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 $\mu_\kappa^0 + \mu_\kappa^1 \log(S_m) + \mu_\kappa^2 \log(S_m)^2$.