American Economic Review 2014, 104(10): 3073–3114
http://dx.doi.org/10.1257/aer.104.10.3073

Competition and Ideological Diversity: Historical Evidence from US Newspapers[†]

By Matthew Gentzkow, Jesse M. Shapiro, and Michael Sinkinson*

We study the competitive forces which shaped ideological diversity in the US press in the early twentieth century. We find that households preferred like-minded news and that newspapers used their political orientation to differentiate from competitors. We formulate a model of newspaper demand, entry, and political affiliation choice in which newspapers compete for both readers and advertisers. We use a combination of estimation and calibration to identify the model's parameters from novel data on newspaper circulation, costs, and revenues. The estimated model implies that competition enhances ideological diversity, that the market undersupplies diversity, and that optimal competition policy requires accounting for the two-sidedness of the news market. (*JEL* D72, K21, L13, L41, L82, N42, N72)

Decentralized markets may not supply the socially optimal variety of products (Steiner 1952; Dixit and Stiglitz 1977; Mankiw and Whinston 1986). This is especially true of the news media, because diversity of news and opinion can have beneficial effects on political competition that is not internalized by the market participants (Becker 1958; Downs 1957). According to the US Supreme Court, "the widest possible dissemination of information from diverse and antagonistic sources is essential to the welfare of the public" (*Associated Press v. United States* 1945).

Competition policy toward media has long been shaped by the perceived importance of these political externalities. The Postal Act of 1792 created massive subsidies for newspaper distribution (Kielbowicz 1983, 1990).[1] Joint operating agreements, in which newspapers effectively colluded on subscription and advertising sales but

* Gentzkow: University of Chicago Booth School of Business, 5807 S. Woodlawn Avenue, Chicago, IL 60637, and NBER (e-mail: gentzkow@chicagobooth.edu); Shapiro: University of Chicago Booth School of Business, 5807 S. Woodlawn Avenue, Chicago, IL 60637, and NBER (e-mail: jesse.shapiro@chicagobooth.edu); Sinkinson: Wharton School, University of Pennsylvania, 3620 Locust Walk, Philadelphia, PA 19104 (e-mail: msink@wharton.upenn.edu). We are grateful to Alan Bester, Ambarish Chandra, Tim Conley, Christian Hansen, Igal Hendel, Caroline Hoxby, Jon Levin, Kevin Murphy, Andrei Shleifer, E. Glen Weyl, and numerous seminar participants for advice and suggestions, and to our dedicated research assistants for important contributions to this project. This research was funded in part by the Initiative on Global Markets, the George J. Stigler Center for the Study of the Economy and the State, the Ewing Marion Kauffman Foundation, the Centel Foundation/Robert P. Reuss Faculty Research Fund, the Neubauer Family Foundation, and the Kathryn C. Gould Research Fund, all at the University of Chicago Booth School of Business, the Social Sciences and Humanities Research Council of Canada, and the National Science Foundation. The authors declare that they have no relevant or material financial interests that relate to the research described in this paper.

[†] Go to http://dx.doi.org/10.1257/aer.104.10.3073 to visit the article page for additional materials and author disclosure statement(s).

[1] Under the 1792 act, a four-page letter cost $1 to mail 450 miles; a newspaper of the same size cost 1.5 cents (Kielbowicz 1983). Debate over the details of the subsidy concerned, among other things, the appropriate diversity of news provision from local and national sources (Kielbowicz 1983; John 2009).

remained editorially separate, began in 1933 and later became a legislated exception to the Sherman Act (Busterna and Picard 1993).[2] The Communications Act of 1934 empowered the Federal Communications Commission to limit concentration of control over broadcast spectrum (Candeub 2007). Concerns about diversity of viewpoints played a major role in the federal antitrust action against the Associated Press, which ended with the 1945 Supreme Court decision quoted above. Antitrust exemptions, ownership regulation, and explicit subsidies remain important policies in the United States and elsewhere.[3]

We present a historical study of the economic forces that determine ideological diversity, and the impact of policies designed to increase it, using novel data from US daily newspapers in 1924. In this period, hundreds of cities across the country had multiple competing papers, affording us a large cross-section of experiments which can be used to identify competitive interactions. Most newspapers had current or past affiliations with either the Republican or Democratic party, providing a convenient proxy for the political slant of their content (Gentzkow, Glaeser, and Goldin 2006; Hamilton 2006). Ideology was one of the main dimensions of differentiation along which competitive lines were drawn. Television had not been introduced, and radio was still in its infancy, so newspapers were for most Americans the only source of daily political information. Whether a given town had only Republican papers, only Democratic papers, or papers spanning both sides of the political spectrum thus had a dramatic effect on the range of views to which its voters were exposed (Galvis, Snyder, and Song 2012).

We model newspaper competition in this period in a framework that endogenizes decisions over entry, political orientation, subscription prices, and advertising rates. The model embeds Gentzkow's (2007) multiple-discrete-choice demand framework in a sequential entry game in the spirit of Bresnahan and Reiss (1991) and Mazzeo (2002). In the model, newspapers first decide whether to enter the market, then choose either Republican or Democratic affiliation, taking into account household demand, the responses of other entering newspapers, and the effect of affiliation choice on subscription and advertising prices. The model allows households to exhibit a preference for newspapers whose ideology matches their own, and to regard newspapers with the same political affiliation as more substitutable than newspapers with different affiliations. The advertising model is stylized, but it captures the key prediction from the theory literature on two-sided markets that advertising-market competition depends on the extent of overlap in newspapers' readership (Armstrong 2002; Anderson, Foros, and Kind 2011; Ambrus, Calvano, and Reisinger 2013).

Our key results hinge on the strength of newspapers' incentives to differentiate ideologically from their competitors. In our model, these incentives are governed by two parameters. First, they depend on the extent to which same-affiliation

[2] The Newspaper Preservation Act of 1970, which established the antitrust exemption for joint operating agreements, states its goal as "maintaining a newspaper press editorially and reportorially independent and competitive in all parts of the United States."

[3] House Speaker Nancy Pelosi recently asked Attorney General Eric Holder to consider First Amendment issues when deciding antitrust enforcement for local newspaper consolidation (Pelosi 2009). The Federal Communications Commission (FCC) continues to regulate broadcast media ownership "on the theory that diversification of mass media ownership serves the public interest by promoting diversity of program and service viewpoints" (FCC 2010). The proposed Newspaper Revitalization Act would grant newspapers an implicit federal subsidy in the form of nonprofit status (Priest 2011). Explicit subsidies to the press are common in Europe (Murschetz 1998).

newspapers are closer substitutes than opposite-affiliation papers. This determines the gains to differentiation through standard Hotelling channels. Second, they depend on the extent of diminishing returns to impressions in the advertising market. This determines the overall intensity of advertising competition, and thus the incentive to differentiate in order to soften this competition.

To estimate the demand side of the model, we use data on 1924 daily newspaper circulation by town. These data allow us to compare the circulation of a given newspaper across many towns with differing ideology. Descriptive analysis shows that a 10 percentage point increase in a town's Republican vote share increases circulation of Republican papers relative to Democratic papers by 10 percent. This fact pins down consumers' taste for like-minded news in our model. The relative substitutability of same-affiliation papers is identified by variation in relative circulation with respect to the number of papers of each type. We find that adding a second Republican paper to a town with one Republican and one Democratic newspaper reduces the relative circulation of the existing Republican paper by 4 percent.

We calibrate several model parameters. Because we do not have price instruments we believe are credible, we estimate the price coefficient by imposing the assumption that observed prices satisfy firms' first-order conditions. Because our circulation data do not record overlap in the readership of different papers, we calibrate the overlap predicted by our model to match that observed in a set of historical readership surveys. We calibrate marginal costs and advertisers' willingness to pay to match historical data for a set of representative newspapers. Large markups over marginal costs and significant overlap in readership both suggest that newspapers were highly differentiated products.

To estimate the entry, affiliation choice, and advertising parameters of the model, we use data on the order of entry and observed affiliations in each 1924 newspaper market. Controlling for the fraction Republican, our descriptive analysis suggests that adding an additional Republican incumbent reduces an entering paper's likelihood of choosing a Republican affiliation by 15 percentage points. This relationship identifies the strength of differentiation incentives overall. Since the demand estimates pin down the Hotelling portion of these incentives, the residual is attributed in our model to diminishing returns to advertising. The relationship between population and the observed number of firms identifies the parameters of the distribution of fixed costs.

An important concern is that the correlations we exploit for identification may be confounded with unobserved variation in consumer ideology or preferences, biasing downward the estimated incentive to differentiate and the estimated substitutability of same-affiliation newspapers (Aguirregabiria and Nevo 2013). We address these issues by allowing explicitly for unobserved variation in household ideology, using a novel identification strategy which exploits correlation across markets that are close enough to share similar characteristics but far enough apart that their newspapers do not compete. We assume in the spirit of Murphy and Topel (1990) and Altonji, Elder, and Taber (2005) that the spatial correlation in unobservable dimensions of ideology matches that of observable measures. The resulting spatial structure allows us to infer the distribution of market-level unobservables, much as panel structure facilitates recovering this distribution in dynamic settings (e.g., Collard-Wexler forthcoming; see also Arcidiacono and Miller 2011).

We use the estimated model to measure the importance of competitive forces relative to other incentives in shaping the ideological diversity of the news market. We measure diversity by the number of markets with at least one newspaper affiliated with each party, the share of households living in such markets, and the share of households reading at least one newspaper affiliated with each party. We find that the incentive to differentiate from competitors in order to attract more readers and soften price and advertising competition (Mullainathan and Shleifer 2005) increases diversity significantly, offsetting a strong incentive to cater to the tastes of majority consumers (George and Waldfogel 2003).

Next, we compare the market outcomes to those that would be chosen by a social planner maximizing economic welfare, but ignoring any externalities from diversity. Relative to the first best, market entry is inefficiently low, market prices are inefficiently high, and the market incentive to differentiate politically from competitors is inefficiently weak. Thus, there is no conflict between the policy goals of maximizing economic welfare and preserving diversity in the marketplace of ideas. Policies aimed at the latter goal are likely to also be beneficial from the perspective of the former.

Finally, we consider a range of competition policy experiments. Allowing newspapers to collude on circulation prices reduces economic welfare and has mixed effects on diversity. By contrast, allowing newspapers to collude on *advertising* prices increases both economic welfare and diversity. Advertising prices rise, leading circulation prices to fall as newspapers compete intensely for readers (Rochet and Tirole 2006; Dewenter, Haucap, and Wenzel 2011). Entry increases dramatically. Consumer surplus increases, significant profit is transferred from advertisers to newspapers, and the share of households who read diverse papers increases significantly. The contrasting effects of circulation and advertising price collusion highlight the importance of accounting for the two-sided nature of media markets in policy evaluation. When we allow newspapers to form joint operating agreements and collude on both circulation and advertising prices, diversity increases at no cost to economic welfare. We show that joint ownership (in which one entity has the exclusive right to open and operate newspapers in a market) reduces welfare and diversity, while an explicit subsidy (modeled on the US postal subsidy system) increases both welfare and diversity.

Throughout our analysis, we treat consumer ideology, as measured by Republican vote shares, as exogenous to newspaper affiliations. This decision follows our finding in Gentzkow, Shapiro, and Sinkinson (2011) that the entry or exit of a partisan newspaper does not change the expected party vote share. Importantly, this assumption is consistent with large political externalities to ideological diversity. A newspaper's party affiliation need not affect expected vote shares, since rational voters will take an outlet's bias into account in updating their beliefs (Chiang and Knight 2011). Yet diverse media may still provide more information in aggregate (Anderson and McLaren 2012), making beliefs more correlated with the truth even if though they may not change on average. For example, if Democratic papers report more aggressively on scandals affecting Republican politicians and vice versa (Gentzkow, Glaeser, and Goldin 2006; Galvis, Snyder, and Song 2012), having a newspaper from each party will tend to maximize the chance that consumers learn about a given scandal. In the online Appendix to this paper, we offer a formal model which captures these ideas.

Our work builds on other empirical models of entry and product positioning with explicit demand systems.[4] Like Fan (2013), we use a demand model that allows consumers to choose bundles of products. Like Fan (2013) and Jeziorski (forthcoming), we include a microfounded model of advertising competition. Along with Berry, Eizenberg, and Waldfogel (2013), we are among the first to model both entry and product positioning decisions in a two-sided market. An important difference between our model and past work is that we allow for both unobserved market characteristics and idiosyncratic firm-level shocks, introducing a novel strategy to separate causal effects of one firm's choices on its competitors from the confounding effect of correlated unobservables.

Our paper also relates to the theoretical literature on two-sided markets, especially to work which emphasizes the importance of "multi-homing" by consumers (Armstrong 2002; Anderson, Foros, and Kind 2010, 2011; Ambrus, Calvano, and Reisinger 2013). We add richness to existing models by endogenizing both entry and product positioning,[5] and we contribute novel possibility results regarding the efficiency of market equilibrium and the effects of competition policy.

Finally, our paper is related to research on the incentives which shape the political orientation of the news media (Prat and Strömberg 2013).[6]

The remainder of the paper is organized as follows. Section I introduces the historical data which form the basis of our analysis. Section II discusses the historical context for our data. Section III presents descriptive evidence on the determinants of newspaper demand and affiliations and lays out our strategy for estimating the incentive to differentiate in the presence of unobserved consumer heterogeneity. Section IV lays out our model. Sections V and VI detail the estimation and identification of the demand and supply portions of the model, respectively. Section VII presents estimates and counterfactual simulations. Section VIII concludes.

I. Data

A. *Road Map*

We use two main data sources. To estimate the supply side of our model—that is, newspapers' entry and affiliation decisions—we use 1924 data on the number, affiliations, and circulation prices of papers in a cross-section of daily newspaper

[4] See Reiss and Spiller (1989); Einav (2007, 2010); Draganska, Mazzeo, and Seim (2009); Berry, Eizenberg, and Waldfogel (2013); Fan (2013); Seim and Waldfogel (2013); and Jeziorski (forthcoming). More broadly, our work relates to a large literature on entry and competition in advertising-funded markets, including Berry and Waldfogel (2001); Rysman (2004); Kaiser and Wright (2006); Argentesi and Filistrucchi (2007); Wilbur (2008); Chandra and Collard-Wexler (2009); and Sweeting (2010), to empirical studies of the effect of competition and ownership structure on product variety in the news media (Berry and Waldfogel 2001; Sweeting 2010; Waldfogel 2011), and to studies of the extent to which competition creates an incentive to differentiate (e.g., Borenstein and Netz 1999).

[5] Most existing theoretical models (e.g., Gabszewicz, Laussel, and Sonnac 2001, 2002; Antonielli and Filistrucchi 2012; and Kind, Schjelderup, and Stähler 2013) of product differentiation in two-sided markets assume that each consumer can consume a single product.

[6] Gentzkow and Shapiro (2010) use a similar framework to study ideological positioning of US newspapers in recent years. Because few modern markets have more than one newspaper, however, they cannot address the impact of competition. Chiang's (2010) study of US newspapers is the closest to ours in investigating equilibrium ideological positioning of newspapers in multipaper markets. Chiang (2010) uses household-level data to test the predictions of a variant of Mullainathan and Shleifer's (2005) model, and finds that ideologically extreme households in multipaper markets are more likely to read a newspaper than those in single-paper markets.

markets. These data come from newspaper directories, and have a single observation for each newspaper. To estimate the demand side of the model, we use 1924 data on the circulation of each daily newspaper by town. These data come from circulation reports newspapers file with an auditing agency, and since the typical newspaper circulates in many towns, they have multiple observations per newspaper. We supplement these two primary datasets with information on costs and revenues of representative newspapers, as well as information from a small number of readership surveys, which we use to calibrate some of the parameters of our model.

B. *Cross-Section of Daily Newspaper Markets*

Our cross-section of newspaper markets is based on the US Newspaper Panel (Gentzkow, Shapiro, and Sinkinson 2011). The panel contains the name, city, political affiliation, and subscription price of every English-language daily newspaper in the United States in 1869 and in every presidential year from 1872 to 1924. Our main analysis is based on the data for 1924, but we use the complete panel for supplemental analysis and to define some variables.

To estimate our model of affiliation choice we will require the order of entry and political affiliation of each daily newspaper in 1924. For each market with two or more daily newspapers in 1924, we define the newspapers' order of entry as the order in which the newspapers first appear in our panel, breaking ties at random. We classify a newspaper's affiliation as Republican if it ever declares a Republican affiliation and as Democratic if it ever declares a Democratic affiliation.[7]

As we will estimate a model of entry, our sample must include markets which could have had a daily newspaper but did not. We define the universe of such potential newspaper markets to be the set of all cities with populations between 3,000 and 100,000 and at least one *weekly* newspaper as of 1924.[8]

Estimation also requires an empirical proxy for consumers' political ideology. For this we gather data on the average share of the two-party presidential vote going to Republicans over the period from 1868 to 1928.[9] To implement the strategy for controlling for unobserved ideology discussed in Section IIIC, we group markets into

[7] In the handful of cases in which a newspaper declares a Republican affiliation in one year and a Democratic affiliation in another, we use the affiliation declared most often by the newspaper. Although many formerly affiliated newspapers had, by 1924, switched their status to "Independent," evidence that we discuss in Gentzkow, Shapiro, and Sinkinson (2011) and in Section II suggests that such newspapers' content retained its historical slant. We exclude from our sample 142 newspapers which only ever declare their status as Independent, and 36 which never declare an affiliation of any kind. In Appendix A we present results for the subsample of markets which do not contain an Independent newspaper in 1924 and the subsample which do not contain an unaffiliated newspaper in 1924.

[8] Data on the universe of cities and their populations come from the 1924 N. W. Ayer and Son's *American Newspaper Annual.* We exclude very large and very small cities because we expect their economic primitives may be sufficiently different that our model will be a poor fit. (New York City, for example, had more than 100 newspapers in 1924, and these papers were far more heterogeneous than those in the typical market in our data.) In Appendix A we present an analysis of the sensitivity of our findings to tightening the population bounds for the sample and to excluding markets close to very large cities.

[9] We match markets to Census place definitions in 1990 and match each Census place to the county containing the largest share of the place's population in 1990. We use the Census place-county match to combine city-level newspaper data with county-level voting data from various sources, as in Gentzkow, Shapiro, and Sinkinson (2011). We exclude a small number of markets for which we cannot identify the presidential vote share. In Appendix A we present results excluding markets in the South, where the Democrats were dominant.

TABLE 1—SUMMARY STATISTICS FOR NEWSPAPER MARKETS

Number of newspapers	0	1	2	3+	All
Mean population	5,944	10,688	24,049	36,832	10,943
Share of newspapers that are Republican		0.60	0.50	0.68	0.57
Share of multipaper markets that are diverse			0.53	0.61	0.54
Republican vote share					
Mean	0.52	0.51	0.50	0.55	0.51
Standard deviation	0.15	0.15	0.12	0.09	0.15
Number of markets	960	612	297	41	1,910
Number of diverse markets			158	25	183
Number of newspapers		612	594	132	1,338

Notes: Data are from the cross-section of daily newspaper markets in 1924 defined in Section IB. Diverse markets are those with at least one Republican and at least one Democratic newspaper. Republican vote share is the average Republican share of the two-party vote in presidential elections from 1868 to 1928.

matched pairs in which both markets are located in the same state and are between 100 and 400 kilometers apart.[10]

Table 1 presents summary statistics for our cross-section of markets. Our sample includes 1,910 markets, 950 of which have at least one daily newspaper, and 338 of which have more than one daily newspaper. Population is highly correlated with the number of newspapers. In total there are 1,338 newspapers in the sample, of which 57 percent are Republican. Overall, 54 percent of multipaper markets are ideologically diverse in the sense of having at least one Republican and at least one Democratic newspaper. In the average market, Republican and Democratic presidential candidates tend to get a similar number of votes, but there is substantial cross-market variation in the vote share.

C. *Town-Level Circulation Data*

Our town-level data on the total circulation of each newspaper come from 1924 reports submitted by newspapers to the Audit Bureau of Circulations (ABC), an independent organization created to verify circulation claims.[11] This is, to our knowledge, the first dataset with disaggregated information on circulation for a large number of newspapers prior to the late twentieth century.

We match newspapers in the ABC data to those in the US Newspaper Panel using the newspaper's name and location.[12] We construct a cross-section of towns with at least one matching circulating newspaper in which no newspaper is headquartered.

[10] To select among all such pairs those markets that are most similar in size, we first identify the pair with lowest absolute difference in log population, breaking ties randomly. We then remove the matched markets from consideration and find the pair with the next lowest population difference. We repeat this matching process until all markets are matched.

[11] In most cases these audits cover a 12-month period ending in 1924; in some cases the examination period is shorter or ends in 1923. We obtained the reports on microfilm from ABC and converted them to machine-readable text. From each audit report we extract the newspaper's name, location, and circulation in each town which receives "25 or more copies daily through carriers, dealers, agents, and mail." We compute total circulation by town across all editions of the same paper and average circulation by town across all audit reports (if more than one edition or audit report is available).

[12] Not all newspapers are represented in the ABC data. In Appendix A we present results excluding towns for which newspapers headquartered nearby are not represented in the data.

Table 2—Summary Statistics for Towns with Circulation Data

Number of circulating newspapers	1	2	3+	All
Mean population	447	390	566	472
Share of newspapers that are Republican	0.52	0.54	0.57	0.55
Share of multipaper towns that are diverse		0.38	0.67	0.53
Republican vote share				
Mean	0.49	0.51	0.54	0.51
Standard deviation	0.16	0.16	0.15	0.16
Number of towns	4,144	3,737	4,307	12,188
Number of diverse towns		1,418	2,876	4,294
Number of newspaper-towns	4,144	7,474	17,161	28,779

Notes: Data are from the cross-section of news-reading towns in 1924 defined in Section IC. Diverse towns are those with at least one Republican and at least one Democratic newspaper. Republican vote share is the average Republican share of the two-party vote in presidential elections from 1868 to 1928.

We exclude headquarter markets because we wish to estimate our demand model using variation in the circulation of the same newspaper across a set of comparable small towns in which no single newspaper has a dominant position.

We match towns to 1990 Census place codes using town and state name, and we use place codes to match towns to counties, measuring a town's ideology by its county's presidential vote share. We exclude towns which we cannot successfully match to Census geographies, and a small number for which we do not have county presidential voting data. For computational reasons, we exclude 52 towns in which more than ten newspapers are available. We use the same algorithm described for markets in Section IB to group towns into matched pairs located in the same state between 100 and 400 kilometers apart.

Table 2 presents summary statistics for the towns in our sample. Our sample includes 12,188 towns, in 8,044 of which more than one daily newspaper circulates. Overall, 53 percent of multipaper towns are ideologically diverse in the sense of having at least one Republican and at least one Democratic newspaper available.

D. *Readership Survey Data*

Our circulation data measure total copies circulated but do not tell us anything about patterns of readership at the household level. We supplement the data with information from two sources.

First, we use newly digitized aggregate reports from 17 newspaper readership surveys, covering 9 (mostly large) cities over the period 1929–1969.[13] Survey respondents declared the full set of newspapers read by their household. From each report we compute, for each pair of newspapers, the share of subscribers to either newspaper who subscribe to both. We use this measure to characterize the extent of multiple readership in competitive markets.

Second, we use data from the study *Cost of Living in the United States*, *1917–1919* (Bureau of Labor Statistics 1986; see also Costa 2001). This study contains

[13] We provide publication details for each report in the online Appendix.

microdata on "number of newspapers purchased by the household" for a sample of "families of wage earners or salaried workers in industrial locales scattered throughout the United States." Though the data are not nationally representative and do not include detail on specific newspapers, they provide the earliest microdata we are aware of on the number of newspapers read by US families. We match the geographic codes in the data to those in our cross-section of newspaper markets, and we select the subsample of the data consisting of newspaper-reading families who live in a city in our cross-section.

E. *Cost and Revenue Data*

To calibrate features of newspaper cost and revenue structure, we obtained income statements for 94 anonymous newspapers in 1927 from the Inland Daily Press Association (Yewdall 1928). Since the data do not identify individual newspapers, we match each record in the US Newspaper Panel to the record in the Inland Press data with the closest circulation value.

We compute the variable cost of each newspaper as the annual per-copy cost of printing and distribution, including paper and ink costs and mailing and delivery costs. We compute fixed costs per copy as the difference between annual total costs per copy and annual variable costs per copy. We also compute the annual per-copy advertising revenue of each newspaper. Finally, we compute the annual per-copy circulation revenue of each newspaper (revenue from subscriptions and single-copy sales).

II. Historical Background on Newspaper Affiliations

The median newspaper in our 1924 cross-section entered its market prior to 1896. During the 1890s, newspapers devoted 20–40 percent of their coverage to politics (Baldasty 1992). It was common for newspapers to choose an explicit affiliation with either the Democratic or the Republican party. The practice faded over time: by the mid-twentieth century it was rare for newly formed newspapers to declare an explicit affiliation (Gentzkow, Glaeser, and Goldin 2006; Hamilton 2006).

A newspaper's political affiliation was strongly related to the political orientation of its content (Summers 1994; Kaplan 2002; Gentzkow, Glaeser, and Goldin 2006; Hamilton 2006; Gentzkow, Shapiro, and Sinkinson 2011), and newspaper owners understood that affiliations were a potential dimension of product differentiation.[14] Political affiliations may also have served political aims, but at the time of our study commercial considerations were likely dominant (Baldasty 1992).[15]

[14] James E. Scripps declared in 1879 that "As a rule, there is never a field for a second paper of precisely the same characteristics as one already in existence. A Democratic paper may be established where there is already a Republican; or vice versa; an afternoon paper where there is only a morning; a cheap paper where there is only a high-priced one; but I think I can safely affirm that an attempt to supplant an existing newspaper … of exactly the same character has never succeeded" (quoted in Hamilton 2006, p. 47). Through the early twentieth century, James' brother, E.W. Scripps, exploited the nominal independence of his newspaper chain to adapt editorial content to market conditions, emphasizing Republican ideas in markets with established Democratic newspapers, and Democratic ideas when Republicans were entrenched (Baldasty 1999, p. 139).

[15] In related work, we show that newspapers' affiliations exerted, on average, at most a small effect on electoral outcomes (Gentzkow, Shapiro, and Sinkinson 2011), and that in most times and places incumbent parties exerted

We model a newspaper's political affiliation as a static, binary characteristic. We treat affiliation as binary because qualitative and quantitative evidence suggests that papers of a given affiliation hewed closely to the party line.[16] We treat affiliation as static because, although newspapers often switched from declaring a Republican or Democratic affiliation to declaring themselves as Independent, Gentzkow, Shapiro, and Sinkinson (2011) find that such declared changes do not correlate with changes in content.[17]

Although the assumption of fixed, binary affiliations is reasonable in context, it is still an approximation. The historical record provides examples of content differences among papers of the same affiliation, particularly on issues where disagreements between factions within the party were significant (Summers 1994, pp. 43–58). To the extent that binary affiliations are a coarse summary of a more continuous space of political content, caution is needed in linking our results to effects on underlying content. Our results capture diversity at the level of party affiliations, not intraparty factions or shadings.

III. Descriptive Evidence

A. *Partisanship and Newspaper Circulation*

In our model, a household's utility from reading a newspaper will depend on the match between the newspaper's ideology and the household's ideology and on the presence of substitute newspapers in the household's consumption bundle.

Table 3 shows that both factors play a significant role in driving observed demand. The table presents OLS regressions of the Republican-Democrat difference in mean log circulation (i.e., the average of log circulation among Republican papers minus the average log circulation among Democratic papers) on measures of household ideology and/or the presence of substitutes. Specification (1) includes only household ideology, specification (2) includes only counts of substitute newspapers, and specification (3) includes both. Given the construction of the dependent measure, coefficients can be interpreted as the marginal effect of a given variable on the circulation of Republican papers relative to Democratic papers.

The greater is the Republican share of households in a town, the greater will be the relative circulation of Republican newspapers. However, having more Republican newspapers available will tend to depress the circulation of the average Republican paper due to substitution effects. Because Republican newspapers are more likely

at most a limited influence on newspapers' political affiliations (Gentzkow et al. forthcoming). We note, however, that Petrova (2011) provides evidence that political patronage influenced newspaper affiliations in the late 1800s.

[16] Newspaper proprietor Horace Greeley writes in his autobiography: "A Democratic, Whig, or Republican journal is generally expected to praise or blame, like or dislike, eulogize or condemn, in precise accordance with the views and interest of its party" (Greeley 1872, p. 137). According to Kaplan (2002, p. 23), "In professing allegiance to a party, the Detroit press assumed specific obligations. The individual journal was the organ of the political community, and commissioned with the task of expressing the group's ideas and its interests." Consistent with this narrative evidence, Gentzkow, Shapiro, and Sinkinson (2011) show that the political orientation of voters strongly predicts the affiliations of local papers, but is only weakly correlated with their content conditional on affiliation.

[17] In the online Appendix, we present evidence on the extent to which newspapers of a given affiliation adjust their content in response to changes in consumer preferences or the competitive landscape. There is qualitative evidence consistent with such adjustment, but the precision of the exercise is limited so we cannot say confidently that such adjustment took place.

Table 3—Demand for Partisanship

Dependent variable: Average log(circulation) of R papers − average log(circulation) of D papers	(1)	(2)	(3)
Republican vote share	0.8517		0.9510
	(0.1910)		(0.1980)
Number of Republican papers		−0.0187	−0.0360
		(0.0134)	(0.0136)
Number of Democratic papers		0.0066	0.0174
		(0.0152)	(0.0154)
R^2	0.0101	0.0007	0.0127
Number of counties	1,219	1,219	1,219
Number of towns	4,294	4,294	4,294

Notes: Data are from the cross-section of news-reading towns in 1924 defined in Section IC. The dependent variable is the difference in mean log circulation of Republican and Democrat newspapers. Republican vote share is the average Republican share of the two-party vote in the county in presidential elections from 1868 to 1928. Sample is all towns with at least one paper of each affiliation. Standard errors in parentheses are clustered at the county level.

to be available in towns with more Republican households, these two effects tend to work in opposite directions. Therefore, we expect that specification (1) understates the effect of household ideology and specification (2) understates the importance of substitutes. Specification (3) shows that, as expected, both effects are estimated to be larger when the regression includes measures of both household ideology and the presence of substitutes.

In the online Appendix, we show that the two effects illustrated by specification (3) are robust to a number of alternative specifications. We show that both the effect of household ideology and the effect of substitutes are robust to a specification with both newspaper and town fixed effects, and to controlling for nonpolitical attributes of both newspapers and towns. We also show that the key qualitative patterns in the data are present in both large and small towns, and that qualitatively similar patterns emerge when we study changes in circulation over time rather than in the cross-section.

The estimated relationships in specification (3) are economically significant. Increasing the fraction Republican among voters by 10 percentage points increases the relative circulation of Republican papers by 10 percent. Adding a second Republican paper to a market with one Republican and one Democratic newspaper reduces the relative circulation of the existing Republican paper by 4 percent.

B. *Determinants of Newspapers' Affiliation Choices*

Given that households demand own-type newspapers and that same-type papers are more substitutable, we would expect that newspaper affiliation would respond both to household ideology and to market structure.

Table 4 shows that these expectations are borne out in our data. The table presents OLS regressions of a dummy for whether a newspaper chooses a Republican affiliation on measures of household ideology and incumbent affiliations. Specification (1) includes only household ideology, specification (2) includes only incumbent affiliations, and specification (3) includes both.

Table 4—Determinants of Newspaper Affiliation

Dependent variable: Dummy for newspaper choosing R affiliation	(1)	(2)	(3)
Republican vote share	2.1824		2.3356
	(0.0557)		(0.0611)
Number of Republican incumbents		−0.0168	−0.1525
		(0.0318)	(0.0342)
Number of Democratic incumbents		−0.0190	0.1260
		(0.0377)	(0.0297)
R^2	0.3561	0.0004	0.3819
Number of markets	950	950	950
Number of newspapers	1,338	1,338	1,338

Notes: Data are from the cross-section of daily newspaper markets in 1924 defined in Section IB. The unit of analysis is the newspaper. Republican vote share is the average Republican share of the two-party vote in presidential elections from 1868 to 1928. The number of Republican/Democratic incumbents is the number of sample newspapers of the given affiliation that entered prior to the newspaper in question. Sample is all markets with at least one paper. Standard errors in parentheses are clustered at the market level.

The more Republican are the households in a market, the more likely is an entering paper to choose a Republican affiliation. However, facing a Republican incumbent reduces the likelihood that an entering paper affiliates with the Republican party. Because Republican incumbents are more likely in markets with more Republican households, these two effects tend to work in opposite directions. Therefore, we expect that specification (1) understates the effect of household ideology, and specification (2) understates the effect of incumbent affiliation. Specification (3) shows that, as expected, both effects are estimated to be larger when the regression includes measures of both household ideology and incumbent affiliations.

In the online Appendix we exploit panel structure to show that the correlation between household ideology and newspaper affiliation decisions is not driven by reverse causality from newspaper content to voter behavior.

The effects we estimate in specification (3) are economically significant. A 10 percentage point increase in the fraction Republican among households increases the likelihood of a Republican affiliation by 23 percentage points. Having a Republican incumbent instead of a Democratic incumbent reduces the likelihood of a Republican affiliation by 28 percentage points.

Figure 1 illustrates the key patterns in specification (3) of Table 4 graphically. Panel A shows that the probability of the first entrant choosing a Republican affiliation is increasing in the Republican vote share in the market. Panel B shows that the probability of the second entrant choosing a Republican affiliation is increasing in the Republican vote share and is lower when the first entrant's affiliation is Republican.

C. *Controlling for Unobserved Ideology*

Controlling for the Republican vote share greatly affects the strength of the substitution and differentiation effects we estimate in Tables 3 and 4. It remains possible that variation in consumer ideology not captured by our observable proxy is a source of bias. In this section, we outline an identification strategy that exploits spatial correlation in consumer ideology to identify the role of unobserved heterogeneity

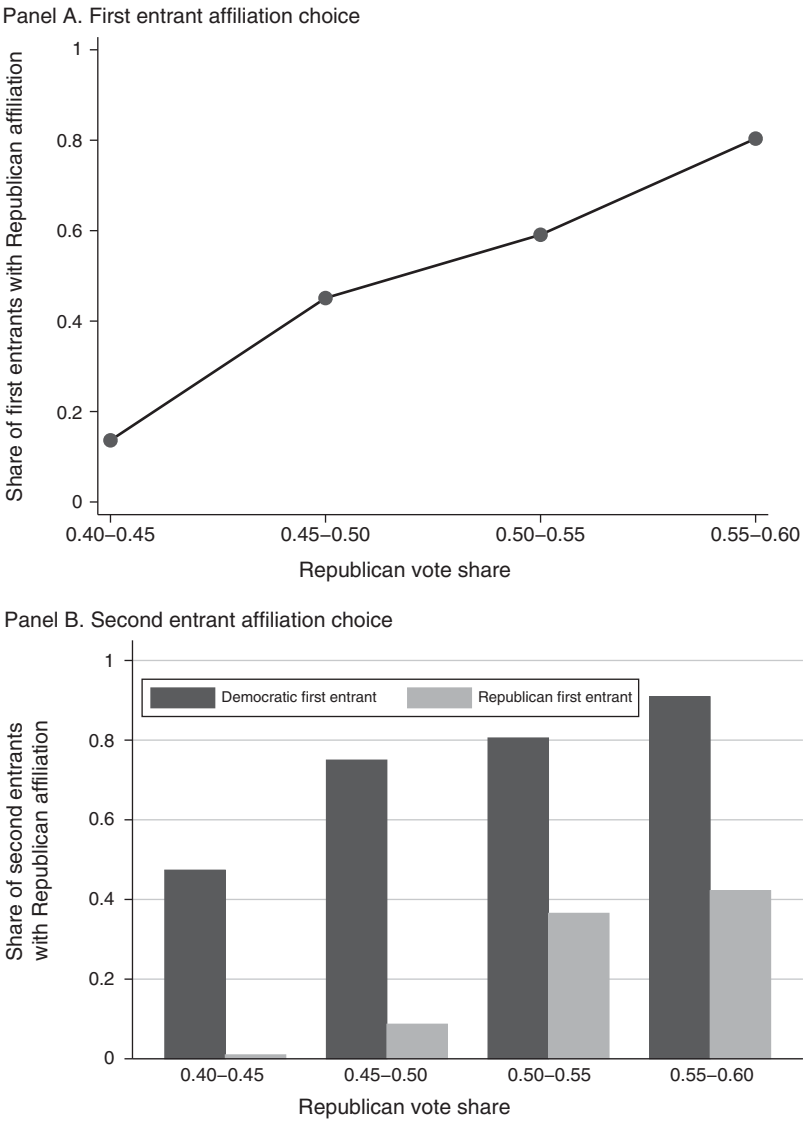


FIGURE 1. DETERMINANTS OF NEWSPAPER AFFILIATIONS

Notes: Data are from the cross-section of daily newspaper markets in 1924 defined in Section IB. Republican vote share is the average Republican share of the two-party vote in presidential elections from 1868 to 1928. The sample includes all markets with two or more newspapers in which the Republican vote share is between 0.4 and 0.6.

across towns and markets, much in the way that correlation over time facilitates identification in panel settings (e.g., Collard-Wexler forthcoming).

To illustrate the logic of our strategy, consider newspapers' affiliation choices. In markets whose first entrant is Democratic, the second entrant is Republican 48 percent of the time. In markets whose first entrant is Republican, the second entrant is Republican 51 percent of the time. We interpret this slight positive correlation as the net effect of negative correlation due to differentiation and positive correlation due to variation in consumer ideology.

Now consider the affiliation choices of the second entrant in a neighboring market—defined in Section IB as a similar-size market between 100 and 400 kilometers away. In markets whose first entrant is Democratic, the second entrant in the neighboring market is Republican 31 percent of the time. In markets whose first entrant is Republican, the second entrant in the neighboring market is Republican 64 percent of the time. As newspapers at this distance did not compete directly, we interpret this strong positive correlation as evidence of underlying spatially correlated variation in consumer ideology.

We show in the online Appendix that a similar pattern is present in the circulation data. A town whose available newspapers are majority Republican exhibits slightly lower relative demand for Republican newspapers. A town whose *neighbor* has primarily Republican newspapers exhibits greater relative demand for Republican newspapers.

In both cases, comparing the correlation within a location with the correlation across neighboring locations reveals information about the importance of unobservable variation in consumer ideology. We will exploit this information to identify our formal model, relying on three key assumptions.

First, we assume that our pairs of markets and towns are close enough to share similar ideology but far enough apart that their newspapers do not interact directly. Appendix Figure 1 shows direct support for this assumption. Two counties located 100–400 kilometers apart have a highly correlated Republican vote share and fraction white. However, newspapers headquartered in the first county rarely circulate in the second at such distances. Second, we assume that there are no spatially correlated supply-side variables which affect the relative profitability of different affiliations.[18] Third, we assume that the correlation of the unobservables is the same as the correlation of the observables.[19] In Appendix A we present evidence on the sensitivity of our findings to variation in the assumed spatial correlation.

D. *Multiple Readership and the Extent of Differentiation*

In our model, market performance (the efficiency of entry and pricing decisions) depends on the extent of differentiation among newspapers. The model estimates reported below imply that this differentiation was substantial. Several pieces of evidence are consistent with this conclusion, some of which we incorporate in estimation, and some of which provide independent verification.

First, newspaper markups were large even in competitive markets. The average newspaper in our sample earned $4.69 (in 1924 dollars) in circulation revenue and

[18] Variable costs such as paper and ink were not affiliation-specific, and in any case these commodities were traded nationally. The cost of hiring editors or reporters could be affiliation-specific, but the market for such talent was geographically broad. For example, in 1920, 49 percent of prime-age (25–55) white male journalists lived in a state other than their state of birth, as against 33 percent for all prime-age white males (Ruggles et al. 2010). Common ownership of newspapers in different markets is a final possible source of correlation. In Appendix A we show that removing the small number of market pairs with common ownership makes little difference to our results.

[19] Appendix Figure 1 shows that the the spatial correlation pattern of the fraction white is similar to that of the Republican vote share. Consistency in the spatial correlation across different observable characteristics of the consumers provides some support for the assumption that the spatial correlation in unobservables will match the spatial correlation in the observables, though of course we cannot test this restriction directly. Murphy and Topel (1990) and Altonji, Elder, and Taber (2005) provide additional justification for using observables to learn the covariance properties of unobservables.

$14.19 in advertising revenue per subscriber, for a gross margin of $10.09 on variable costs of $8.79 per subscriber. As we show in the online Appendix, newspapers in more competitive markets charged, if anything, higher prices.

Second, circulation changes around newspaper entry suggest limited substitutability. In the online Appendix, we show that the entry of an average newspaper increases total market circulation by 24 percent. If there was *no* substitution with existing newspapers, we estimate that this number would be only moderately higher, at 28 percent. Put differently, only about 14 percent of the circulation of an entering newspaper comes at the expense of existing newspapers' circulation. The rest comes either from households who previously did not read a newspaper, or from households reading multiple papers.

Third, multiple readership was quantitatively important at the time of our study. In our 1917–1919 survey data, 15 percent of households who report reading a daily newspaper report reading two or more newspapers. In our readership survey data, for the average pair of newspapers, 16 percent of households who read either paper read both. And as we document in the online Appendix, overlap was if anything larger for newspapers with the same political affiliation, suggesting a high degree of differentiation along nonpolitical dimensions.

IV. Model

A. *Road Map*

The goal of our model is to parsimoniously capture the effect of consumer preferences, price competition, and advertising competition on equilibrium product diversity. Computational and data limitations mean the model is necessarily stylized. We approximate a set of economic forces we judge to be most important, while abstracting from many others.

In the next two subsections, we define the model and characterize its equilibrium. Then in section IVD we return to the main assumptions, discussing their limitations, their importance for our main results, and the evidence that supports them.

B. *Setup*

We consider a cross-section of markets indexed by $m \in \{1, \ldots, M\}$. Each market has J^{max} potential newspaper entrants, a unit mass of homogeneous potential advertisers, and a mass S_m of households indexed by i.

We index the J_m newspapers which choose to enter market m in equilibrium by $j \in \{1, \ldots, J_m\}$. Each entering newspaper chooses a political affiliation $\tau_{jm} \in \{R, D\}$, a circulation price p_{jm}, and an advertising price a_{jm}.

Each household has a political affiliation $\theta_{im} \in \{R, D\}$. We denote the share of households with $\theta_{im} = R$ by ρ_m and assume that ρ_m is common knowledge to market participants but unobserved by the econometrician.

The J_m newspapers may also be available in one or more hinterland towns, which we index by $t \in \{M + 1, \ldots, M + T\}$. A given town t may receive newspapers from more than one market m. We assume that these towns are sufficiently small that they have a negligible impact on newspaper profits, and thus do not affect the entry,

affiliation, and pricing decisions we model below. While we do not explicitly model the economic process that determines which newspapers are available in which towns, in estimation we will allow that the town's choice set depends on town ideology ρ_t.

The game proceeds in five stages. First, the potential entrants choose sequentially whether or not to enter. Second, the newspapers which have entered sequentially choose their affiliations in order of their indices j. The assignment of these indices is random and not learned until the second stage. Third, newspapers simultaneously choose their circulation prices. Fourth, newspapers simultaneously choose their advertising prices, after which each advertiser simultaneously decides whether or not to advertise in each newspaper. Finally, households choose to consume any bundle of the available newspapers, or no newspaper at all. At the end of each stage, all newspapers' choices are observable to all other newspapers.

The profits of entering newspaper j are given by

$$\pi_{jm} = S_m\left[\left(p_{jm} + \psi_{jm} a_{jm} - MC\right) q_{jm} - \xi_{jm}(\tau_{jm})\right] - \kappa_m, \tag{1}$$

where ψ_{jm} is the mass of advertisers advertising in newspaper j, a_{jm} is newspaper j's per-copy advertising price, MC is a marginal cost common to all newspapers and markets, q_{jm} is the share of households purchasing newspaper j, $\xi_{jm}(\tau_{jm})$ is an affiliation-specific cost, and κ_m is a market-specific fixed cost. A newspaper privately observes its own ξ_{jm} after entry decisions are made, at the beginning of the second stage; these shocks are newspapers' only private information. We assume that $\xi_{jm}(\tau_{jm})/\sigma_\xi$ is distributed mean-zero type-I extreme value, where $\sigma_\xi > 0$ is a constant. We assume that κ_m / S_m is distributed logistic with scale parameter σ_κ and location parameter $\mu_\kappa^0 + \mu_\kappa^1 \log(S_m)$.

While the cost shocks ξ_{jm} are ultimately a model residual, we present evidence in the online Appendix that the affiliations of co-owned newspapers are correlated, suggesting that these residuals may be thought of as partly capturing the personal political preferences of owners. We model these cost shocks as proportional to the number of households. Structurally, this reflects the idea that owners may value greater reach for their preferred ideologies. Practically, this assumption makes the affiliation choice game neutral to market scale.

Each advertiser earns a revenue equal to the integral over i of $\mathbf{1}_{n_{im} \geq 1}\left[a_h + (n_{im} - 1) a_l\right]$, where n_{im} is the number of newspapers read by i that contain the advertiser's ad, $\mathbf{1}$ is the indicator function, a_l and a_h are the value to the advertiser of first and subsequent impressions respectively, and $0 \leq a_l \leq a_h$. An advertiser's profit is the advertiser's revenue minus the sum of $a_{jm} q_{jm} S_m$ over all newspapers j in which the advertiser chooses to advertise. The difference between a_l and a_h captures the extent of diminishing returns in advertising impressions. The model allows for the case of zero return to duplicate impressions ($a_l = 0$) as well as the case of no diminishing returns ($a_h = a_l$).

Our demand specification follows Gentzkow (2007) in allowing explicitly for multiple readership. The utility of household i in market m from consuming a bundle of newspapers $\mathcal{B}$ is given by

$$u_{im}(\mathcal{B}) = \sum_{j \in \mathcal{B}} \left(\underline{\beta} \mathbf{1}_{\theta_{im} \neq \tau_{jm}} + \overline{\beta} \mathbf{1}_{\theta_{im} = \tau_{jm}} - \alpha p_{jm} \right) - g_s(\mathcal{B}) \Gamma_s - g_d(\mathcal{B}) \Gamma_d + \varepsilon_{im}(\mathcal{B}), \tag{2}$$

where $g_s(\mathcal{B})$ is the number of distinct two-newspaper subsets of bundle $\mathcal{B}$ such that the two newspapers have the same political affiliation, $g_d(\mathcal{B})$ is the number of two-newspaper subsets with different affiliations, and $\varepsilon_{im}(\mathcal{B})$ is a type-I extreme value error. Note that the utility from consuming no newspapers is $\varepsilon_{im}(\emptyset)$. A household thus receives per-newspaper utility $\overline{\beta}$ for each newspaper in its consumption bundle that has the same affiliation as the household, and per-newspaper utility $\underline{\beta}$ for each newspaper that has a different affiliation. Utility is diminished by an amount Γ_s for every pair of newspapers with the same affiliation and by an amount Γ_d for every pair with a different affiliation. The specification thus allows that same-affiliation papers are closer substitutes than opposite-affiliation papers. We assume that this demand specification applies to both newspaper markets and hinterland towns.

C. *Equilibrium*

We derive a pure-strategy perfect Bayesian equilibrium of the model beginning at the end of the game and working backward.

In the final stage of the game, the demands q_{jm} are uniquely determined given the number of newspapers, their affiliations, and their circulation prices. Integration over ε_{im} and θ_{im} yields a closed form for q_{jm} as a sum of familiar logit probabilities.[20]

In the fourth stage, newspapers simultaneously choose advertising prices given the number of newspapers, their affiliations, and their circulation prices. In any pure strategy equilibrium of the advertising pricing stage in market m with affiliations $\boldsymbol{\tau}$ and prices $\mathbf{p}$, all advertisers must advertise in all newspapers ($\psi_{jm} = 1$), and newspaper j's advertising price per copy must equal

$$a_{jm}(\mathbf{p}, \boldsymbol{\tau}) = a_h \mathscr{E}_{jm}(\mathbf{p}, \boldsymbol{\tau}) + a_l\big(1 - \mathscr{E}_{jm}(\mathbf{p}, \boldsymbol{\tau})\big), \tag{6}$$

where $\mathscr{E}_{jm}$ is the share of newspaper j's readers who are "exclusive" in the sense that they read no other newspaper.[21] In equilibrium, each newspaper charges advertisers

[20] Let

$$u_m^{\theta}(\mathcal{B}) = \sum_{j \in \mathcal{B}} \left(\underline{\beta}\mathbf{1}_{\theta \neq \tau_{jm}} + \overline{\beta}\,\mathbf{1}_{\theta = \tau_{jm}} - \alpha p_{jm}\right) - g_s(\mathcal{B})\Gamma_s - g_d(\mathcal{B})\Gamma_d \tag{3}$$

denote the mean utility of households of type θ for bundle $\mathcal{B}$. Then the share of households of type θ who purchase newspaper j is

$$q_{jm}^{\theta} = \frac{\sum_{\{\mathcal{B} \in \mathbb{B} \,:\, j \in \mathcal{B}\}} \exp\big(u_m^{\theta}(\mathcal{B})\big)}{\sum_{\mathcal{B}' \in \mathbb{B}} \exp\big(u_m^{\theta}(\mathcal{B}')\big)}, \tag{4}$$

where $\mathbb{B}$ is the set of all bundles of the papers in market m. The market-wide share of households purchasing newspaper j is then

$$q_{jm} = \rho_m q_{jm}^{R} + (1 - \rho_m)\, q_{jm}^{D}. \tag{5}$$

[21] Although demand has not yet been realized at the advertising stage, $\mathscr{E}_{jm}$ depends only on affiliations and prices, both of which have been chosen at this stage of the game. Anderson, Foros, and Kind (2011) prove our characterization formally. A proof sketch is as follows. First, observe that in any equilibrium all advertisers must advertise in all newspapers, since if a newspaper receives no advertising, there is always some positive advertising price below a_l that the newspaper would like to charge and that would attract advertising, thus raising the newspaper's profits. Second, observe that in any equilibrium each newspaper will charge a price such that advertisers are indifferent between advertising in that newspaper and not; otherwise the newspaper could raise its advertising price and increase its profits. With all advertisers advertising in all newspapers, it is straightforward to show that this maximum price is given by (6) for all newspapers, implying the desired result.

only for the incremental value of the impressions the newspaper can deliver, which is reduced if these impressions are duplicated with other newspapers.

In the third stage, firms simultaneously choose circulation prices given the number of newspapers and their affiliations. An equilibrium of this stage in market m with affiliations $\boldsymbol{\tau}$ is a vector $\mathbf{p}^*$ such that each element p_j^* satisfies

$$p_j^* \in \arg\max_{p_j} \left(p_j + a_{jm}(\mathbf{p}^*, \boldsymbol{\tau}) - MC\right) q_{jm}(\mathbf{p}^*, \boldsymbol{\tau}). \tag{7}$$

We cannot provide a proof of the uniqueness of the pricing game equilibrium. In estimation we solve numerically for the first-order conditions of the game and we verify that all newspapers' second-order conditions hold at the solution. We choose a starting value close to the observed prices and verify that the solution is not sensitive to local variation (plus or minus \$1 per copy) in the choice of starting value at the estimated parameters.

In the second stage, firms sequentially choose affiliations given the number of newspapers and their affiliation-specific shocks ξ_{jm}. An equilibrium of this stage in market m given the number of newspapers J is a vector $\boldsymbol{\tau}^*$ such that each τ_j^* maximizes $\left(\mathrm{E}_{\boldsymbol{\tau}_{j^+}^*} v_{jm}\left(\left[\boldsymbol{\tau}_{j^-}^*, \tau_j^*, \boldsymbol{\tau}_{j^+}^*\right]\right) - \xi_{jm}\left(\tau_j^*\right)\right)$, where $\boldsymbol{\tau}_{j^-}^*$ and $\boldsymbol{\tau}_{j^+}^*$ are vectors of affiliations of the newspapers with indices less than and greater than j, respectively, and $v_{jm}(\boldsymbol{\tau})$ denotes the equilibrium value of $\left(p_{jm} + a_{jm} - MC\right) q_{jm}$ given affiliations $\boldsymbol{\tau}$. For generic realizations of cost shocks ξ_{jm} there is a unique equilibrium vector of affiliation choices that can be computed by backward induction.

In the first stage, potential entrants sequentially choose either to enter or to not enter. At this point in the game all potential entrants are symmetric and share the same information sets, and since the number of potential entrants is finite, this stage has a unique equilibrium for generic parameter values. Let $P_m(\boldsymbol{\tau})$ denote the equilibrium probability that the second-stage affiliation vector is $\boldsymbol{\tau}$ conditional on $|\boldsymbol{\tau}|$ newspapers entering. Given affiliations $\boldsymbol{\tau}$, let $\bar{\xi}_{jm}(\boldsymbol{\tau})$ denote the expected value of $\xi_{jm}(\tau_j)$ conditional on newspaper j choosing its affiliation optimally. The per-household expected variable profit of each entering newspaper given J entrants is

$$V_m(J) = \frac{1}{J} \sum_{j=1}^{J} \sum_{\boldsymbol{\tau} \in \mathcal{T}_J} \left(v_{jm}(\boldsymbol{\tau}) - \bar{\xi}_{jm}(\boldsymbol{\tau})\right) P_m(\boldsymbol{\tau}), \tag{8}$$

where $\mathcal{T}_J$ is the set of $\boldsymbol{\tau}$ vectors with $|\boldsymbol{\tau}| = J$. If V_m is strictly decreasing in J, the equilibrium number of firms J^* is the unique number such that entering newspapers are profitable but a marginal entrant would not be. That is,

$$V_m(J^*) \geq \frac{\kappa_m}{S_m} > V_m(J^* + 1) \tag{9}$$

for $J^* \in \{1, \ldots, J^{max} - 1\}$. If $V_m(1) < \kappa_m / S_m$ then $J^* = 0$ is the equilibrium, and if $V_m(J^{max}) > \kappa_m / S_m$ then $J^* = J^{max}$ is the equilibrium. Though we do not have a formal proof that V_m must be decreasing, this condition is intuitive: it means that all else equal a firm would rather be in a market with fewer competitors. In repeated simulations we find that this property holds for all markets in our data at the estimated parameters.

D. *Discussion*

Market Definition.—We make two important simplifying assumptions in defining newspaper markets. First, we assume that newspapers only compete with other newspapers headquartered in the same market, and we ignore circulation in hinterland towns in modeling newspapers' affiliation, pricing, and entry choices. In reality, the 1924 ABC data show that home-market papers constitute 90 percent of circulation in news markets, and the average newspaper sold 65 percent of copies in its home market.[22] Our definition is thus an approximation to a reality in which consumers exhibit strong but not exclusive preferences for local papers. To assess robustness to this assumption, we show results in Appendix A from a subsample that excludes markets close to large cities, and from a specification in which we incorporate hinterland towns into our measure of market ideology.

Second, we aggregate all substitutes for daily newspapers into an outside option whose prices and characteristics we do not model explicitly. We deliberately choose a period of study in which there were few such substitutes that were also significant sources of political information. In 1924, television did not exist and radio was in its infancy as a news source (Sterling and Kittross 2001). Although weekly newspapers and magazines existed and played an important role in the media market, neither conveyed the news on a daily basis, and neither weekly newspapers nor weekly magazines achieved total weekly circulation in excess of the total *daily* circulation of daily newspapers (Field 2006).

Product Characteristics.—Our model endogenizes political affiliation but not other forms of differentiation. This is clearly a dramatic simplification, as variation in both quality and nonpolitical horizontal dimensions (such as time of publication) was clearly important. Estimating consumer preferences for other dimensions is straightforward, but endogenizing newspapers' choices of attributes along multiple dimensions would add significant complexity.

Failing to account for unobserved vertical differentiation can lead to bias in price coefficients (Berry, Levinsohn, and Pakes 1995). As we detail further below, this concern motivates us to identify the price coefficient α from the monopoly first-order condition (Gentzkow 2007) rather than from price variation. We present several additional sensitivity analyses. In Appendix A we show results from a model which allows utility to depend on distance to a newspaper's headquarters, an important shifter of quality. We also experiment with specifications which use a newspaper's price and home market circulation as quality proxies. In the online Appendix, we show explicitly that the crucial cross-sectional patterns which identify our demand system are robust to allowing flexibly for variation in quality at the newspaper level.

Ignoring nonpolitical horizontal differentiation is also an important simplification. The more newspapers can differentiate on nonpolitical dimensions, the weaker will be their incentive to differentiate on politics (Irmen and Thisse 1998; Liu and Shuai

[22] Fan (2013) uses a wider market definition which encapsulates 85 percent of a newspaper's circulation and includes circulation outside a newspaper's home market. Allowing for this additional realism would be difficult in our model as we estimate newspapers' incentive to enter the market. Doing so in a model with overlapping markets would mean computing post-entry equilibrium configurations taking account of strategic linkages of distant newspapers through chains of partially overlapping markets.

2013). We expect our empirical estimates to reflect the incentive to differentiate on political dimensions *given* the extent of differentiation on other dimensions. As we do not treat differentiation on other dimensions as endogenous, we cannot allow it to vary in our counterfactuals, which could impact our conclusions. For example, we could overstate or understate the welfare effects of collusion, because collusion can both encourage and discourage nonpolitical differentiation (Sweeting 2010). In addition, we could overstate the value of variety, because we capture nonpolitical differentiation through a symmetric logit error (Ackerberg and Rysman 2005).

In the online Appendix we present sensitivity analyses related to these concerns. We show that our finding that variety is undersupplied survives even if we exogenously cap the number of entering newspapers. We also present results from an experiment in which we simulate data from a model with two types of horizontal differentiation—politics and time of publication—and estimate a misspecified model that allows only for political differentiation. We find that the estimated model matches the qualitative counterfactual predictions of the data-generating model well, although there are some quantitative differences between the two.

Consumer Preferences.—Our demand specification is designed to capture two key elements: consumers' preferences for like-minded political news, and the possibility of a given household reading multiple papers. The former is obviously important given our focus on political differentiation. The latter is equally crucial, because audience duplication across papers will be the key driver of advertising competition. It is also consistent with our readership surveys, which show a significant amount of multiple readership.

Our demand model nests several cases of interest. When $\underline{\beta} = \overline{\beta}$ and $\Gamma_d = \Gamma_s = 0$, it is equivalent to a model in which each newspaper is a monopolist facing logit demand. When $\underline{\beta} = \overline{\beta}$ and $\Gamma_d, \Gamma_s \to \infty$, it is a standard logit model in which each household reads at most one newspaper. When $\underline{\beta} \to -\infty$, it is equivalent to a model in which there are two distinct markets, one for R newspapers and one for D newspapers.

An important simplifying assumption is that we allow only two types of consumers: Republican and Democratic. In reality, of course, some consumers in the period we study did not have a definite partisan affiliation, although this group was likely in a minority.[23] In the presence of unmodeled nonpartisan consumers, we expect that the gap $\overline{\beta} - \underline{\beta}$ which we estimate will measure the "average" level of partisanship in news preferences (i.e., a value between the preferences of partisans and nonpartisans). The online Appendix presents estimates of an augmented demand system which allows for politically unaffiliated consumers, and shows how our counterfactual estimates change with the fraction unaffiliated.

We assume that the same demand model applies in newspapers' headquarter markets and in the small, hinterland towns surrounding those markets. The assumption that preferences do not depend directly on market size, though common in the

[23] Using Burnham's (1965) index based on aggregate election returns, Rusk (1970) estimates that split-ticket voting in the United States was not more than 7 percent during the period 1876–1908. Millspaugh (1918) reports based on actual ballot records that 21.7 percent of votes in Rhode Island in 1906 were split-ticket. Erikson and Tedin (1981) report that 26 percent of voters switched parties between the 1924 and 1928 elections and that this figure fell to 11 percent by 1944. (The 1924–1928 period coincides with a major shift in US party politics.)

entry literature (see, e.g., Bresnahan and Reiss 1991), is a strong restriction. In the online Appendix we show that the key qualitative features of demand which we highlight in our descriptive analysis are present for both large and small towns, and in Appendix A we show sensitivity to removing the largest and smallest hinterland towns from the sample.

Advertising Game.—Our model of advertising competition draws heavily on the theoretical literature on competition in two-sided markets with multihoming (Armstrong 2002; Anderson, Foros, and Kind 2011; Ambrus, Calvano, and Reisinger 2013). Allowing for advertising competition is important because advertising accounted for the majority of newspaper revenue during the period we study.

The prediction of diminishing returns to duplicate impressions fits with narrative evidence from the period we study. It was common for advertisers to assess the duplication in readership across publications when considering where to place ads, and to consider duplicate impressions to the same household to be less valuable than unique impressions.[24] Indeed, these practices explain the existence of the readership surveys that we use for a portion of our analysis, which were typically sponsored by one or more local newspapers.

Our advertising model makes several important simplifying assumptions. First, we do not allow the quantity of ads to affect the utility of a newspaper to consumers. In contrast to the literature on broadcast media, for print media the evidence is mixed on consumers' valuations of advertising, with good empirical support for a positive value to readers in some settings (Bogart 1981; Sonnac 2000; Kaiser and Wright 2006; Kaiser and Song 2009). Implicitly, our approach follows Dertouzos and Trautman (1990) in assuming the consumer treats advertising and news content symmetrically. Second, we assume that advertisers' valuations are homogeneous and do not depend on consumer types (as they do, for example, in Chandra 2009).

We impose these restrictions because we do not have reliable cross-sectional data on advertising quantities and rates. The most important consequence of these assumptions is that all advertisers are served in equilibrium in the model, which means that the advertising side of the market is allocatively efficient even under imperfect competition. This is a strong assumption. However, we note that because display advertising rates are often negotiated individually, newspapers have substantial scope for price discrimination in rates, which means that imperfect competition may not lead to quantity restrictions relative to the first best.

We also assume that newspaper costs are independent of the number of ads printed. This is primarily for simplicity. Equilibrium advertising prices and quantities would be unchanged if we allowed for a per-reader cost of printing each advertiser's ad, provided the printing cost per reader is less than a_l.

For ease of exposition, we assume that circulation prices are fixed at the time firms set advertising rates. This is consistent with the fact that subscription prices are typically posted (and so adjust relatively infrequently), whereas advertising rates

[24] In his text on advertising campaigns, Martin (1921, p. 148) writes that "The same advertisement seen in two or three newspapers is certainly more effective than if seen in one, but some advertisers are convinced that it is not worth three times as much to have an advertisement seen in three papers, reaching largely the same readers, as to have it seen in one."

are often negotiated. However, because advertising prices do not affect consumer demand, the equilibria of the game we study are equivalent to those of a game with simultaneous choice of both circulation and advertising prices.

Entry and Affiliation Games.—Our model of entry and affiliation choice is shaped by three main considerations. First, to credibly identify the strategic interactions of firms which share a market environment, it is important to allow for unobservable shocks at both the market and individual firm level (Brock and Durlauf 2007; Aguirregabiria and Nevo 2013). Second, to take advantage of our data, we want the model to reflect the reality that entry in these markets happened sequentially, and that we know the order in which it occurred. Third, as a practical matter, we want to avoid complications related to estimating models with multiple equilibria.

To meet these goals and still maintain tractability, we combine a relatively rich incomplete information model of affiliation choice with a more stylized complete-information model of the entry stage in the style of Bresnahan and Reiss (1991). In the affiliation stage, firms' decisions are based on both idiosyncratic and market-level unobservables. They condition on the choices of past movers, and take account of the way their decisions will affect those who come later. In the entry stage, by contrast, firms do not yet know their idiosyncratic shocks, and so they are all symmetric. Equilibrium is determined by a simple optimality condition, though it still requires numerical integration over the market-level shock as in Mazzeo (2002).

An important departure from Bresnahan and Reiss (1991) is that we allow the distribution of fixed costs to depend on market size. We do this because newspapers' fixed investments, notably editorial costs, are endogenous to the quality of the newspaper and hence to the size of the market served (Berry and Waldfogel 2010). In Section VII we report evidence that our estimates of the fixed costs of newspapers of different size are a good match to the data. In Appendix A we show that our findings are robust to allowing a more flexible dependence of the distribution of fixed costs on population.

Among the many restrictive assumptions our model embeds, two are particularly important. First, we assume that entry decisions precede affiliation decisions, with firms only learning their cost shocks ξ_{jm} post-entry.[25] This is clearly an abstraction, and is at odds with our preferred interpretation of the shocks ξ_{jm} as reflecting owners' political preferences. Substantively, we expect the main costs of this assumption to be that our model does not allow entry deterrence incentives to affect affiliation choices, and that our model does not allow selection of owners into like-minded markets. The benefits are that we simplify computation dramatically, since we need only backward induct through the sequential game for the set of actual entrants rather than the full set of potential entrants, and that our estimates are not sensitive to assumptions about the set of potential entrants. The latter is particularly important in our case, since we have almost no evidence on the nature of this pool or the way it varies across markets.

[25] The assumption that agents learn their private information after entry is common in the literature on auctions (Levin and Smith 1994; Bajari and Hortaçsu 2003). A related assumption is that firms do not know their order in the affiliation choice game at the time they enter. This is purely for technical convenience as it allows us to characterize the equilibrium of the entry game succinctly with equation (9). If we instead assumed that firms chose affiliations in the order in which they entered, conditions on the payoffs of the marginal entrant would no longer be sufficient.

Second, we approximate a dynamic entry process by a static model. Although we capture some aspects of the dynamics by making affiliation choice sequential, we abstract from the reality that one entrant typically operates in the market for a substantial time before the next entrant arrives, that firms do exit, and that different entrants face different demand conditions when choosing affiliations. The most obvious challenge in moving to a dynamic model is the computational difficulty of allowing for both market-level and firm-level unobservables (Aguirregabiria and Nevo 2013).

V. Demand Estimation

We estimate the parameters of equation (2) by maximum likelihood using circulation data from hinterland towns. We assume that measured circulation $\hat{Q}_{jt}$ of newspaper j in town t is equal to $q_{jt}S_t\zeta_{jt}$, where q_{jt} is the share of households purchasing newspaper j, S_t is the number of households in town t, and ζ_{jt} is a measurement error with $\log\,\zeta_{jt} \sim N\left(0,\, \sigma_\zeta^2\right)$, i.i.d. across newspapers and towns.

To implement the spatial identification strategy outlined in Section IIIC, we assume that the share ρ_t of consumers in town t with $\theta = R$ is unobserved and may be correlated within the pairs of neighboring towns defined in Section IC. Specifically, we assume that $\rho_t = \text{logit}^{-1}(\text{logit}\,(Z_t) + \nu_t)$, where Z_t is the observed Republican vote share in t's county and ν_t is a normally distributed unobservable with mean μ_ν^{town} and standard deviation σ_ν^{town}. The logit transformation ensures that $\rho_t \in (0,\, 1)$. We assume that ν is correlated (and jointly normal) between pairs of neighboring towns t and t', but independent across pairs, with the within-pair correlation restricted to match that of the observable Z:

$$\frac{\text{cov}\,(\nu_t,\, \nu_{t'})}{\text{var}\,(\nu_t)} = \frac{\text{cov}\left(\text{logit}\,(Z_t),\, \text{logit}\,(Z_{t'})\right)}{\text{var}\left(\text{logit}\,(Z_t)\right)}. \tag{10}$$

The assumption that the spatial correlation of unobservables is equal to that of observables is intermediate between two extremes: perfect correlation, in which case observably equivalent neighboring towns cannot have systematically different circulation patterns, and no correlation, in which case observably equivalent neighboring towns must have orthogonal circulation.

Our model of newspaper entry is appropriate for headquarter markets, but not necessarily for hinterland towns, where newspaper availability was often determined by the decisions of news dealers and other independent newspaper agents. To flexibly account for the endogeneity of the choice set to town ideology ρ_t, we adopt a reduced form in which $\Pr(\tau_{jt} = R) = \text{logit}^{-1}\left(\mu_\rho^0 + \mu_\rho^1\,\text{logit}\,(\rho_t)\right)$, where μ_ρ^0 and μ_ρ^1 are parameters to be estimated. In our main estimates, we treat the number of newspapers J_t available in town t as nonstochastic. In Appendix A we show that our results are robust to modeling J_t as a random variable whose distribution depends on ρ_t and the size of the town S_t, and to allowing more flexibility in the dependence of affiliations on ρ_t.

As in the descriptive analysis in Section III, we use as our dependent measure the difference between the mean log circulation of Republican newspapers and the mean log circulation of Democratic newspapers in each town t. We do this to scale out variation in population, which is likely to be poorly measured.

In addition to the dependent measure, the econometrician observes Z_t and the sets $\mathcal{J}_t^R$ and $\mathcal{J}_t^D$ of Republican and Democratic papers available in town t, respectively. Given some true ideology ρ_t, the conditional likelihood of the data for town t is

$$(11)\quad L_t(\rho_t) = \frac{1}{\tilde{\sigma}_t}\phi\left(\frac{1}{\tilde{\sigma}_t|\mathcal{J}_t^R|}\sum_{j\in\mathcal{J}_t^R}\log\left(\frac{\hat{Q}_{jt}}{q_{jt}}\right) - \frac{1}{\tilde{\sigma}_t|\mathcal{J}_t^D|}\sum_{j\in\mathcal{J}_t^D}\log\left(\frac{\hat{Q}_{jt}}{q_{jt}}\right)\right)\Pr(\boldsymbol{\tau}_t|\rho_t, J_t),$$

where $\phi(\,)$ denotes the standard normal PDF and $\tilde{\sigma}_t = \sigma_\zeta\sqrt{1/|\mathcal{J}_t^R| + 1/|\mathcal{J}_t^D|}$. The unconditional log likelihood of the observed data is

$$(12)\qquad \ln L = \sum_{(t,t')}\ln\int_{\rho_t,\rho_{t'}} L_t(\rho_t)L_{t'}(\rho_{t'})\, dF^{town}(\rho_t, \rho_{t'}|Z_t, Z_{t'}),$$

where $F^{town}(\,)$ is the conditional joint distribution of ρ_t and $\rho_{t'}$ and the sum is taken over all pairs of neighboring towns. For towns that do not have at least one paper of each affiliation, the circulation portion of the likelihood $\phi(\cdots)/\tilde{\sigma}_t$ is unity; these towns contribute to identification only via $\Pr(\boldsymbol{\tau}_t|\rho_t, J_t)$.

We introduce additional data moments to complete identification of our model. Using our cost and revenue data, we calibrate the marginal cost MC and the monopoly advertising revenue per reader a_h to match their sample analogues in monopoly newspaper markets with $Z_m \in [0.45, 0.55]$. For any candidate value of the other parameters of the model, we choose the price coefficient α and the utility shifter $\underline{\beta}$ so that the predicted average price and circulation per household of monopoly newspapers in a market with $\rho = 0.5$ matches the observed average price and circulation per household of monopoly newspapers in markets with $Z_m \in [0.45, 0.55]$.[26] We also choose the substitution parameter Γ_d so that the predicted overlap in readership in a market with equal shares of Republicans and Democrats, one paper of each affiliation, and average prices, matches the average overlap in readership among different-affiliation newspapers in our readership survey data. In Appendix A we present evidence on the sensitivity of our estimates to changes in the empirical moments used in calibration.

We estimate the remaining parameters $\{\overline{\beta}, \Gamma_s, \sigma_\zeta, \mu_\nu^{town}, \sigma_\nu^{town}, \mu_\rho^0, \mu_\rho^1\}$ by maximizing equation (12).[27]

A. *Identification*

Fixing the affiliations of available newspapers, the correlation shown in Table 3 between the relative demand for Republican newspapers and the observed fraction Republican Z_t identifies $\overline{\beta}$ relative to $\underline{\beta}$. The share of households reading the newspaper then pins down the levels of $\overline{\beta}$ and $\underline{\beta}$. Given these two parameters, observed

[26] Discounts to subscribers mean that circulation revenue per copy may be below posted subscription prices. We compute the average discount as the average ratio of subscription price to annual circulation revenue, and apply this discount to all subscription prices to compute the effective price of each newspaper.

[27] We approximate the integral in the likelihood using sparse grid integration with Gaussian kernel and accuracy 3 (Heiss and Winschel 2008; Skrainka and Judd 2011). In the online Appendix, we present estimates of the model in which we reduce and increase the accuracy by 1.

monopoly markups identify the price sensitivity parameter α as in Gentzkow (2007).[28]

The relationship between the share of a town's available newspapers that are Republican and Z_t identifies the parameters μ_ρ^0 and μ_ρ^1, and the variance of unobserved ideology σ_ν^{town} is identified by spatial correlation in circulation as outlined in Section IIIC. Given these parameters, Γ_s is identified by the strength of the relationship (shown in Table 3) between the relative circulation of Republican papers and the relative number of Republican papers. Given the other parameters, Γ_d is then identified by the extent of overlap in the readership of newspapers with different affiliations.

The average relative circulation of Republican papers identifies μ_ν^{town}. The parameter σ_ζ, which governs the importance of measurement error in circulation, is then identified by the variance of residual circulation.

Although this heuristic discussion of identification treats the different steps as separable, the demand parameters are in fact jointly determined and jointly estimated.

VI. Supply Estimation

Taking the demand parameters estimated in Section V as given, we estimate the remaining parameters by maximum likelihood using our market-level data on newspaper entry and affiliation choices.

To implement the spatial identification strategy outlined in Section IIIC, we assume that ρ_m is unobserved and may be correlated within the pairs of neighboring markets defined in Section IB. We assume that $\rho_m = \text{logit}^{-1}(\text{logit}(Z_m) + \nu_m)$, with ν_m distributed normally with mean μ_ν^{mkt} and standard deviation σ_ν^{mkt}. We assume that the analogue of equation (10) holds for ν_m and Z_m.

We set the number of potential entrants J^{max} to 6, which is 1 more than the maximum number of newspapers observed in any market in our data. In simulations of our baseline model with $J^{max} = 10$, we find that fewer than 1 percent of markets have more than 6 entrants.

The econometrician observes Z_m, population S_m, the number of entering newspapers J_m, and the affiliation choices τ_m. The conditional likelihood of the data for market m given ρ_m and $J_m < J^{max}$ is

$$(13)\quad L_m(\rho_m) = \begin{cases} 1 - G_m(V(J_m + 1, \rho_m)) & \text{if } J_m = 0 \\ \left[G_m(V(J_m, \rho_m)) - G_m(V(J_m + 1, \rho_m))\right] P(\boldsymbol{\tau}_m, \rho_m) & \text{if } J_m > 0, \end{cases}$$

[28] We use supply conditions to identify the price coefficient because we lack compelling exclusion restrictions but we have reasonably good information on variable markups for the typical newspaper. We use the first-order condition from monopoly markets rather than oligopoly markets so that our estimate of the price coefficient do not depend on conduct assumptions, though of course our approach still relies on strong assumptions such as uniform (and observed) marginal costs, the parametric structure we have assumed for consumer demand, and the assumptions about the game between newspapers and advertisers.

where G_m is the CDF of κ_m/S_m. Here we make explicit that both $V(\,)$ and $P(\,)$ depend on ρ_m and so drop the m subscripts. The unconditional log likelihood of the data is

$$\ln L = \sum_{(m,m')} \ln \int_{\rho_m,\rho_{m'}} L_m(\rho_m)\, L_{m'}(\rho_{m'})\; dF^{mkt}(\rho_m,\, \rho_{m'} | Z_m,\, Z_{m'})\,, \tag{14}$$

where $F^{mkt}(\,)$ is the conditional joint distribution of ρ_m and $\rho_{m'}$ and the sum is taken over all pairs of neighboring markets.

We estimate the remaining parameters $\left\{a_l,\, \sigma_\xi,\, \mu_\nu^{mkt},\, \sigma_\nu^{mkt},\, \mu_\kappa^0,\, \mu_\kappa^1,\, \sigma_\kappa\right\}$ by maximizing equation (14), taking as given the demand parameters $\left\{\alpha,\, \underline{\beta},\, \overline{\beta},\, \Gamma_d,\, \Gamma_s\right\}$ estimated as described in Section V.[29]

A. *Identification*

The overall share of newspapers choosing a Republican affiliation pins down μ_ν^{mkt}, and the variance of unobserved ideology σ_ν^{mkt} is identified by spatial correlation in affiliation choices as outlined in Section IIIC.

Given these parameters and the demand parameters, the correlation between entrant and incumbent affiliations (shown in Table 4) identifies the diminishing returns in advertising, captured by the parameter a_l. The intuition is that, because the demand estimates reported below imply that overlap in readership is greater between newspapers of the same affiliation than newspapers of a different affiliation, lower values of a_l correspond to a stronger incentive to differentiate in order to soften advertising competition, so a_l is identified by the extent to which newspapers differentiate more than would be expected from the substitution and price effects predicted from the demand system. Entry patterns also contribute to the identification of a_l, as they are informative about the extent to which per-newspaper profits decline with the number of newspapers.

The scale term σ_ξ is identified by residual variation in newspapers' affiliation choices.

The correlation between the number of newspapers and the market's population determines μ_κ^0 and μ_κ^1, and the extent of variation in the number of newspapers conditional on population determines σ_κ.

Although this heuristic discussion of identification treats the different steps as separable, the supply parameters are in fact jointly determined and jointly estimated.

VII. Results

A. *Parameter Estimates and Determinants of Diversity*

Tables 5 and 6 report estimates of demand and supply parameters, respectively, along with asymptotic standard errors. In the online Appendix, we present Monte

[29] We approximate the integral in the likelihood using sparse grid integration with Gaussian kernel and accuracy 3 (Heiss and Winschel 2008; Skrainka and Judd 2011). In the online Appendix, we present estimates of the model in which we reduce and increase the accuracy by 1.

TABLE 5—PARAMETER ESTIMATES (*Demand model*)

Price coefficient (α)	0.1798
	(0.0032)
Mean utility for different-affiliation paper ($\underline{\beta}$)	−0.2906
	(0.0676)
Mean utility for same-affiliation paper ($\overline{\beta}$)	0.8137
	(0.0759)
Substitutability between same-type papers (Γ_s)	0.5645
	(0.0669)
Substitutability between different-type papers (Γ_d)	0.3004
	(0.0469)
Standard deviation of log of measurement error (σ_ζ)	0.7017
	(0.0077)
Mean of unobservable shifter of fraction Republican (μ_ν^{town})	0.0466
	(0.0422)
Standard deviation of unobservable (σ_ν^{town})	0.2783
	(0.0135)
Parameters governing share of town's newspapers that are Republican	
μ_ρ^0	−0.0714
	(0.0850)
μ_ρ^1	1.9952
	(0.0336)
Calibrated parameters	
Marginal cost (MC)	8.1749
Spatial correlation of unobservable $\left(\frac{\text{cov}(\nu_t, \nu_{t'})}{\text{var}(\nu_t)}\right)$	0.7233
Number of towns	12,188
Number of newspapers	670
Number of newspaper-towns	28,779

Notes: Table shows maximum likelihood estimates of demand model parameters with asymptotic standard errors in parentheses. See Section V for details.

Carlo experiments and experiments with random starting values for both sets of parameters.

The qualitative patterns in both sets of parameters accord with economic intuition and the descriptive evidence in Tables 3 and 4. On the demand side, households prefer newspapers whose affiliations match their own. Bundles of newspapers produce less utility than the sum of the utilities produced by the component papers alone, and these diminishing returns are greater for same-type newspapers than for opposite-type newspapers. There is substantial unobserved heterogeneity in household ideology across towns, which in turn is correlated with the fraction of available newspapers that are Republican. On the supply side, advertising rates are lower for overlapping readers than for singleton readers, and unobserved heterogeneity is less important.[30]

[30] The fact that unobservables are less important in the supply model than in the demand model may come from the fact that county vote share is a better proxy for the ideology of large markets than of small towns. In the online Appendix we show that unobserved heterogeneity matters in the sense that estimates of key demand parameters change meaningfully when we omit unobservable heterogeneity from the model.

Table 6—Parameter Estimates (*Supply model*)

Advertising revenue per reader of non-singleton bundles (a_l)	7.4447
	(1.2626)
Standard deviation of affiliation cost shocks (σ_ξ)	0.2277
	(0.0298)
Mean of unobservable shifter of fraction Republican (μ_ν^{mkt})	−0.0114
	(0.0184)
Standard deviation of unobservable (σ_ν^{mkt})	0.1523
	(0.0684)
Parameters governing the distribution of fixed costs	
μ_κ^0	8.7354
	(0.4860)
μ_κ^1	−0.6448
	(0.0618)
σ_κ	0.3607
	(0.0345)
Calibrated parameters	
Advertising revenue per reader of singleton bundles (a_h)	13.4707
Spatial correlation of unobservable $\left(\frac{\text{cov}(v_m, v_{m'})}{\text{var}(\nu_m)}\right)$	0.7217
Number of markets	1,910
Number of newspapers	1,338

Notes: Table shows maximum likelihood estimates of supply model parameters with asymptotic standard errors in parentheses adjusted for the uncertainty in demand parameters (Murphy and Topel 1985). See Section VI for details.

Our model implies that readership overlaps more between papers of the same affiliation than papers of different affiliations, a fact consistent with evidence reported in the online Appendix from our readership surveys. For example, in data simulated from our model for two-paper markets, the average readership overlap for same-affiliation papers is 17 percent, compared to 14 percent for opposite-affiliation papers. This results from the strong taste for like-minded news ($\overline{\beta} - \underline{\beta}$) outweighing the greater substitutability of same-affiliation papers ($\Gamma_s > \Gamma_d$).[31] As noted above, it implies that advertising competition will increase incentives to differentiate politically.

The estimated parameters of the fixed cost distribution appear reasonable. In simulation we find that the mean fixed cost of monopoly newspapers is $9.03 per copy, as against $7.73 in the Inland Press data. The concept measured by the model incorporates sunk costs and opportunity costs that may not be reflected in financial data, so it is intuitive that the estimated fixed costs are somewhat higher than those in the Inland Press data. The model implies that fixed costs per capita decline very slowly with the size of the market: a 10 percent increase in population reduces fixed costs per capita by only six cents. This is consistent with the Inland Press data, which show essentially no relationship between fixed costs per copy and the number of copies sold.

[31] The large difference between $\overline{\beta}$ and $\underline{\beta}$ is in turn driven by the strong relationship between vote shares and the relative circulation of Republican papers.

TABLE 7—DETERMINANTS OF EQUILIBRIUM DIVERSITY

	Markets with diverse papers	Share of households in markets with diverse papers	Share of households reading diverse papers
Baseline	143	0.22	0.029
Ignore competitors' choices	68	0.11	0.014
Ignore household ideology	211	0.31	0.038
Ignore idiosyncratic cost shocks	110	0.18	0.024

Notes: Table shows averages over five counterfactual simulations at the parameters reported in Tables 5 and 6. A market has diverse papers if it has at least one Republican and one Democratic paper, and a household reads diverse papers if it reads at least one Republican and one Democratic paper. "Baseline" is simulation of the estimated model. "Ignore competitors' choices" is a counterfactual in which each paper chooses its affiliation as if it will be the only paper in the market. "Ignore household ideology" is a counterfactual in which each paper chooses its affiliation as if its market were 50 percent Republican ($\rho = 0.5$). "Ignore idiosyncratic cost shocks" is a counterfactual in which each paper chooses its affiliation as if $\xi = 0$. The number of newspapers is fixed at its baseline value in all counterfactuals.

In the online Appendix, we present estimates of the main regression specifications in Tables 3 and 4 using data simulated from the model at the estimated parameters. We also present a figure illustrating the fit of the entry model. These regressions and figure show that the estimated model fits key features of the data well on the whole. An important exception is that the model underpredicts the number of large markets with two papers relative to the number with one or three, possibly due to the functional form imposed by the symmetric logit error in the demand system. The online Appendix also presents evidence on the model's out-of-sample fit to the distribution of subscription prices across market configurations, and to the effect of long-term changes in marginal cost on newspaper market structure.

To interpret the magnitude of the parameter estimates and to study the drivers of ideological diversity, Table 7 shows the estimated model's prediction of the level of diversity at baseline and under three counterfactual scenarios. We measure diversity in three ways: the number of markets with diverse papers (at least one paper of each type), the share of households in a market with diverse papers, and the share of households reading at least one paper of each type.

In our first counterfactual, we assume that each entering newspaper chooses its affiliation as if it expected to be the only newspaper in the market. In our second counterfactual, we assume that each newspaper chooses its affiliation as if its market had equal numbers of Republican and Democratic households. In our third counterfactual, we assume that each entering newspaper chooses its affiliation as if there are no idiosyncratic affiliation-specific cost shocks ξ. These counterfactuals can be thought of as measuring the importance of competition, consumer tastes, and idiosyncratic factors, respectively, in determining equilibrium diversity.

We find that competition exerts a large effect on diversity: when competitive effects are absent, diversity falls by half. Eliminating catering to consumer tastes increases diversity by about as much as competition reduces it. Eliminating the role of idiosyncratic factors matters less than eliminating competition.

Table 8—Equilibrium and Surplus-Maximizing Outcomes

	Baseline	Chosen to maximize total surplus	
		Post-entry outcomes	Entry and post-entry outcomes
Markets with newspapers	951	951	1,910
Markets with multiple newspapers	256	256	1,845
Share of households reading a newspaper	0.39	0.53	0.91
Average price in multipaper markets	5.48	0.04	0.05
Average ad revenue per reader in multipaper markets	11.24	11.55	11.31
Per household			
Consumer surplus	3.44	6.55	15.69
Newspaper profit	0.41	−6.27	−17.51
Advertiser profit	0.39	6.86	10.39
Total surplus	4.24	7.15	8.56
Diversity			
Markets with diverse papers	143	175	1,370
Share of households in markets with diverse papers	0.22	0.27	0.84
Share of households reading diverse papers	0.029	0.091	0.334

Notes: Table shows averages over five counterfactual simulations at the parameters reported in Tables 5 and 6. The distribution of profits between newspapers and advertisers is indeterminate in the two counterfactuals shown; we assume that advertisers capture all surplus from advertising. A market has diverse papers if it has at least one Republican and one Democratic paper, and a household reads diverse papers if it reads at least one Republican and one Democratic paper. "Baseline" is simulation of the estimated model. In column 2, the number of newspapers is fixed at its baseline value and a social planner chooses affiliations, ad prices, and circulation prices to maximize total surplus, with the constraint that all prices must be weakly positive. In column 3, the social planner also chooses the number of papers in each market. Average price is an annual subscription price. Average ad revenue is reported per reader per year. Surplus and profit numbers are reported in annual dollars per household.

B. *Equilibrium and Welfare-Maximizing Outcomes*

In the first column of Table 8, we report market structure, prices, and welfare for our baseline model.[32] As in Table 7, each reported value is the average over five simulations. We also repeat the baseline diversity statistics from Table 7 in the final three rows for comparison with what follows.

Of the 951 markets in our baseline simulation with at least one newspaper, 256 have two or more. Thirty-nine percent of households read at least one newspaper. In multipaper markets, the average annual subscription price of competitive newspapers is \$5.48 (in 1924 dollars), and the average advertising revenue per reader per year is \$11.24. Total surplus is \$4.24 per household per year, which breaks down into \$3.44 of consumer surplus, \$0.41 of newspaper profit, and \$0.39 of advertiser profit.

[32] We define consumer surplus in market m as total realized utility divided by the marginal utility of money:

$$\sum_{i=1}^{S_m} u_{im}(\mathcal{B}_i)/\alpha, \tag{15}$$

where $\mathcal{B}_i$ is the utility-maximizing bundle for household i and α is the price coefficient in our demand system. We define advertiser surplus in market m as the total value of advertisements placed less total advertising expenditures

$$S_m\left((1-q_{0m})(a_h-a_l)+\sum_{j=1}^{J_m} q_{jm}(a_l-a_{jm})\right), \tag{16}$$

where q_{0m} is the share of households purchasing no newspaper. We define total surplus as the sum of consumer surplus, advertiser surplus, and newspaper profits.

In the final two columns of Table 8, we compare these equilibrium outcomes to those that would be chosen by a social planner whose goal is to maximize total surplus. Importantly, we do not assume that the social planner internalizes any political externalities associated with ideological diversity. These simulations therefore allow us to evaluate whether there is any trade-off between the objectives of maximizing economic welfare and preserving diversity in the marketplace of ideas. As these simulations ignore many practical difficulties of implementation, they should not be thought of as policy analysis, but rather as framing for the policy experiments which we consider below.

The second column of Table 8 holds the number of newspapers fixed at baseline values, but allows the social planner to choose affiliations, circulation prices, and advertising prices. Because we estimate that newspapers exercise substantial market power, the social planner chooses substantially lower prices than occur in market equilibrium, with an average price in multipaper markets of only \$0.04, leading the share of households reading newspapers to increase by about one-half. As in Steiner (1952), the social planner also chooses more ideological diversity than occurs in market equilibrium: the number of markets with diverse papers increases from 143 to 175. This occurs because newspapers do not capture the full surplus from greater diversity. We show in the online Appendix that this distortion is most important in markets in which consumers' affiliations are about evenly split. The combined effect of the reduction in prices and the increase in the diversity of newspapers is to increase the share of households reading diverse papers by a factor of three.

The third column of Table 8 allows the social planner to control newspapers' entry decisions as well as post-entry outcomes. The results show that in market equilibrium the number of newspapers falls well short of the social optimum. The social planner increases the number of markets with at least one paper from 951 to 1,910 and the number of markets with multiple papers from 256 to 1,845. Increased entry further increases diversity: the number of households in markets with diverse papers rises to 84 percent, and one-third of households read diverse papers on any given day.

The source of insufficient entry here is the distortion formalized by Spence (1975): in markets with fixed costs, entrants do not internalize the effect of entry on the surplus of inframarginal consumers.[33] The result is not mechanical. In the standard symmetric logit model, which our model nests as a limit case, the number of firms in the free entry equilibrium can be greater or fewer than the first-best (Anderson, de Palma, and Thisse 1992). Insufficient entry arises at the estimated parameters because consumers capture a large share of surplus and because the significant (and empirically realistic) amount of multiple readership means the business-stealing externality highlighted in Mankiw and Whinson (1986) is relatively small. This contrasts with the results of Berry and Waldfogel (1999) for radio, where the estimated business-stealing externality is large, and equilibrium entry is consequently found to be excessive.

Because the use of a symmetric logit error is known to exaggerate the benefits from additional variety, in the online Appendix we show that the gains from moving

[33] For early discussions of the tendency toward inefficient entry in concentrated markets see Hotelling (1938) and the work of Jules Dupuit as summarized in Ekelund and Hébert (1999, pp. 159–91).

Table 9—Policy Experiments

	Baseline	Allow price collusion	Allow advertising collusion	Allow joint operating agreements	Allow joint ownership	Optimal subsidy
Markets with newspapers	951	951	951	951	954	1,883
Markets with multiple newspapers	256	290	400	415	126	1,253
Share of households reading a newspaper	0.39	0.36	0.44	0.42	0.33	0.74
Average price in multipaper markets	5.48	7.53	5.07	6.61	6.13	3.21
Average ad revenue per reader in multipaper markets	11.24	11.60	12.14	12.30	12.54	10.60
Per household						
Consumer surplus	3.44	2.98	4.46	3.79	2.63	8.93
Newspaper profit	0.41	0.42	0.44	0.50	0.86	1.07
Advertiser profit	0.39	0.29	0	0	0	1.68
Cost of subsidy						5.63
Total surplus	4.24	3.69	4.90	4.29	3.49	6.05
Diversity						
Markets with diverse papers	143	157	225	238	62	704
Share of households in markets with diverse papers	0.22	0.24	0.31	0.32	0.11	0.57
Share of households reading diverse papers	0.029	0.021	0.052	0.039	0.011	0.133

Notes: Table shows averages over five counterfactual simulations at the parameters reported in Tables 5 and 6. A market has diverse papers if it has at least one Republican and one Democratic paper, and a household reads diverse papers if it reads at least one Republican and one Democratic paper. "Baseline" is simulation of the estimated model. Columns 2–4 are counterfactuals in which entering papers set prices, ad rates, or prices and ad rates, respectively, to maximize their total profits. Column 5 is a counterfactual in which all potential entrants in a given market are jointly owned. Joint ownership means that newspapers make entry, affiliation, pricing, and ad rate decisions to maximize joint profits subject to a common affiliation cost shock ξ. Column 6 is a counterfactual which provides a payment per copy sold to all papers. Average price is an annual subscription price. Average ad revenue is reported per reader per year. Surplus and profit numbers are reported in annual dollars per household. Cost of subsidy includes a 30 percent cost of public funds.

to the social optimum are large even when we severely cap the number of potential entrants to each market.

The results in Table 8 show that there is no conflict between the goal of maximizing economic welfare and the goal of maintaining diversity in the marketplace of ideas. Policies that increase entry, as well as policies which promote diversity conditional on entry, would likely increase economic welfare even if the political externalities to diversity were small.

C. *Policy Experiments*

Table 9 presents a series of policy experiments based on the model. The first column shows baseline results for reference. The second through fourth columns relax competition policy by allowing newspapers to collude on prices only, advertising only, and both prices and advertising.[34] In all of these columns newspapers continue to make noncooperative entry and affiliation decisions. Arrangements in which

[34] We define a collusive price of newspaper j as the jth element of a price vector $\mathbf{p}^*$ that solves

$$\mathbf{p}^* \in \arg\max_{\mathbf{p}} \sum_{j=1}^{J_m} \left(p_j + a_{jm}(\mathbf{p}, \boldsymbol{\tau}) - MC\right) q_{jm}(\mathbf{p}, \boldsymbol{\tau}). \tag{17}$$

newspapers collude on prices and advertising but remain editorially separate are called "joint operating agreements" and have existed in the United States since 1933 (Busterna and Picard 1993).[35]

Allowing price collusion reduces economic welfare and has little effect on diversity. Average prices in multipaper markets rise significantly, from \$5.48 to \$7.53. Advertising revenue per reader increases slightly, as a consequence of less overlap in newspaper readership. The number of markets with two or more newspapers rises modestly from 256 to 290. Most of the gain to newspapers is offset by this increase in competitiveness, so total newspaper profit increases only slightly, while consumer surplus and advertiser profit both fall. Additional entry also offsets the reduced incentive to differentiate due to softer price competition, and so effects on diversity are modest: the share of households with access to diverse papers rises slightly, while the share reading them falls.

Advertising collusion, on the other hand, causes large increases in both economic welfare and diversity. Because our baseline estimates imply significant competition in the advertising market ($a_l < a_h$), advertising collusion increases advertising revenue per reader from \$11.24 to \$12.14. The increase in advertising revenue leads newspapers to reduce circulation prices to consumers, consistent with the well-known "seesaw principle" in two-sided markets (Rochet and Tirole 2006; Dewenter, Haucap, and Wenzel 2011). Entry increases dramatically, with the number of markets with multiple papers going from 256 to 400. These factors together cause consumer surplus to increase significantly, and total surplus increases increases from \$4.24 to \$4.90 per household per year. The large increase in entry more than offsets the reduced incentive to differentiate due to reduced advertising competition, and so diversity rises by about one-half on all measures.

Joint operating agreements combine the effects of price and advertising collusion. The effects of advertising collusion dominate the effect on diversity, which remains positive on all measures. The two types of collusion essentially cancel in terms of welfare impact, with a small net gain in total surplus relative to baseline.

An important take-away from these results is that the two-sided nature of media markets substantially changes the evaluation of policy instruments. Price and advertising collusion are frequently treated as symmetric in the policy debate,[36] while in fact the two are very different. Joint setting of prices amounts to a tax on marginal readership and only a modest spur to entry, while joint setting of advertising rates

We define the collusive per-reader advertising revenue of newspaper j as

$$a_{jm} = a_h\left(\frac{1-q_{0m}}{\sum_{k=1}^{J_m} q_{km}}\right) + a_l\left(1-\frac{1-q_{0m}}{\sum_{k=1}^{J_m} q_{km}}\right), \tag{18}$$

where q_{0m} is the share of households purchasing no newspaper.

[35] We assume that papers in joint operating agreements keep all of their own subscription revenue and that they share advertising revenue in proportion to their circulations. These assumptions are a reasonable match to the revenue-sharing arrangements of joint operating agreements authorized under the Newspaper Preservation Act of 1970 (Busterna and Picard 1993). In some cases a newspaper's share of revenue is a "sliding" function of the newspaper's contribution to revenue or to total advertising sales. In other cases, the revenue sharing rule is fixed in advance, but in such cases is usually related to the initial capital investment of the newspapers, and hence to their financial health at the time of the agreement. In both types of arrangements, a newspaper with a greater circulation will generally be entitled to a greater share of the joint venture's revenue.

[36] See, e.g., the discussion of the debate surrounding the Newspaper Preservation Act of 1970 in Oppenheim and Shields (1981, pp. 187–89).

amounts to a subsidy to marginal readership and a massive spur to entry. In a world where entry, readership, and diversity are all inefficiently low, permitting advertising collusion may be a surprisingly attractive policy to a regulator concerned with both economic welfare and diversity per se.

In the fifth column of Table 9, we evaluate the effect of relaxing ownership regulation by assuming that all newspapers in a market are jointly owned. Federal oversight of broadcast media ownership began in the United States with the Communications Act of 1934 (Candeub 2007) and continues today.[37] We model joint ownership by assuming that entering newspapers set collusive circulation and advertising prices as in joint operating agreements, that the number of entering newspapers is chosen to maximize total expected newspaper profits, and that newspapers choose affiliations to maximize total newspaper profits subject to a common affiliation-specific cost shock ξ.[38]

Joint ownership significantly reduces welfare, diversity, and the number of newspapers. Circulation and advertising prices both rise, and newspaper readership falls. Most of the drop in diversity is a consequence of reduced entry; the share of multipaper markets with diverse papers remains roughly stable. This reflects two offsetting effects on differentiation. On the one hand, allowing newspapers to internalize the effect of their affiliation choices on their competitors significantly increases the incentive to differentiate (Sweeting 2010). On the other hand, the fact that we assume jointly owned newspapers share a common cost shock ξ significantly increases the within-market correlation of affiliation choices, providing a strong force in the other direction.

In the sixth and final column of Table 9 we evaluate a marginal cost subsidy to newspapers. In the 1920s, postal subsidies offset a meaningful fraction of newspaper delivery costs for many newspapers (Kielbowicz 1994). We allow the government to transfer K dollars per newspaper sold to the newspaper's owner, at a cost of $(1 + \lambda)$ per dollar transferred. We set the marginal cost λ of public funds to 0.3 (Poterba 1996; Einav, Finkelstein, and Cullen 2010). We compute the level of K that maximizes total surplus.

The surplus-maximizing marginal cost subsidy amounts to an average payment of $4.00 per copy per year, equivalent to a 49 percent reduction in marginal cost. For comparison, the US postal subsidy amounted to a roughly 12 percent reduction in marginal cost.[39] Of all the policies we consider, this one is the most effective in increasing economic welfare and diversity, both because it promotes entry in markets that previously had no papers, and because it increases readership conditional on the number of papers.

[37] For example, in the United States today, the FCC limits ownership of a daily newspaper and a TV or radio station in the same local market, as well as ownership of multiple radio or television stations in the same market. Direct regulation of newpaper ownership is less common, though it does exist. In France, for example, no newspaper acquisition will be approved if the combined entity will have a circulation share greater than 30 percent (McEwen 2007).

[38] That is, we assume that $\xi_{jm}(\tau_{jm}) = \xi_{j'm}(\tau_{j'm})\ \forall j, j'\ s.t.\ \tau_{jm} = \tau_{j'm}$. We continue to assume that the draw on ξ is not known at the entry stage, and compute the expected values $V(J)$ by numerically integrating over the ξ via Monte Carlo simulation.

[39] In 1924, the post office's cost of publication delivery exceeded its revenue by a factor of more than three (Kielbowicz 1994). We estimate that postage accounted for 6 percent of variable costs, so the implicit subsidy was approximately 12 percent of variable costs.

VIII. Conclusions

We estimate a model of newspapers' entry and choice of political affiliation which matches key facts from novel data on US daily newspapers in 1924. We use the model to evaluate the economic determinants of ideological diversity and to evaluate several important policies. We find that competitive incentives are a crucial driver of ideological diversity. We show that there is no conflict between the goal of maximizing economic welfare and the goal of preserving ideological diversity. We find that accounting for the two-sided nature of the market is critical for evaluating competition policies, in that permitting advertising collusion increases both welfare and diversity, whereas permitting price collusion reduces welfare and has mixed effects on diversity. We evaluate other prominent media policies such as ownership regulation and explicit subsidies.

Appendix

A. *Alternative Specifications*

In Appendix Table 1, we show how our key results vary with alternative specifications of the model. In the first three columns we show, for each specification and counterfactual, the share of households reading at least one paper of each affiliation, averaged over five simulations. The following three columns report, for each specification and counterfactual, the total surplus per household, averaged over five simulations. The first and fourth columns report results for the baseline model. The second and fifth columns report results assuming that the social planner chooses all entry and post-entry decisions as in the final column of Table 8. The third and sixth columns report results with joint operating agreements.

The first row of the table repeats the results from our main specification for reference. In parentheses, we show standard errors for each counterfactual, computed as the standard deviation across five sets of parameters, each drawn from the asymptotic (joint) distribution of the demand and supply parameters. In brackets, we show the simulation error for each counterfactual, computed as the standard deviation across five simulation draws from the baseline parameters divided by $\sqrt{5}$.

The second through ninth rows explore changes to the moments we use to calibrate parameters in the model. In each case we change a single moment (increasing or decreasing by 25 percent), reestimate the model, and recompute counterfactuals. The second and third specifications show results for the marginal cost. The fourth and fifth specifications show results for monopoly advertising revenue per reader. The sixth and seventh specifications show results for the average overlap in readership among different-affiliation newspapers. These changes leave our key qualitative conclusions unchanged. Not surprisingly, as these parameters directly affect the economic efficiency of newspaper readership, changing them has some quantitative effect on the welfare calculations and hence the scope for welfare-improving changes.

The eighth and ninth specifications increase and decrease the calibrated values of both $\text{cov}(\nu_t, \nu_{t'})/\text{var}(\nu_t)$ and $\text{cov}(\nu_m, \nu_{m'})/\text{var}(\nu_m)$ by 25 percent relative to their baseline values. These changes have little effect on our quantitative results.

Appendix Table 1—Alternative Specifications

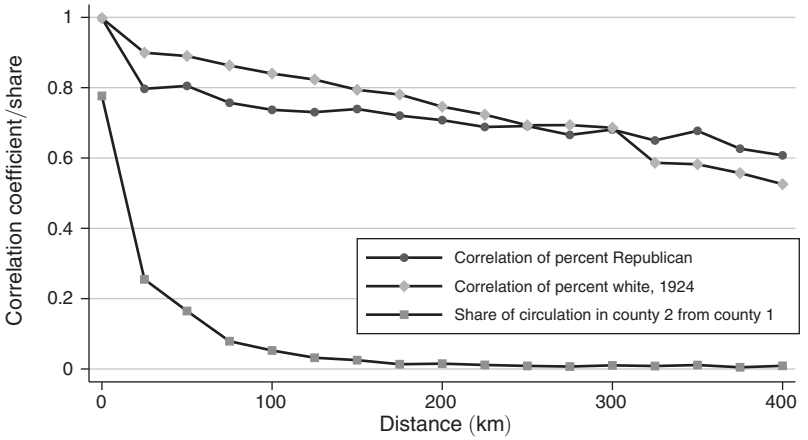
	Households reading diverse papers			Total surplus		
	Baseline	Social planner	Allow joint operating agreements	Baseline	Social planner	Allow joint operating agreements
(1) Preferred estimate	0.029	0.334	0.039	4.24	8.56	4.29
(Standard errors)	(0.001)	(0.034)	(0.001)	(0.084)	(0.127)	(0.067)
[Simulation error]	[0.002]	[0.001]	[0.001]	[0.071]	[0.064]	[0.061]
Changing calibrated values						
(2) Increase marginal cost by 25 percent	0.029	0.324	0.040	3.37	6.63	3.42
(3) Decrease marginal cost by 25 percent	0.029	0.334	0.038	5.05	10.76	5.10
(4) Increase a_h by 25 percent	0.028	0.356	0.035	5.37	12.80	5.44
(5) Decrease a_h by 25 percent	0.029	0.321	0.041	2.79	5.45	2.85
(6) Increase average readership overlap by 25 percent	0.033	0.373	0.056	4.37	8.92	4.81
(7) Decrease average readership overlap by 25 percent	0.024	0.236	0.025	4.18	8.03	3.92
(8) Increase spatial correlation of unobservables by 25 percent	0.029	0.346	0.039	4.23	8.69	4.27
(9) Decrease spatial correlation of unobservables by 25 percent	0.029	0.326	0.039	4.25	8.50	4.30
Modifying model specification						
(10) Endogenous J_t in demand model	0.029	0.325	0.039	4.25	8.50	4.30
(11) Add flexibility to fixed cost distribution	0.023	0.324	0.033	3.95	8.22	4.06
(12) Add flexibility to affiliation choice in demand model	0.029	0.344	0.039	4.23	8.69	4.28
(13) Add distance to HQ as utility shifter in demand model	0.029	0.376	0.039	4.17	9.14	4.20
(14) Add HQ circulation as utility shifter in demand model	0.028	0.353	0.038	4.20	8.94	4.26
(15) Incorporate hinterland towns in market ideology	0.024	0.398	0.032	4.20	10.48	4.28
(16) Fix all prices to mean price	0.030	0.389	0.038	4.14	9.49	4.16
(17) Add price as utility shifter in demand model	0.025	0.266	0.040	4.27	8.39	4.82
Modifying estimation sample						
(18) Tighten population cut-offs for markets	0.024	0.362	0.035	4.05	8.71	4.18
(19) Remove markets with independent papers	0.029	0.304	0.038	4.20	8.24	4.22
(20) Remove markets with unaffiliated papers	0.027	0.319	0.036	4.12	8.34	4.17
(21) Remove markets near major cities	0.029	0.225	0.038	4.68	7.90	4.64
(22) Remove towns with missing data for nearby newspapers	0.030	0.351	0.040	4.24	8.62	4.25
(23) Remove market pairs with cross-market co-ownership	0.027	0.327	0.038	4.14	8.42	4.20
(24) Remove towns in the top 10 percent by population	0.029	0.342	0.039	4.23	8.64	4.27
(25) Remove towns in the bottom 10 percent by population	0.029	0.337	0.039	4.24	8.57	4.28
(26) Remove towns and markets in the South	0.036	0.470	0.040	3.99	10.45	3.90

Note: See Appendix A for details.

The tenth through seveneenth rows explore changes to model specification. In each case we change a feature of the model, estimate the modified model, and recompute counterfactuals.

The tenth row presents estimates from a specification in which we modify the demand model to treat the number of newspapers available in a town as endogenous. In particular, we model the number of newspapers J_t in a town t as a Poisson random variable whose log mean is a linear function of $\log(S_t)$, ρ_t, ρ_t^2.

The eleventh row adds flexibility to the fixed cost distribution in the supply model by allowing κ_m/S_m to be distributed logistic with location parameter $\mu_\kappa^0 + \mu_\kappa^1 \log(S_m) + \mu_\kappa^2 \log(S_m)^2$.



Appendix Figure 1. Spatial Decay in Newspaper Shipments and Demographic Correlations

Notes: Data are from the US Census and the Audit Bureau of Circulation data described in Section IC. The first two lines show the correlation coefficient of fraction Republican and fraction white for counties located in the same state, at different centroid distances. Republican vote share is the average Republican share of the two-party vote in presidential elections from 1868 to 1928. The third line shows the share of newspaper circulation in county 2 accounted for by newspapers headquartered in county 1, for counties located at different centroid distances. Only counties containing at least one market in the sample described in Section IB are included.

The twelfth row presents estimates from a specification in which we allow greater flexibility in the way in which consumer ideology affects the affiliations of newspapers that are available in a given town. In particular, we assume that the probability that a given newspaper available in town t is Republican is $\text{logit}^{-1}\left(\mu_\rho^0 + \mu_\rho^1 \text{logit}(\rho_t) + \mu_\rho^2 \text{logit}(\rho_t)\right)$.

The thirteenth and fourteenth rows extend the demand model to allow the utility from reading a newspaper to depend on a quality shifter. In particular, we assume that the utility of bundle $\mathcal{B}$ is shifted by $\sum_{j \in \mathcal{B}} \alpha_d d_j$, where d_j is a quality shifter and α_d is a parameter that we estimate. In the thirteenth row, d_j is the distance from the town to the newspaper's home market. In the fourteenth row, d_j is the circulation of the newspaper in its home market.

The fifteenth row replaces our measure of consumer ideology for each market, the average share of the two-party presidential vote going to Republicans over the period 1868 to 1928, with the population-weighted average of the measure across the market and all of the hinterland towns served by newspapers headquartered in the market. For towns with no hinterland circulation, this corresponds to our usual measure of consumer ideology.

The sixteenth row replaces all prices in our demand data with the mean price. The seventeenth row allows price to enter as a quality shifter.

None of these changes to model specification changes the qualitative conclusions from comparing across counterfactuals.

The remaining rows of the table present estimates from various subsets of the main estimation sample. The sample in the eighteenth row tightens the population restrictions defining the universe of potential daily newspaper markets by

25 percent, by excluding all market pairs containing a market with population smaller than 3,750 or larger than 75,000. The sample in the nineteenth row excludes any market pair containing one or more independent newspapers in 1924. The sample in the twentieth row excludes any market pair containing one or more unaffiliated newspapers as of 1924. The sample in the twenty-first row excludes any market pair containing a market within 100km of any of the ten most populous cities as of the 1920 Census. The sample in the twenty-second row drops any town pair for which our town-level circulation data omit a newspaper in at least one town's nearest news market. The sample in the twenty-third row excludes any market pair containing a pair of papers in different markets that are owned by the same chain as of 1932. (Our ownership data are from the 1932 *Editor and Publisher Yearbook*. The earlier annual directories that we use to construct our main sample do not include lists of chain-owned newspapers.) The sample in the twenty-fourth row excludes any town pair for which a town's population is in the top 10 percent. The sample in the twenty-fifth row excludes any town pair for which a town's population is in the bottom 10 percent. The sample in the twenty-sixth row excludes any market pair containing a market in the South.

None of these changes to the sample changes our qualitative conclusions. As we would expect, removing markets in the South meaningfully affects our quantitative results. Because of the dominance of the Democratic party, Southern markets demand (and receive) little diversity, so removing Southern markets increases baseline diversity and increases the scope for welfare gains from improving diversity.

REFERENCES

Ackerberg, Daniel A., and Marc Rysman. 2005. "Unobserved Product Differentiation in Discrete-Choice Models: Estimating Price Elasticities and Welfare Effects." *RAND Journal of Economics* 36 (4): 771–88.

Aguirregabiria, Victor, and Aviv Nevo. 2013. "Recent Developments in Empirical IO: Dynamic Demand and Dynamic Games." In *Advances in Economics and Econometrics*, Tenth World Congress. Vol.3, edited by Daron Acemoglu, Manuel Arellano, and Eddie Deckel, 53–122. Cambridge: Cambridge University Press.

Altonji, Joseph G., Todd E. Elder, and Christopher R. Taber. 2005. "Selection on Observed and Unobserved Variables: Assessing the Effectiveness of Catholic Schools." *Journal of Political Economy* 113 (1): 151–84.

Ambrus, Attila, Emilio Calvano, and Markus Reisinger. 2013. "Either or Both Competition: A 'Two-sided' Theory of Advertising with Overlapping Viewerships." Unpublished.

Anderson, Simon P., Øystein Foros, and Hans Jarle Kind. 2010. "Hotelling Competition with Multi-Purchasing: Time Magazine, Newsweek, or Both?" Unpublished.

Anderson, Simon P., Øystein Foros, and Hans Jarle Kind. 2011. "Competition for Advertisers in Media Markets." Unpublished.

Anderson, Simon P., and John McLaren. 2012. "Media Mergers and Media Bias with Rational Consumers." *Journal of the European Economic Association* 10 (4): 831–59.

Anderson, Simon P., Andre de Palma, and Jacques-Francois Thisse. 1992. *Discrete Choice Theory of Product Differentiation*. Cambridge: MIT Press.

Antonielli, Marco, and Lapo Filistrucchi. 2012. "Collusion and the Political Differentiation of Newspapers." Tilburg Law and Economics Center (TILEC) Discussion Paper 2012-014.

Arcidiacono, Peter, and Robert A. Miller. 2011. "Conditional Choice Probability Estimation of Dynamic Discrete Choice Models with Unobserved Heterogeneity." *Econometrica* 79 (6): 1823–67.

Argentesi, Elena, and Lapo Filistrucchi. 2007. "Estimating Market Power in a Two-Sided Market: The Case of Newspapers." *Journal of Applied Econometrics* 22 (7): 1247–66.

Armstrong, Mark. 2002. "Competition in Two-sided Markets." Unpublished.

Bajari, Patrick, and Ali Hortaçsu. 2003. "The Winner's Curse, Reserve Prices, and Endogenous Entry: Empirical Insights from eBay Auctions." *RAND Journal of Economics* 34 (2): 329–55.

Baldasty, Gerald J. 1992. *The Commercialization of News in the Nineteenth Century.* Madison: University of Wisconsin Press.

Becker, Gary S. 1958. "Competition and Democracy." *Journal of Law and Economics* 1: 105–09.

Berry, Steven, Alon Eizenberg, and Joel Waldfogel. 2013. "Optimal Product Variety in Radio Markets." Unpublished.

Berry, Steven, James Levinsohn, and Ariel Pakes. 1995. "Automobile Prices in Market Equilibrium." *Econometrica* 63 (4): 841–90.

Berry, Steven T., and Joel Waldfogel. 1999. "Free Entry and Social Inefficiency in Radio Broadcasting." *RAND Journal of Economics* 30 (3): 397–420.

Berry, Steven T., and Joel Waldfogel. 2001. "Do Mergers Increase Product Variety? Evidence from Radio Broadcasting." *Quarterly Journal of Economics* 116 (3): 1009–25.

Berry, Steven, and Joel Waldfogel. 2010. "Product Quality and Market Size." *Journal of Industrial Economics* 58 (1): 1–31.

Bogart, Leo. 1981. *Press and Public: Who Reads What When Where and Why in American Newspapers*. Hillsdale, NJ: Lawrence Erlbaum Associates.

Borenstein, Severin, and Janet Netz. 1999. "Why Do All the Flights Leave at 8am? Competition and Departure-time Differentiation in Airline Markets." *International Journal of Industrial Organization* 17(5): 611-640.

Bresnahan, Timothy F., and Peter C. Reiss. 1991. "Entry and Competition in Concentrated Markets." *Journal of Political Economy* 99 (5): 977–1009.

Brock, William A., and Steven N. Durlauf. 2007. "Identification of Binary Choice Models with Social Interactions." *Journal of Econometrics* 140 (1): 52–75.

Burnham, Walter Dean. 1965. "The Changing Shape of the American Political Universe." *American Political Science Review.* 59 (1): 7–28.

Busterna, John C., and Robert G. Picard. 1993. *Joint Operating Agreements: Newspaper Preservation Act and Its Application* (*Panel Answer Book Series*). Norwood, NJ: Ablex Publishing Corporation.

Candeub, Adam. 2007. "Media Ownership Regulation, the First Amendment, and Democracy's Future." *Media Ownership Regulation* 41 (4): 1547–1611.

Chandra, Ambarish. 2009. "Symposium on Advertising and Disclosure: Targeted Advertising: The Role of Subscriber Characteristics in Media Markets." *Journal of Industrial Economics* 57 (1): 58–84.

Chandra, Ambarish, and Allan Collard-Wexler. 2009. "Mergers in Two-Sided Markets: An Application to the Canadian Newspaper Industry." *Journal of Economics and Management Strategy* 18 (4): 1045–70.

Chiang, Chun-Fang. 2010. "Political Differentiation in Newspaper Markets." Unpublished.

Chiang, Chun-Fang, and Brian Knight. 2011. "Media Bias and Influence: Evidence from Newspaper Endorsements." *Review of Economic Studies* 78 (3): 795–820.

Collard-Wexler, Allan. Forthcoming. "Mergers and Sunk Costs: An Application to the Ready-Mix Concrete Industry." *American Economic Journal: Microeconomics*.

Costa, Dora L. 2001. "Estimating Real Income in the United States from 1888 to 1994: Correcting CPI Bias Using Engel Curves." *Journal of Political Economy* 109 (6): 1288–1310.

Dertouzos, James N., and William B. Trautman. 1990. "Economic Effects of Media Concentration: Estimates from a Model of the Newspaper Firm." *Journal of Industrial Economics* 39 (1): 1–14.

Dewenter, Ralf, Justus Haucap, and Tobias Wenzel. 2011. "Semi-collusion in Media Markets." *International Review of Law and Economics* 31 (2): 92–8.

Dixit, Avinash K., and Joseph E. Stiglitz. 1977. "Monopolistic Competition and Optimum Product Diversity." *American Economic Review* 67 (3): 297–308.

Downs, Anthony. 1957. "An Economic Theory of Political Action in a Democracy." *Journal of Political Economy* 65: 135–50.

Draganska, Michaela, Michael Mazzeo, and Katja Seim. 2009. "Beyond Plain Vanilla: Modeling Joint Product Assortment and Pricing Decisions." *Quantitative Marketing and Economics* 7 (2): 105–46.

Einav, Liran. 2007. "Seasonality in the U.S. Motion Picture Industry." *RAND Journal of Economics* 38 (1): 127–45.

Einav, Liran. 2010. "Not All Rivals Look Alike: Estimating an Equilibrium Model of the Release Date Timing Game." *Economic Inquiry* 48 (2): 369–90.

Einav, Liran, Amy Finkelstein, and Mark R. Cullen. 2010. "Estimating Welfare in Insurance Markets Using Variation in Prices." *Quarterly Journal of Economics* 125 (3): 877–921.

Ekelund, Robert Burton, and Robert F. Hébert. 1999. *Secret Origins of Modern Microeconomics: Dupuit and the Engineers*. Chicago: University of Chicago Press.

Erikson, Robert S., and Kent L. Tedin. 1981. "The 1928-1936 Partisan Realignment: The Case for the Conversion Hypothesis." *American Political Science Review* 75 (4): 951–62.

Fan, Ying. 2013. "Ownership Consolidation and Product Characteristics: A Study of the US Daily Newspaper Market." *American Economic Review* 103 (5): 1598–1628.

Federal Communications Commission (FCC). 2010. "Notice of inquiry." FCC 10-92. Washington, DC.

Field, Alexander J. 2006. "Newspapers and Periodicals—Number and Circulation, By Type: 1850-1967. In *The Historical Statistics of the United States*, edited by Susan B. Carter, Scott Sigmund Gartner, Michael R. Haines, Alan L. Olmstead, Richard Sutch, and Gavin Wright, 253–66. New York: Cambridge University Press.

Gabszewicz, Jean J., Didier Laussel, and Nathalie Sonnac. 2001. "Press Advertising and the Ascent of the 'Pensée Unique.'" *European Economic Review* 45 (4-6): 641–51.

Gabszewicz, Jean J., Didier Laussel, and Nathalie Sonnac. 2002. "Press Advertising and the Political Differentiation of Newspapers." *Journal of Public Economic Theory* 4 (3): 317–34.

Galvis, Ángela Fonseca, James M. Snyder, Jr., and B. K. Song. 2012. "Newspaper Market Structure and Behavior: Partisan Coverage of Political Scandals in the US from 1870 to 1910." Unpublished.

Gentzkow, Matthew. 2007. "Valuing New Goods in a Model with Complementarity: Online Newspapers." *American Economic Review* 97 (3): 713–44.

Gentzkow, Matthew, Edward L. Glaeser, and Claudia Goldin. 2006. "The Rise of the Fourth Estate: How Newspapers Became Informative and Why it Mattered." In *National Bureau of Economic Research Corruption and Reform: Lessons from America's Economic History*, edited by Edward L. Glaeser and Claudia Goldin, 187–230. Chicago: University of Chicago Press.

Gentzkow, Matthew, Nathan Petek, Jesse M. Shapiro, and Michael Sinkinson. Forthcoming. "Do Newspapers Serve the State? Incumbent Party Influence on the US Press, 1869-1928." *Journal of the European Economic Association*.

Gentzkow, Matthew, and Jesse M. Shapiro. 2010. "What Drives Media Slant? Evidence from U.S. Daily Newspapers." *Econometrica* 78 (1): 35–71.

Gentzkow, Matthew, Jesse M. Shapiro, and Michael Sinkinson. 2011. "The Effect of Newspaper Entry and Exit on Electoral Politics." *American Economic Review* 101 (7): 2980–3018.

Gentzkow, Matthew, Jesse M. Shapiro, and Michael Sinkinson. 2014. "Competition and Ideological Diversity: Historical Evidence from US Newspapers: Dataset." *American Economic Review.* http://dx.doi.org/10.1257/aer.104.10.3073.

George, Lisa, and Joel Waldfogel. 2003. "Who Affects Whom in Daily Newspaper Markets?" *Journal of Political Economy* 111 (4): 765–84.

Greeley, Horace. 1872. *The Autobiography of Horace Greeley: Recollections of a Busy Life*. New York: E.B. Treat.

Hamilton, James T. 2006. *All the News That's Fit to Sell: How the Market Transforms Information into News*. Princeton: Princeton University Press.

Heiss, Florian, and Viktor Winschel. 2008. "Likelihood Approximation by Numerical Integration on Sparse Grids." *Journal of Econometrics* 144 (1): 62–80.

Hotelling, Harold. 1938. "The General Welfare in Relation to Problems of Taxation and of Railway and Utility Rates." *Econometrica* 6 (3): 242–69.

Irmen, Andreas, and Jacques-François Thisse. 1998. "Competition in Multi-characteristics Spaces: Hotelling Was Almost Right." *Journal of Economic Theory* 78 (1): 76–102.

Jeziorski, Przemyslaw. Forthcoming. "Effects of Mergers in Two-Sided Markets: Examination of the U.S. Radio Industry." *American Economic Journal: Microeconomics.*

John, Richard R. *Spreading the News: The American Postal System from Franklin to Morse.* Cambridge: Harvard University Press. Google eBook.

Kaiser, Ulrich, and Minjae Song. 2009. "Do Media Consumers Really Dislike Advertising? An Empirical Assessment of the Role of Advertising in Print Media Markets." *International Journal of Industrial Organization* 27 (2): 292–301.

Kaiser, Ulrich, and Julian Wright. 2006. "Price Structure in Two-Sided Markets: Evidence from the Magazine Industry." *International Journal of Industrial Organization* 24 (1): 1–28.

Kaplan, Richard L. 2002. *Politics and the American Press: The Rise of Objectivity, 1965–1920*. Cambridge: Cambridge University Press.

Kielbowicz, Richard B. 1983. "The Press, Post Office, and Flow of News in the Early Republic." *Journal of the Early Republic* 3 (3): 255–80.

Kielbowicz, Richard B. 1990. "Postal Subsidies for the Press and the Business of Mass Culture, 1880-1920." *Business History Review* 64 (3): 451–88.

Kielbowicz, Richard B. 1994. "Cost Accounting in the Service of Policy Reform: Postal Rate Making, 1875-1926." *Social Science Quarterly* 75 (2): 284–99.

Kind, Hans Jarle, Guttorm Schjelderup, and Frank Stähler. 2013. "Newspaper Differentiation and Investments in Journalism: The Role of Tax Policy." *Economica* 80 (317): 131–48.

Levin, Dan, and James L. Smith. 1994. "Equilibrium in Auctions with Entry." *American Economic Review* 84 (3): 585–99.

Liu, Qihong, and Jie Shuai. 2013. "Multi-dimensional Product Differentiation." *International Journal of Industrial Organization* 31 (5): 417–28.

Mankiw, N. Gregory, and Michael D. Whinston. 1986. "Free Entry and Social Inefficiency." *RAND Journal of Economics* 17 (1): 48–58.

Martin, Mac. 1921. *Advertising Campaigns.* New York: Alexander Hamilton Institute.

Mazzeo, Michael J. 2002. "Product Choice and Oligopoly Market Structure." *RAND Journal of Economics* 33 (2): 221–42.

McEwen, Michael. 2007. "Media Ownership; Rules Regulations and Practices in Selected Countries and their Potential Relevance to Canada." Canadian Radio-television and Telecommunications Commission. http://www.crtc.gc.ca/eng/publications/reports/mcewen07.htm (accessed October 29, 2012).

Millspaugh, A. C. 1918. "Irregular Voting in the United States." *Political Science Quarterly* 33 (2): 230–54.

Mullainathan, Sendhil, and Andrei Shleifer. 2005. "The Market for News." *American Economic Review* 95 (4): 1031–53.

Murphy, Kevin M., and Robert H. Topel. 1985. "Estimation and Inference in Two-Step Econometric Models." *Journal of Business and Economic Statistics* 3 (4): 370–79.

Murphy, Kevin M., and Robert H. Topel. 1990. "Efficiency Wages Reconsidered: Theory and Evidence." In *Advances in the Theory and Measurement of Unemployment*, edited by Y. Weiss and G. Fishelson, 204–40. New York: St. Martin's Press.

Murschetz, Paul. 1998. "State Support for the Daily Press in Europe: A Critical Appraisal." *European Journal of Communication* 13 (3): 291–313.

Oppenheim, Saul Chesterfield, and Carrington Shields. 1981. *Newspapers and the Antitrust Laws*. Charlottesville, VA: The Michie Company.

Pelosi, Nancy. 2009. "Letter to Eric Holder." *San Francisco Bay Guardian* (SFBG) http://www.sfbg.com/PDFs/politics/PelosiHolder.pdf (accessed August 19, 2013).

Petrova, Maria. 2011. "Newspapers and Parties: How Advertising Revenues Created an Independent Press." Unpublished.

Poterba, James M. 1996. "Government Intervention in the Markets for Education and Health Care: How and Why?" In *Individual and Social Responsibility: Child Care, Education, Medical Care, and Long-Term Care in America*, edited by Victor R. Fuchs, 277–308. Chicago: University of Chicago Press.

Prat, Andrea, and David Strömberg. 2013. "The Political Economy of Mass Media." In *Advances in Economics and Econometrics, Proceedings of the Tenth World Congress of the Econometric Society.* Vol. II, edited by Daron Acemoglu, Manuel Arellano, and Eddie Dekel, 135–87. Cambridge: Cambridge University Press.

Priest, Andrea. 2011. "Turning the Watchdog into a Lapdog: Why the Proposed Newspaper Bailout is the Wrong Solution for a Failing Industry." *William & Mary Business Law Review* 2 (2): 401–36.

Reiss, Peter C., and Pablo T. Spiller. 1989. "Competition and Entry in Small Airline Markets." *Journal of Law and Economics* 32 (2): S179–202.

Rochet, Jean-Charles, and Jean Tirole. 2006. "Two-Sided Markets: A Progress Report." *RAND Journal of Economics* 37 (3): 645–67.

Ruggles, Steven, J., Trent Alexander, Katie Genadek, Ronald Goeken, Matthew B. Schroeder, and Matthew Sobek. 2010. Integrated Public Use Microdata Series: Version 5.0 [Machine-readable database]. Minneapolis: University of Minnesota.

Rusk, Jerrold G. 1970. "The Effect of the Australian Ballot Reform on Split Ticket Voting: 1876–1908." *American Political Science Review* 64 (4): 1220–38.

Rysman, Marc. 2004. "Competition between Networks: A Study of the Market for Yellow Pages." *Review of Economic Studies* 71 (2): 483–512.

Seim, Katja, and Joel Waldfogel. 2013. "Public Monopoly and Economic Efficiency: Evidence from the Pennsylvania Liquor Control Board's Entry Decisions." *American Economic Review* 103 (2): 831–62.

Skrainka, Benjamin S., and Kenneth L. Judd. 2011. "High Performance Quadrature Rules: How Numerical Integration Affects a Popular Model of Product Differentiation." Unpublished.

Sonnac, Nathalie. 2000. "Readers' Attitudes Toward Press Advertising: Are They Ad-Lovers or Ad-Averse?" *Journal of Media Economics* 13 (4): 249–59.

Spence, A. Michael. 1975. "Monopoly, Quality, and Regulation." *Bell Journal of Economics* 6 (2): 417–29.

Steiner, Peter O. 1952. "Program Patterns and Preferences, and the Workability of Competition in Radio Broadcasting." *Quarterly Journal of Economics* 66 (2): 194–223.

Sterling, Christopher H., and John M. Kittross. 2001. *Stay Tuned: A History of American Broadcasting.* 3rd ed. Mahwah, NJ: Lawrence Erlbaum Associates.

Summers, Mark Wahlgren. 1994. *The Press Gang: Newspapers and Politics, 1865-1878*. Chapel Hill: University of North Carolina Press.

▶ **Sweeting, Andrew.** 2010. "The Effects of Horizontal Mergers on Product Positioning: Evidence from the Music Radio Industry." *RAND Journal of Economics* 41 (2): 372–97.

US Department of Labor, Bureau of Labor Statistics. 1986. "Cost of Living in the United States, 1917-1919." Inter-university Consortium for Political and Social Research (ICPSR) Study 8299.

Waldfogel, Joel. 2011. "Station Ownership and the Provision and Consumption of Radio News." Federal Communications Commission. http://www.fcc.gov/encyclopedia/2010-media-ownership-studies (accessed August 15, 2013).

▶ **Wilbur, Kenneth C.** 2008. "A Two-Sided, Empirical Model of Television Advertising and Viewing Markets." *Marketing Science* 27 (3): 356–78.

Yewdall, Clifford. 1928. *Report of the Cost Finding Committee*. Des Plaines, IN: Inland Daily Press Association.