceding is a "worst-case" scenario, in the sense that it assumes cable news operators seek only to maximize the vote share of a favored party. In reality, the cable channels are businesses whose revenue derives from advertising and affiliate fees from cable providers,[37] which are generally increasing in audience size. The profit motive presumably provides some disincentive from choosing extreme ideological locations that would reduce ratings by turning off too many moderate viewers.

We examined the extent to which this trade-off constrains the channels' persuasive power, by comparing the power-maximizing ideological position to the ratings-maximizing ideological position. Figure 6 compares each of the three channels' actual, ratings-maximizing, and influence-maximizing[38] ideological positioning in the 2000–2008 period.

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[37] According to SNL, the FNC received 64 percent of its revenue from affiliate fees in 2015.

[38] For MSNBC and CNN, we plot the choice that maximizes Democratic vote share; for FNC we plot the choice that maximizes Republican vote share.
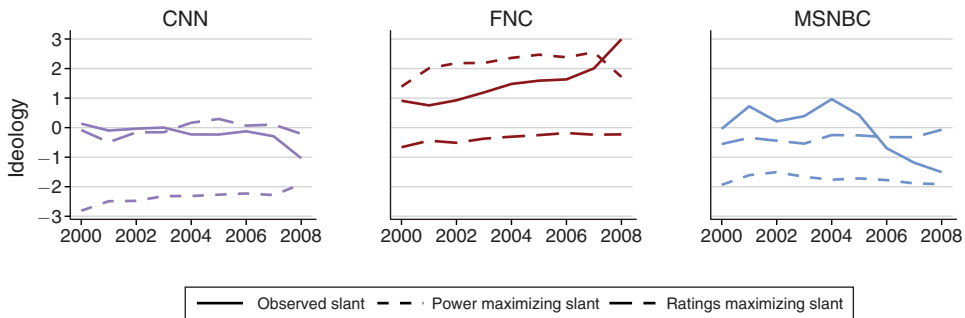
FIGURE 6. OPTIMAL SLANT UNDER DIFFERENT OBJECTIVES

Notes: Channels' ideological positioning from 2000–2008. The three lines are the observed position from the text-based measure, the position that would maximize the channel's ratings, and the position that maximizes the vote share for a favored party. For FNC, we show the position that maximizes Republican vote share; for the other two channels we show the position that maximizes Democratic vote share.

The optimal ideological location from a ratings perspective is quite centrist, and similar for all three of the channels. Comparison of the channel's actual location with the vote-share maximizing choice, however, reveals an asymmetry: the two relatively liberal channels, and CNN in particular, are far from the location that would maximize the vote share of Democratic candidates. FNC, on the other hand, is close to, and by 2008 actually exceeds, the position that maximizes Republican vote share. Were Fox to move even further to the right, the loss of liberal viewers turned off by Fox's extreme location would outweigh the gain in persuasive potential among liberal viewers who continued to watch, reducing FNC's overall influence on election outcomes.

Relatedly, the power figures presented in Table 11 do not represent symmetric swings around the actual vote share totals: FNC is already close to achieving the maximal Republican vote share it can attain on its own, and its power consists almost entirely of the damage it could do to Republican candidates by moving to the left. We estimate that a leftward move would be beneficial for FNC in ratings terms: the increase in average FNC viewership in the viewership-maximizing counterfactual relative to the base case ranges from 5 minutes per week in 2000 to 35 minutes per week in 2008, compared to base levels of approximately 60 minutes per week. Most of this viewership increase comes from the extensive margin, with FNC increasing its reach[39] in the viewership-maximizing counterfactual by an additional 1 percent of viewers in 2000 and more than 6 percent in 2008, relative to baseline.

Several caveats to this exercise are in order. First, these are partial-equilibrium results holding the locations of the other channels fixed at their actual locations. Although an interesting question in its own right, modeling the strategic interaction between channels in this complex dynamic game is beyond the scope of this paper. Second, although ratings are related to profitability, they are not the same thing. Advertising rates vary with the demographics of the audience, and it is possible that a smaller audience is more valuable than a larger one if its composition is skewed in

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[39] This is a fraction of viewers who watch any positive amount of the channel.

ways—toward higher income households, for example—that are attractive to advertisers. And cable providers' willingness to pay affiliate fees is likely to be higher for differentiated news channels than for homogeneous ones. Hence, though FNC's strategy appears to cost it some viewers relative to a more centrist editorial policy, we cannot conclude from this observation that the FNC ownership must therefore be willing to sacrifice profits for Republican votes.

VII. Conclusion

This paper provides estimates of both the influence of slanted news on voting behavior and the taste for like-minded news in the context of cable television news in the United States. The key ingredient in the analysis is the use of channel positions as instrumental variables to estimate a model of viewership, voting, and ideology evolution. We show instrumental variables estimates that watching FNC increases the probability of voting Republican in presidential elections. We probe the instrumental variables assumption by correlating channel positions with observables: demographics which predict FNC viewership, demographics which predict partisan vote shares, pre-FNC partisan vote shares, pre-FNC partisan donations, and local satellite viewership of FNC.

We estimate a model of consumer-viewer-voters who choose cable subscriptions, allocate time to watching news channels, and vote in elections. The tastes for news channels are partly determined by the closeness of the news channels' estimated ideology to the individuals. Individual ideology evolves toward the estimated ideologies of the news channels that a consumer watches. We use the estimated model to characterize the degree of polarization that one can attribute to slanted cable news consumption, to measure effects of cable news on elections, and to assess the positioning strategies of the cable news channels. Our estimates imply increasing effects of FNC on the Republican vote share in presidential elections over time, from 0.46 points in 2000 to 6.34 points in 2008. Furthermore, we estimate that cable news can increase polarization and explain about two-thirds of the increase among the public in the United States, and that this increase depends on both a persuasive effect of cable news and the existence of tastes for like-minded news. Finally, we find that an influence-maximizing owner of the cable news channels could have large effects on vote shares, but would have to sacrifice some levels of viewership to maximize influence.

Future research could go in a number of directions. The use of channel positions as an instrumental variable could be useful in other studies of how media consumption affects behavior. One could also use channel position variation to study the cable news channels in more detail by examining specific programs, e.g., "The O'Reilly Factor," and specific issues like abortion, gay marriage, or government spending. In a different direction, studying the causes and consequences of the divergence in estimated ideologies seems fruitful.[40] It would also be useful to test, refine, or expand the specific model we employ for belief updating after media consumption.

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[40] This includes improving these text based procedures to allow for sentiment analysis or other partisan indicators.

For example, one could allow for a joint distribution of influence parameters and tastes for like-minded news in the population.

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