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.