The Decline of Local News Coverage: Evidence from U.S. Newspapers*

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Abstract

Coverage of local politics by U.S. local daily newspapers has dropped substantially over the last two decades. At the same time, online media platforms proliferated and the print newspaper industry consolidated. This paper studies the sources of the decline of local political news. To this end, I build a demand and supply model of the newspaper industry with endogenous local and national news content. The model allows for readers to have heterogenous preferences over newspaper content, for the outside option to reflect the increased media choice over the sample period, and for publishers to exploit cost efficiencies in the production of news. I estimate the model using a novel panel of newspapers' characteristics, local and national political coverage, and ownership information. I find that consolidation of newspapers explains about one third of the declining trend in local political coverage, while changes in readers' demand for print newspapers and preferences for local topics account for the remaining two thirds. In a counterfactual simulation where Gannett, the biggest newspaper conglomerate, acquires all remaining independent newspapers, local news coverage drops by 4 percent.

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1 Introduction

Local newspapers have long been the primary source of information when it comes to local and national news. They play an essential role in the functioning of democracy by informing voters and driving citizen engagement (DellaVigna and Kaplan (2007), Gentzkow et al. (2011)), helping keep elected representatives accountable (Snyder Jr and Strömberg (2010), Gao et al. (2019), Gavazza et al. (2019)), as well as setting the political agenda debate and influencing policy (Strömberg (2001), Eisensee and Strömberg (2007)). Local newspapers are particularly important given their detailed coverage local topics (Mondak (1995)).

Yet, over the past few decades, there have been major changes in the local news environment. Traditional print local newspapers have been challenged by increased competition in readership and advertising from new online platforms and have struggled to move to the online setting (Angelucci and Cagé (2019)). Declining readership and revenues forced many of them to downsize, cut journalistic resources, or shut down entirely (Hamilton (2016), Abernathy (2018), Peterson (2021)). These changes also affected the composition of news (Angelucci et al. (2020), Djourelova et al. (2021)). In particular, newspapers' reporting of local politics has dropped substantially over the last two decades.

On one hand, changes in demand may have contributed to this declining trend in local news coverage of politics. Today, consumers have access to a wide variety of media platforms such as online news websites, news apps, and social media (Arceneaux and Johnson (2013), Kennedy and Prat (2019)), crowding out print readership (Gentzkow and Shapiro (2006), Gentzkow (2007)). In addition, readers' preferences for local news topics may be changing and may have played a part in the decrease in local news coverage. Indeed, there is evidence that civic engagement has gone down in OECD countries, that citizens feel less attached to their communities, and are less active politically at the local level (Putnam (2000), Putnam (2015)). All these factors have been strongly tied to local news consumption (Barthel et al. (2016)). In that sense, dedicated coverage of local news and local politics may not be as valuable to readers anymore (Hopkins

(2018)).

On the other hand, the reduction in local news provision may also have been amplified by supply-side changes in the newspaper industry. Increased competition from new media platforms and declining revenues have led many local newspapers to consolidate, with media conglomerates acquiring many previously independent newspapers and small newspaper chains. In fact, about half of the local daily newspapers in the U.S. have changed owner over the last 20 years, with most of them being acquired by bigger and bigger ownership groups. Consolidation brings about changes in the cost of producing local and national news. To save costs, larger newspaper groups tend to favor content that can be produced centrally and distributed to the many publications they own, while cutting journalistic resources devoted to the production of locally-oriented content (Dunaway (2008), Noam et al. (2009), Martin and McCrain (2019)). Such cost efficiencies were the primary motive when newspaper conglomerate Gannett acquired Gatehouse in 2019. Gannett expected no increased revenues from the acquisition, but foresaw $300 million in cost savings from staff cuts and local newsroom closures (Hendrickson (2019), Tracy (2019)).

This paper empirically studies the sources of the decline in local news coverage of politics by local daily newspapers in the U.S. Specifically, I ask to what extent does this declining trend reflect a change in reader tastes for local news coverage, increased demand for online media platforms, or consequences of ownership consolidation. To this end, I first provide descriptive evidence of the impact of consolidation on news coverage using a difference-in-differences strategy as well as event studies. To gain additional insights, I develop and estimate an equilibrium model of the newspaper industry with endogenous local and national news content. I use counterfactual analysis to quantify the importance of the different forces in driving the decrease in local coverage of politics. Lastly, I quantify the effect of further hypothetical consolidation on the provision of news coverage.

The empirical analysis requires significant data collection. I assemble a novel panel of U.S. local daily newspapers between the years 2000 and 2020. I construct measures of

newspapers' local and national political coverage directly from the text of news articles. For each newspaper and year, I conduct separate, automated searches on NewsBank, an online archive of news articles, to count articles mentioning specific keywords associated with local and national politics. I supplement this data with information on newspaper characteristics from newspaper directories that I digitized, and with information on newspaper ownership and acquisitions from quarterly industry reports.

I first document a substantial drop in local news coverage of politics between 2000 and 2020. I then provide descriptive evidence that ownership consolidation affects news content using a difference-in-differences design. I compare the change in local and national news coverage of local newspapers that consolidate to the news content choices of newspapers that do not consolidate over the same period. I find that newspapers acquired by big media conglomerates tend to alter the composition of news away from local reporting towards more national content. These findings are consistent with media groups exploiting cost efficiencies in the production of national news, pooling journalistic resources to produce content that can be syndicated across the many newspapers they own, while cutting resources devoted to the production of locally-focused content as a means to save on costs. In contrast, smaller newspaper chains tend to also exploit cost efficiencies in the production of local news coverage, consistent with the fact that these newspapers are more local or regional in nature.

Motivated by these findings, I develop and estimate a demand and supply model of the newspaper industry with endogenous local and national news content by building on prior work by Fan (2013). In her study of the newspaper industry, she stresses the importance of accounting for changes in product characteristics such as quality and variety when evaluating welfare in a merger analysis. This paper, in contrast, studies the determinants of the decline in local political coverage by newspapers over the last 20 years. Doing so poses several challenges. I need to account for the rise in alternative media sources over time, as well as allow for changes in reader preferences for news topics. I also must account for the fact that ownership consolidation likely alters the cost structure of the merged newspapers.

I model the demand for local daily newspapers as a discrete choice problem featuring heterogeneous reader preferences over local and national news content. Specifically, readers' tastes for local and national political reporting are allowed to vary both with their demographic characteristics and over time. In addition, to reflect the increased media choice offered by online sources over the sample period, I let the outside option vary over time and with markets' internet access rates. The supply side is a static two-stage game. In the first stage, newspaper publishers choose local and national political coverage for the newspapers they own. In the second stage, they set subscription prices. The model allows for the costs of providing local and national content to differ. The model also accounts for the effects of ownership changes on the cost of local and national news production by incorporating parameters that allow for cost efficiencies in the production of news content for newspaper chains.

I estimate demand and supply jointly, using a two step generalized method of moments procedure similar to Berry et al. (1995). The demand side of the model is identified by taking advantage of the panel structure of my dataset. I use two sources of exogenous variation in subscription prices and local and national news content to identify the preference parameters. The first set of instruments I use consists of average subscription prices and news content decisions of other newspapers owned by the same publisher. The second source of exogenous variation arises from variation in news publisher characteristics, including size and whether or not it is a conglomerate. These variables exhibit large variation over the sample period due to the frequent ownership changes. To estimate the supply side, I use news publishers' first order conditions with respect to subscription prices and local and national news content to recover the implied marginal cost of circulation and cost of news content production.

On the demand side, I find substantial heterogeneity in reader tastes for local and national coverage of politics. Readers' preferences for local news content decreased over the sample period. In addition, the preference parameter estimates show that older readers, more educated readers, and readers living in more rural areas tend to prefer more local political coverage. Younger individuals, as well as those living in more urban markets tend to exhibit higher preferences for national news content. I also find

that readers' valuation for the outside choice improved with internet access rates and over the sample period, consistent with the advent of online news platforms over the sample period. On the supply side, I find significant cost efficiencies in the production of national news coverage for all newspaper groups. Media conglomerates tend to find local news coverage more expensive to produce than non conglomerates, while smaller newspaper chains tend to also exploit cost efficiencies in the production of local news coverage.

The model estimates suggest that declining reader tastes for local content, increased demand for online media platforms, as well as changes in the cost structure of consolidated newspapers have contributed to the decrease in the provision of local political coverage. In order to quantify the strength of each channel in driving this trend, I simulate equilibrium news content choices under several counterfactual scenarios aimed at isolating each force. I find that changes in readers' demand for print newspapers and preferences for local topics explain about two thirds of the declining trend in local political coverage, while consolidation of newspapers amplified this effect by about 50 percent.

I then use the estimated model to quantify the effect of further hypothetical ownership consolidation of local newspapers on the provision of local news coverage. This counterfactual analysis is motivated by the fact that regulators and policymakers are concerned about the survival of local media, and fear that media ownership consolidation may create the potential for decreased content variety (FCC (2016)). I find that in a counterfactual scenario where the biggest newspaper conglomerate, Gannett, acquires all remaining independent newspapers, industry average reporting of local politics declines by 4 percent.

Taken together, my results suggest that increased competition from online news platforms as well as growing ownership consolidation had a substantial negative impact on local political reporting over the last two decades. My findings have important implications that transcend economic considerations. With less reporting on local politics, citizens are less likely to recall their representative's name, to evaluate their policies,

and to vote, and politicians are less productive (Snyder Jr and Strömberg (2010), Hayes and Lawless (2015)). My study reinforces existing concerns about the loss of media localism as the FCC relaxed rules restricting consolidation of media ownership, for example through the removal of the "main studio rule" which required every radio and television broadcast station to have a main studio located in or near its local community (FCC (2017)).

Related literature. This paper is related to several literatures. First, it adds to the literature on the determinants of news content and product positioning in the media industry. Several studies have focused on the supply-side determinants of news content (e.g. Berry and Waldfogel (2001), Sweeting (2010)). In the daily newspaper industry, George and Waldfogel (2006) show that the entry of the New York Times into local news markets led local newspapers to focus more on their comparative advantage in local coverage. George (2007) finds that greater ownership concentration leads newspapers to differentiate more and to offer a larger variety of content. Berry and Waldfogel (2010) show that the average quality of daily newspapers increases with market size, but that larger markets do not offer significantly more variety. Gentzkow et al. (2014) show that greater newspaper competition is associated with greater ideological diversity.

Other studies highlight the importance of demand-side forces in shaping news coverage (e.g. Mullainathan and Shleifer (2005), Gentzkow and Shapiro (2006)). In particular, George and Waldfogel (2003) find that newspapers have strong incentives to cater to the tastes of consumers in their markets, and Gentzkow and Shapiro (2010) show that a newspaper's slant is positively correlated with the partisan leaning of its coverage area.

My contribution to this literature is twofold. Among the numerous dimensions of media content, the literature has focused largely on news quality and variety, or ideological slant. I focus on another dimension of news content, newspapers' choices of local and national news coverage, which has received little attention in the literature. Notable exceptions closely related to this paper are Angelucci et al. (2020) and Djourelova et al. (2021) who document the impact of the entry of new media sources on newspapers' local

content. Second, I study how both demand and supply forces affect newspapers' choices of news coverage in a unified framework which allows me to measure the contribution of each force in driving the decline of local news coverage. My results suggest that demand channels are important determinants of the decline of local news reporting, and that ownership consolidation amplified these effects.

This paper also contributes to the literature on the consolidation of media ownership (e.g. Sweeting (2010) Sweeting (2013), Byrne (2015), Stahl (2016)). In the newspaper industry, early work focused on the price effects of mergers among newspapers (Chandra and Collard-Wexler (2009)). Closest to this paper is Fan (2013), who recognizes the limitations of focusing only on newspaper prices and estimates a structural model of the U.S. newspaper industry with endogenous product characteristics. She then uses the estimated model to simulate the effects of a merger between two newspapers in Minneapolis that was blocked by the Department of Justice. She finds that ignoring adjustments of product characteristics would have caused substantial differences in the estimated welfare effects of mergers.

My approach complements hers in that this paper also endogenizes decisions over newspaper content. Our papers differ in that I focus on understanding how ownership consolidation affects local newspapers' costs and content choices. First, the model must account for the fact that ownership consolidation changes the cost structure of the merged newspapers. I allow for cost efficiencies in the production of news content for publishers that own multiple newspapers. In fact, prior work by Dertouzos and Trautman (1990) and Berry and Waldfogel (2010) suggested the importance of economies of scale in the production of news content. Consistent with the intuition of these papers, I find that there are significant economies of scale in producing news coverage, especially for media conglomerates in the production of national political content. Second, I also leverage variation induced by the frequent ownership changes over my sample period to build instruments that help identify the preference parameters. They consist of publisher characteristics and average prices and content choices of other newspapers owned by the same media group.

Methodologically, this paper adds to the growing literature on endogenous product choice (Mazzeo (2002), Gandhi et al. (2008), Draganska et al. (2009), Fan (2013), Eizenberg (2014), Byrne (2015), Wollmann (2018), Crawford et al. (2019)) that incorporates endogenous prices and product characteristics in a differentiated products model to assess both the price and non-price effects of mergers.[1] My focus on local news coverage and ownership consolidation is different from all those papers.

The remainder of this paper proceeds as follows. Section 2 describes the data. Section 3 presents descriptive evidence of the effect of consolidation of ownership of news coverage. Section 4 develops the model of demand and supply for local newspapers. Section 5 discusses the identification and estimation strategies, and Section 6 presents the empirical results. Section 7 quantifies the effect of increased demand for online media platforms, changes in reader tastes for local and national content, and increased ownership consolidation in driving the decline of local news coverage by U.S. daily newspapers. Section 8 measures the impact of further ownership consolidation on news reporting. Lastly, Section 9 concludes.

2 Data

This section describes the novel panel of U.S. local daily newspapers I constructed for this study. The main data sources consist of newspaper directories and an online archive of news articles, from which I build a dataset of newspapers' characteristics and measures of news content between 2000 and 2020. I supplement this data with information on newspapers' ownership from industry reports.

2.1 Measuring Local and National Political Coverage

Measuring news coverage is not straightforward. Existing studies have used newspapers' number of pages or the number of reporters on staff (Berry and Waldfogel (2010), An-

[1] See also Crawford (2012) for an overview.

gelucci and Cagé (2019)), newspapers' assignments of reporters to news topics (George (2007)), or the so-called newshole and advertising space (Fan (2013))[2] as measures of news content. All of these measures are inputs to the production of news. In contrast, I measure newspaper coverage directly from the text of news articles. Such an approach has been used to measure ideological slant (Groseclose and Milyo (2005), Gentzkow and Shapiro (2010) and Martin and Yurukoglu (2017)) and to quantify the amount of a newspaper's political coverage (Snyder Jr and Strömberg (2010), Garcia-Jimeno and Yildirim (2017) and Djourelova et al. (2021)).

Data on newspaper articles comes from NewsBank, an online archive that covers news articles for 908 newspapers in my sample and representing 74 percent of total circulation.[3] For each newspaper and year, I conduct separate, automatic searches on the NewsBank database for the count of original news articles[4] that mention specific keywords associated with political coverage. I follow Hopkins (2018) and Peterson (2021) in defining the set of relevant keywords. These terms touch on local and national politics. Articles on local politics are identified based on keywords related to the mayor, city manager, city council, or county government for instance. National coverage of politics is identified based on articles referencing the incumbent President, Congressmen, or Senators.

I focus on newspapers' coverage of politics and not on other dimension of news coverage as political reporting is instrumental to the well-functioning of democracy. Its effects on political attitudes and election outcomes are well documented. In particular, news coverage of local politics is associated with higher civic engagement and greater voter knowledge, which in turn leads to greater accountability from their representatives (Gentzkow and Shapiro (2010), Gentzkow et al. (2011), Snyder Jr and Strömberg (2010),

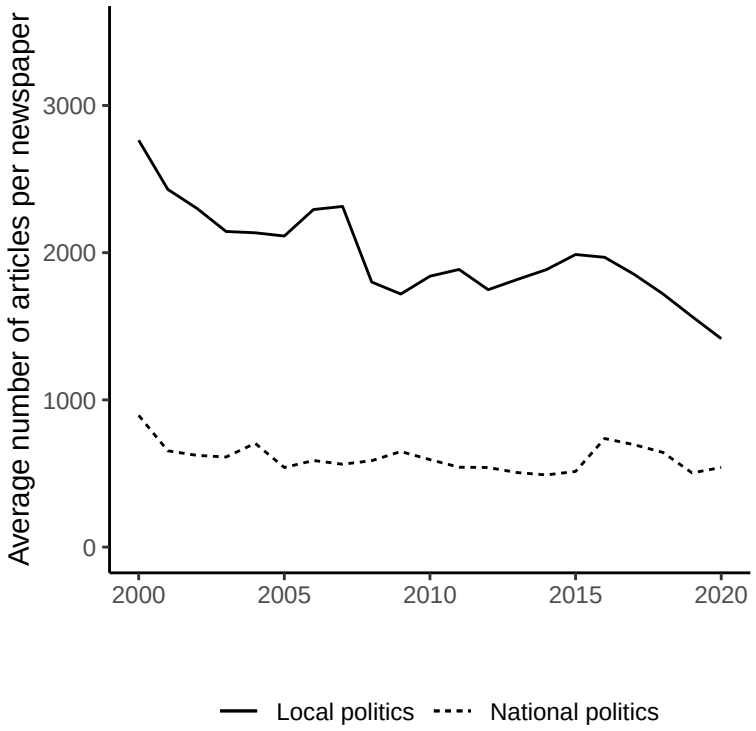
[2]The newshole is the amount of space in the newspaper devoted to anything but advertising.

[3]I match newspapers between the E&P data and the NewsBank database based on their name and their headquarters' city, county and state. In Appendix A, Table 6 compares the characteristics of newspapers present in the NewsBank archive to those in the E&P data. Overall, bigger newspapers are more represented in the NewsBank sample.

[4]I exclude opinion content, news wires stories, focusing instead on content originating with each local newspaper.

Hayes and Lawless (2015), Hayes and Lawless (2018)). National political coverage has also been shown to impact political attitudes and outcomes (DellaVigna and Kaplan (2007) and Martin and Yurukoglu (2017)). Thus, decreased coverage of politics likely brings about social consequences that are fundamentally different from other types of news reporting such as sports or entertainment.

Figure 1: Average Newspaper Coverage of Local and National Politics



Note: The figure plots the average amount of attention newspapers devote to politics per year between 2000 and 2020, defined as the mean number of newspaper articles that mention keywords associated with politics. The solid line represents local coverage of politics and the dashed line represents national political coverage.

On average, a newspaper in my sample writes 2,845 original articles about local political topics and 1,059 about national politics each year. Coverage varies substantially, with standard deviations equal to 2,671 and 1,224 articles respectively. Figure 1 plots the mean amount of attention newspapers devote to local and national politics between 2000 and 2020. There is a substantial drop in news coverage of local politics, which fell

by almost half over the sample period, while coverage of national news dropped slightly over the same period.

2.2 Local Daily Newspapers

I assemble a panel of local daily newspapers characteristics from the Editor and Publisher Year Books (E&P). Every year, E&P compile comprehensive information on all the daily newspapers published in the U.S. Figure 8 in Appendix A shows how information for each newspaper is reported in one of the Year Books. I digitized the E&P Year Books for the years between 2000 and 2020 using Google Cloud's Vision API and LayoutParser by Shen et al. (2021). I extracted information on the city, county and state of the newspapers' headquarters, total circulation, annual subscription prices, the frequency of publication (number of days published), the edition type (morning or evening) and the average number of pages per issue.

Table 1 presents summary statistics at the newspaper-year level. The resulting dataset includes 1,547 unique local newspapers and 28,675 newspapers-years. Additional figures in Appendix A plot the evolution of the newspaper industry between 2000 and 2020. Overall, the number of local daily newspapers declined by 15 percent, and total circulation dropped by more than half over the past 20 years.

Table 1: Summary Statistics for Local Daily Newspapers

	Mean	St. Dev.
Total circulation	28,280	56,710
Annual subscription price ($)	124.59	51.52
Frequency of publication	6.26	0.79
Morning edition	0.56	0.50
Average number of pages per issue	28.78	18.77

Note: Observations are at the newspaper-year level and cover the time period 2000 to 2020.

I follow Gentzkow and Shapiro (2010) and define a newspaper's relevant market as being the county in which its headquarters are located. This is a reasonable approximation that has been used in the literature since the median newspaper sells more than 90 percent of its copies in the county where it is headquartered.[5] Market characteristics are from the Census and consist of county-level socio-economic and demographic characteristics, including population, age, education, median household income, urbanization rates and internet access rates.[6]

Table 2: Summary Statistics for Newspaper Markets

Number of newspapers	1	2	3+	All
Number of markets	20,982	2,417	776	24,175
Median population	64,630	185,361	661,675	73,791
Percent age > 60	0.21	0.20	0.20	0.21
Percent college education	0.26	0.29	0.33	0.26
Median income ($)	42,993	45,822	51,249	43,490
Percent urban	0.63	0.76	0.88	0.66
Percent internet access	0.59	0.61	0.73	0.60

Note: Observations are at the news market-year level and cover the time period 2000 to 2020.

Table 2 presents summary statistics for the newspaper markets. Only about 13 percent of the markets have two or more local daily newspapers circulating. A number of markets that earlier supported multiple daily newspapers have seen at least one of

[5]This figure is based on county-level circulation from the Alliance for Audited Media (AAM) which collects member newspapers' audited reports and circulation counts. I matched AAM member newspapers to those in the E&P books based on the newspapers' name, and its headquarters' city, county and state. In this data, the average newspaper (resp. median newspaper) sells 85 percent (resp. 93 percent) of its subscriptions in the county where it is headquartered.

[6]Population estimates are from the U.S. Census. Median household income estimates are from the U.S. Census Bureau's Small Area Income and Poverty Estimate program. The education data is a 5-year average from the American Community Survey. Internet access rates are county-level estimates from Tolbert and Mossberger (2020) based on the U.S. Current Population Survey and the American Community Survey.

them become a weekly newspaper, or even shut down in the last two decades. The sample includes 1,204 markets with at least one local daily newspaper in 2000 and 1,072 in 2020. The news markets that are able sustain more newspapers tend to be on average more populated, have a higher median household income as well as higher urbanization and internet access rates.

2.3 Newspaper Ownership

Even though the E&P Year Books contain information on newspapers' parent company, names are often irregular and sometimes identify regional subsidiaries or holding companies instead of the ultimate parent. I track newspapers' ownership information and the date of ownership changes using a combination of sources: the UNC's Center for Innovation and Sustainability in Local Media database,[7] and quarterly industry reports made by two of the leading merger and acquisition firms in the newspaper industry, Dirks, Van Essen, Murray & April and Cribb, Cope & Potts.[8]

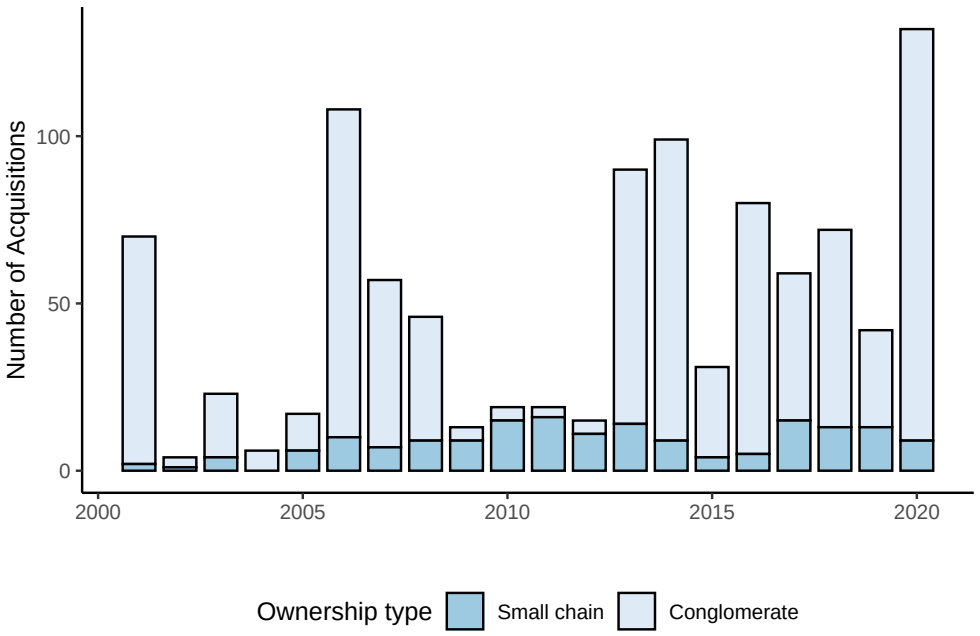
In 2000, the country's 1,468 local daily newspapers were owned by 371 parent companies. In contrast, at the end of my sample period in 2020, 259 companies owned the 1,244 local newspapers. As the number of newspaper owners decreased, ownership consolidation has accelerated over the past 20 years, especially among the largest chains. Figure 5 plots the number of newspapers that changed owners over the last two decades. More than half of all local daily newspapers have changed owners, and some did so multiple times.

Recent changes in the media industry have driven the sale or the closure of many small, independent local newspapers. Consequently, the number of independently owned newspapers has been steadily declining. By 2020, less than 13 percent of the country's local daily newspapers were independently owned.

[7] `https://www.usnewsdeserts.com`. The UNC data is only available for a select number of years (2004, 2014, 2016, 2017 and 2018).

[8] These reports are available at `http://www.dirksvanessen.com/press_releases/` and `https://cribb.com/news-releases/`

Figure 2: Newspaper Ownership Consolidation



Note: The figure plots the number of newspapers that change owner per year. 749 newspapers experience changes of ownership over the sample period, and some multiple times. Acquisitions of local newspapers by conglomerate owners are shown in light blue, and acquisitions by small newspaper chains are in darker blue.

At the same time, newspaper chains grew bigger. In recent years, the most active buyers of daily newspapers have been Gannett/GateHouse, Digital First Media and BH Media Group. These three chains have purchased nearly 60 percent of the newspapers that were sold. Table 7 in Appendix A documents the evolution of national market shares for the top 10 newspaper owners in the U.S. over the sample period. As of 2020, the largest 10 newspaper chains owned half of the daily newspapers, as opposed to 30 percent in 2000. The largest 10 conglomerates also vary in size greatly, from the 28 local daily newspapers owned by Boone Newspapers to the 270 newspapers owned by GateHouse/Gannett.

3 Descriptive Evidence

In this section, I provide descriptive evidence of the impact of ownership consolidation on the provision of local and national news coverage of politics by local daily newspapers using a difference-in-differences approach.

I compare average differences between pre- and post-merger measures of news content for local newspapers that consolidate (treated newspapers) and those that do not (control newspapers). The baseline estimating equation is the following

$$Y_{nt} = \alpha + \beta \mathbb{1}\{\text{Post-Consolidation}\}_{nt} + \gamma X_{nt} + \tau_t + \phi_n + \epsilon_{nt} \tag{1}$$

where n indexes newspapers and t indexes years. τ_t are year fixed effects and ϕ_n are newspaper fixed effects that control for newspaper factors that remain constant over time and affect the outcomes.

The vector X_{nt} includes controls for the average number of pages per issue and total circulation. ϵ_{nt} is a newspaper-year shock. The variable Y_{nt} denotes the outcome of interest, i.e. the log amount of local news coverage and the log amount of national news coverage. $\mathbb{1}\{\text{Post-Consolidation}\}_{nt}$ is a dummy variable that identifies the post-consolidation period for newspaper n. The coefficient β is the average treatment effect for newspapers that consolidate. The specification follows recent recommendations by De Chaisemartin and d'Haultfoeuille (2020).

I investigate the effect of consolidation separately for newspapers acquired by national conglomerates and newspapers acquired by smaller, regional chains. To do so, I also estimate the following extended specification

$$\begin{aligned} Y_{nt} =& \alpha + \beta_1 \mathbb{1}\{\text{Post-Consolidation}\}_{nt} \times \mathbb{1}\{\text{Small Chain Owner}\}_{nt} \\ &+ \beta_2 \mathbb{1}\{\text{Post-Consolidation}\}_{nt} \times \mathbb{1}\{\text{Conglomerate Owner}\}_{nt} \\ &+ \gamma X_{nt} + \tau_t + \phi_n + \epsilon_{nt} \end{aligned} \tag{2}$$

where $\mathbb{1}\{\text{Small Chain Owner}\}_{nt}$ is a dummy variable that identifies newspapers owned by a small newspaper chain at time t, and $\mathbb{1}\{\text{Conglomerate Owner}\}_{nt}$ is a dummy

variable that identifies newspapers owned by a media conglomerate. The coefficient β_1 and β_2 represent the effects of acquisitions by small chains and conglomerate owners, respectively.

The key identifying assumption is that the trends of the outcome variables would be the same for both treated and control newspapers in the absence of the treatment, so that consolidation induces a deviation from this common trend. This assumption is reasonable as most consolidation happening during the sample period were the result of purchases of groups of newspaper as opposed to targeted single newspaper acquisitions. In other words, the many ownership changes are unlikely to be endogenous to the unobserved local market conditions, after controlling for newspaper fixed effects and market characteristics. A similar identifying assumption has been used by Hastings (2004) and Houde (2012) who study mergers in the gasoline industry. To validate the assumption of conditional exogeneity of consolidation, I also estimate event studies below and show no clear significant pre-trends.

Table 3 presents evidence that ownership consolidation impacts local newspapers' content choices. Columns (1) and (3) report the aggregate effect of ownership consolidation on local and national news coverage, and columns (2) and (4) reports results broken down by ownership type. The difference-in-differences estimates show that following acquisitions by media conglomerates, local newspapers increase of the amount of national political coverage by 10 percent, at the expense of local political reporting which drops by about 7 percent. For newspapers acquired by small chains, consolidation increases the amount of local politics by 7 percent and national news coverage by 9 percent.

I track the impact of consolidation on newspapers' local and national news coverage over time estimating event studies. Specifically, I estimate the following model

$$Y_{nt} = \sum_{k=-5}^{+5} \beta_k \mathbb{1}\{\text{Post-Consolidation}\}_n + \gamma X_{nt} + \tau_t + \phi_n + \epsilon_{nt} \tag{3}$$

β_k are the coefficients of interest and capture the time-varying effects of ownership consolidation.

Table 3: Difference-in-Differences Results

	Local Coverage (log)		National Coverage (log)	
	(1)	(2)	(3)	(4)
1{Post-Consolidation}	-0.019		0.086***	
	(0.015)		(0.023)	
1{Post-Consolidation}		0.070**		0.088**
×1{Small Chain Owner}		(0.033)		(0.037)
1{Post-Consolidation}		-0.069***		0.101***
×1{Conglomerate Owner}		(0.017)		(0.025)
Year FE	Y	Y	Y	Y
Newspaper FE	Y	Y	Y	Y
Controls	Y	Y	Y	Y
Observations	12,723	12,723	12,723	12,723
Adjusted R^2	0.580	0.584	0.622	0.623

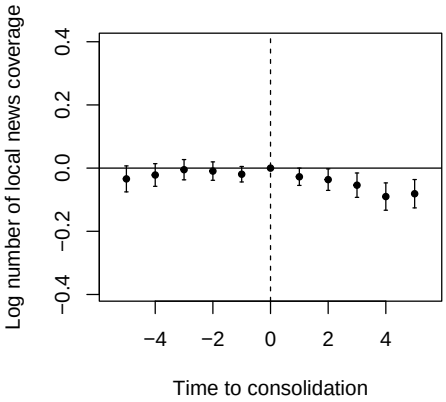
Note: The dependent variable is the log number of articles referring to coverage of local politics in columns (1) and (2), and the log number of articles referring to coverage of national politics in columns (3) and (4). Observations are at the newspaper–year level. Standard errors are clustered at the newspaper level. *, **, *** indicate significance at the 10%, 5%, 1% level, respectively. Controls include newspaper log circulation, frequency type, average number of pages per issue, and news market demographic characteristics.

Figure 3 plots the coefficient estimates on five lags and five leads relative to ownership consolidation. By normalization, consolidation takes place at $t = 0$. Panels (a) and (b) show the dynamic impact of consolidation on local news coverage for newspapers acquired by small, regional chains and newspapers acquired by national conglomerates respectively. Panels (c) and (d) present similar plots for the effect of consolidation on national political news.

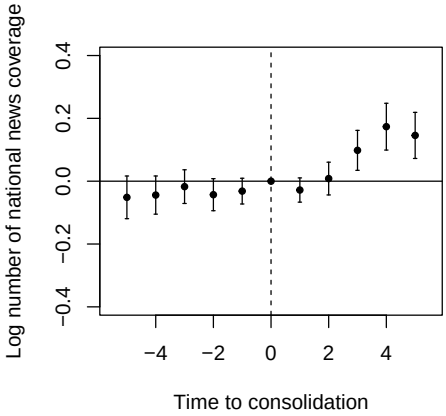
Consistent with the above difference-in-differences results, newspapers acquired by small chains tend to increase the amount of local and national content by up to 13 percent of the mean in the years following consolidation. In contrast, newspapers acquired by bigger newspaper conglomerates experienced a decline in the amount of local reporting by up to 9 percent after consolidation, and an increase in the amount of national content by up to 17 percent. I also find no clear significant pre-trends before consolidation, suggesting that the effects I mentioned are driven by consolidation.

Taken together, these changes in news reporting post ownership consolidation are consistent with cost savings measures taken by media chains. Ownership consolidation brings about changes to the economics of news content production, favoring coverage that is easier to produce and to share across a chain's newspapers. Indeed, for certain areas of news coverage like national news, newspaper groups can combine the journalistic resources of their outlets (Martin and McCrain (2019)). In contrast, locally-oriented content tends to be comparatively more expensive to produce, necessitating resources tailored to a specific coverage area. Media conglomerates tend to cut local coverage to save on costs as evidenced by the many recent layoffs of local reporters and closures of local newsrooms following acquisitions (Dunaway (2008), Darr (2016), Peterson (2021)). Smaller newspaper groups, which are more local or regional in nature, are able to pool reporting resources in the production of local news coverage (Snyder Jr and Strömberg (2010)).

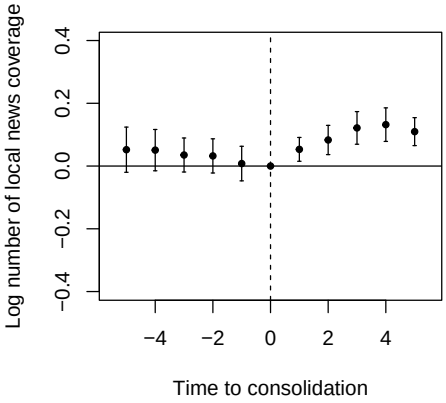
Figure 3: Difference-in-Differences Event Studies



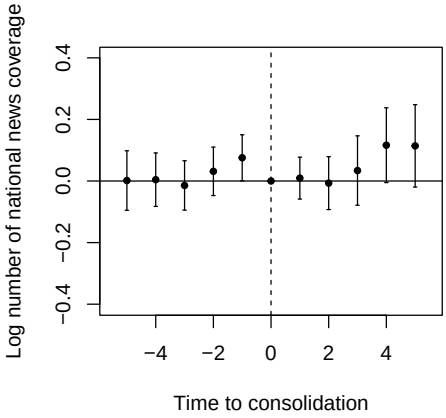
(a) Dynamic Effect of Acquisitions by Conglomerate on Local News Coverage



(b) Dynamic Effect of Acquisitions by Conglomerate on National News Coverage



(c) Dynamic Effect of Acquisitions by Small Chains on Local News Coverage



(d) Dynamic Effect of Acquisitions by Small Chains on National News Coverage

Note: The plots present the difference-in-differences event studies estimates around the time a newspaper consolidates. Panels (a) and (b) show the dynamic effect of acquisitions by national conglomerates on local and national news coverage, respectively. Similarly, panels (c) and (d) plot the dynamic effect of acquisitions by small chains. Coefficients and 95% confidence intervals are reported. Standard errors are clustered at the newspaper level. Controls include year and newspaper fixed effects as well as newspaper log circulation, frequency type, average number of pages per issue, and news market demographic characteristics.

4 Model

My model of newspaper supply and demand builds on the canonical model of Berry et al. (1995) and more recent work by Fan (2013). Since I focus on studying the sources of the decline in coverage of local politics over the last two decades, I need to account for several important changes that occurred to the local news environment. In particular, I must incorporate the rise in alternative media sources over time, as well as allow for potential changes in reader preferences for local and national news. I need to account for the fact that ownership consolidation changes the cost structure of the merged newspapers.

4.1 Demand

Demand for newspapers. The model follows the differentiated product discrete choice framework to describe demand for local daily newspapers. A market is defined as a county, indexed by m, observed in a year t. In each market-year, there are H_{mt} potential readers. Readers are assumed to subscribe to at most one newspaper,[9] and only to newspapers that circulate in the market where they are located. J_{mt} denotes the set of daily newspapers available in market m and in year t. The indirect utility of reader i located in county m from subscribing to newspaper n in year t, u_{inmt}, is

$$u_{inmt} = c_{nt}\beta^c_{imt} + x_{nt}\beta^x + \alpha p_{nt} + d_{mt}\phi + \xi_{nmt} + \epsilon_{inmt} \tag{4}$$

where $c_{nt} = (c^L_{nt}, c^N_{nt})$ is a vector of newspaper content, the amount of coverage of local and national politics described in Section 2. x_{nt} is a vector of exogenous newspaper characteristics, whether or not the newspaper is a morning publication and the average number of pages per issue. p_{nt} is the annual subscription price of newspaper n in year

[9] Only 13 percent of the markets in my sample have 2 or more newspapers, so that duplicate readership is likely minimal. In fact, Fan (2013) uses a multiple discrete choice model to allow for duplicate readership. She finds that in the majority of news markets in her sample fewer than 1 percent of the readers buy 2 newspapers, and that in only 10 percent of the markets more than 5 percent of readers purchase 2 newspapers

t and α denotes readers' valuation of subscription prices. The vector d_{mt} includes demographics of the newspaper circulation area, and captures market-year-specific tastes. ξ_{nmt} captures the unobserved market-year-specific characteristic for newspaper n that may be observed by the newspaper publisher but not by the econometrician.

β^L_{imt} and β^N_{imt} are random coefficients capturing household-specific tastes for news coverage of local and national politics, and are given by

$$\begin{aligned} \beta^L_{imt} &= \beta^L_0 + \beta^L_1(t - t_0) + d_{it}\beta^L_2 + \sigma^L \nu^L_{im} \\ \beta^N_{imt} &= \beta^N_0 + \beta^N_1(t - t_0) + d_{it}\beta^N_2 + \sigma^N \nu^N_{im} \end{aligned} \tag{5}$$

β^L_0 and β^N_0 are common to all readers, and heterogeneity in readers' tastes around β^L_0 and β^N_0 is a function of a set of demographics, $d_{it} = (\mathbb{1}\{\text{Age} > 60\}_{it}$, $\mathbb{1}\{\text{College education}\}_{it}$, $\mathbb{1}\{\text{Urban}\}_{it})$, a time trend, $(t - t_0)$ where t_0 is the first year in the data, and random draws from a standard normal distribution, ν^L_{im} and ν^N_{im}.

Lastly, ϵ_{inmt} is the remaining idiosyncratic taste of reader i located in county m for newspaper n in year t. ϵ_{inmt} is assumed to be i.i.d. and to follow a type I extreme value distribution.

To capture the fact that the outside option evolves over time, due, for example, to the expansion of online news platforms over the sample period, the utility from the outside choice u_{i0mt} takes the following form

$$u_{i0mt} = \rho \text{ Internet}_{mt} + \lambda_t + \epsilon_{i0mt} \tag{6}$$

where λ_t are year fixed effects and Internet_{mt} is the internet access rate in county m and year t.

Importantly, the demand specification is designed to capture two key features. First, it allows for readers' tastes for local and national political coverage to differ based on their demographic characteristics as well as change over time. For instance, preferences for local topics may decline over the sample period. Older readers may also be more interested in local politics while younger urban readers may have stronger preferences for national news coverage. Second, the demand specification takes into account the

increased competition from alternative media platforms such as online news and social media by modeling the utility derived from the outside choice to vary with markets' internet access rates and over time.

Each reader i in market m and year t chooses the alternative n that maximizes her utility. The predicted market share of newspaper n in market m and year t is the probability that newspaper n yields the highest utility across the available newspapers, including the outside good 0. This is given by the logit choice probabilities, integrated over the individual-specific valuations for the news content measures

$$s_{nmt}(\delta_{mt}, c_t, p_t; \theta) = \int \frac{\exp\{\delta_{nmt} + \mu_{nmt}(\sigma, \nu)\}}{1 + \sum_k \exp\{\delta_{kmt} + \mu_{kmt}(\sigma, \nu)\}} dF(d_{mt}, \nu_{im}) \tag{7}$$

where δ_{nmt} is the relative mean utility common to all households for newspaper n in market m and year t, $\delta_{nmt} = c_{nt}\beta_0^c + x_{nt}\beta^x + \alpha p_{nt} + \xi_{nmt} + d_{mt}\phi - \rho \text{ Internet}_{mt} - \lambda_t$, and μ_{nmt} is the term that captures the individual idiosyncratic deviations from the mean utility, $\mu_{int} = (\beta_1^c(t - t_0) + d_{it}\beta_2^L + \sigma^c\nu_{im}^c)c_{nt}$.

4.2 Supply

The supply side of the model is a static two-stage game. I model the profit-maximizing price and news content decisions of newspaper owners.[10] The newspaper market structure such as ownership and circulation area are assumed to be exogenous. Newspaper owners choose the amount of local and national political content for the newspapers they own in the first stage, and subscription prices in the second stage. Newspaper owners solve the problem by backward induction, calculating equilibrium profits under any possible choice of content and then choosing content that maximizes those profits. I also describe these stages in reverse order.

Stage 2: Pricing. The second-stage decision for newspaper owners is to set subscription prices after observing the content chosen for each newspaper in the first stage. An owner f is assumed to maximize the sum of individual profits of the set of newspapers

[10]Note that I abstract from advertising decisions at this stage due to data limitations. Appendix C extends the model to include advertising.

they own, denoted as $\mathcal{N}_{ft}$. Individual profits are profits from newspaper circulation. A publisher chooses subscription prices to maximize

$$\sum_{n \in \mathcal{N}_{ft}} \pi_{nt}^{\text{II}} = \sum_{n \in \mathcal{N}_{ft}} \{(p_{nt} - mc_{nt}^{s}(x_{nt}; \gamma)) \cdot H_{nt} \cdot s_{nt}(\delta_t, c_t, p_t; \theta)\} \tag{8}$$

$mc_{nt}^{s}(\cdot)$ are marginal costs related to circulation, and can be seen as marginal costs of printing and delivery. They are modeled to be a function of newspaper n's characteristics, x_{nt}, such as the frequency of publication and the average number of pages per issue. γ is a vector of parameters entering the marginal cost function. Specifically, the marginal cost of circulation takes the following parametric form

$$mc_{nt}^{s}(x_{nt}; \gamma) = x_{nt}\gamma + \omega_{nt} \tag{9}$$

where ω_{nt} is an unobservable marginal cost shifter.

Stage 1: Content choice. In the first stage of the model, newspaper owners simultaneously make content decisions, with the knowledge that their choice and their rivals' will affect the second stage of the supply game. A newspaper owner f chooses the amount of local and national news coverage, $c_{nt} = (c_{nt}^{L}, c_{nt}^{N})$, to maximize the following profit function

$$\sum_{n \in \mathcal{N}_{ft}} \pi_{nt}^{\text{I}}(c_{nt}) = \sum_{n \in \mathcal{N}_{ft}} \left\{\pi_{nt}^{\text{II}}(p_t, c_t) - F^{L}(c_{nt}^{L}, \zeta_{nt}^{L}; \tau^{L}) - F^{N}(c_{nt}^{N}, \zeta_{nt}^{N}; \tau^{N})\right\} \tag{10}$$

where $\pi_{nt}^{\text{II}}(\cdot)$ is the variable profit from circulation in the second stage, and $F^{L}(\cdot)$ and $F^{N}(\cdot)$ denote the costs associated with choosing local and national news coverage c_{nt}^{L} and c_{nt}^{N}, respectively. ζ_{nt}^{L} and ζ_{nt}^{N} represent unobserved shocks to the costs of local and national news. τ^{L} and τ^{N} denote the vectors of cost parameters to be estimated.

I adopt a quadratic function to approximate the slopes of the local and national news content production costs. Specifically, $F^{L}(\cdot)$ and $F^{N}(\cdot)$ are parameterized as follows

$$\begin{aligned} \frac{\partial F^{L}(c_{nt}^{L}, \zeta_{nt}^{L}; \tau^{L})}{\partial c_{nt}^{L}} =& \tau_0^{L} + \tau_1^{L} c_{nt}^{L} + \tau_2^{L} \mathbb{1}\{\text{Conglomerate Owner}\}_{nt} \\ &+ \tau_3^{L} \mathbb{1}\{\text{Small Chain Owner}\}_{nt} \\ &+ \tau_4^{L} \{\text{Owner Size}\}_{nt} + \zeta_{nt}^{L} \end{aligned} \tag{11}$$

$$\begin{aligned}\frac{\partial F^N(c_{nt}^N, \zeta_{nt}^N; \tau^N)}{\partial c_{nt}^N} =& \tau_0^N + \tau_1^N c_{nt}^N + \tau_2^N \mathbb{1}\{\text{Conglomerate Owner}\}_{nt} \\ &+ \tau_3^N \mathbb{1}\{\text{Small Chain Owner}\}_{nt} \\ &+ \tau_4^N \{\text{Owner Size}\}_{nt} + \zeta_{nt}^N\end{aligned} \tag{12}$$

The parametrization of the cost functions for providing news content capture two key features motivated by the difference-in-differences results in Section 3. First, it allows for the cost of providing local news coverage to differ from the cost of providing national content. Second, the parametrization allows for cost efficiencies in the production of news by letting the costs of providing local and national content differ by ownership type and size. In fact, prior studies by Dertouzos and Trautman (1990) and Berry and Waldfogel (2010) highlighted the importance of economies of scale in the production of news. Here, negative τ_2, τ_3, or τ_4 estimates would indicate cost efficiencies in producing news content.

4.3 Equilibrium Conditions

This section derives the necessary equilibrium conditions for subscription prices and local and national news content.

Starting at the second stage of the supply-side game, a newspaper owner f chooses subscription prices, p_{nt}, for each of newspaper it owns. Taking the derivative of the second-stage profit function in (8) with respect to the subscription price p_{nt} gives the first-order condition $\partial \pi_{ft}^{\text{II}} / \partial p_{nt}$

$$s_{nt} + \sum_{k \in \mathcal{N}_{ft}} (p_{kt} - mc_{kt}^s) \frac{\partial s_{kt}}{\partial p_{nt}} = 0 \tag{13}$$

The first-order condition in (13) can be expressed in matrix form. Let $s_{ft} = [s_{1t}, \cdots, s_{|\mathcal{N}_{ft}|}]'$ be the vector of market shares for newspaper owner f in year t. Define as $p_{ft} = [p_{1t}, \cdots, p_{|\mathcal{N}_{ft}|}]'$ the vector of annual subscription prices, and $mc_{ft}^s = [mc_{1t}^s, \cdots, mc_{|\mathcal{N}_{ft}|}^s]'$ the vector of marginal costs of circulation. All vectors have dimension $|\mathcal{N}_{ft} \times 1|$. Define Ω_{ft} as a $|\mathcal{N}_{ft}| \times |\mathcal{N}_{ft}|$ matrix of first-order derivatives of market

shares with respect to prices

$$\Omega_{ft} = \begin{bmatrix} \frac{\partial s_{1t}}{\partial p_{1t}} & \cdots & \frac{\partial s_{|\mathcal{N}_{ft}|}}{\partial p_{1t}} \\ \vdots & \ddots & \vdots \\ \frac{\partial s_{1t}}{\partial p_{|\mathcal{N}_{ft}|}} & \cdots & \frac{\partial s_{|\mathcal{N}_{ft}|}}{\partial p_{|\mathcal{N}_{ft}|}} \end{bmatrix} \tag{14}$$

Stacking all $\mathcal{N}_{ft}$ newspapers published by owner f together and rearranging the first order condition yields the optimal price equation

$$p_{ft} = mc_{ft} - \Omega_{ft}^{-1} \cdot s_{ft} \tag{15}$$

Moving to the first-stage game, the necessary optimality conditions for newspaper content are given by differentiating the first-stage profit function in (10) with respect to local and national news content c_{nt}^{L} and c_{nt}^{N}. This yields the following first-order condition for coverage of local politics $\partial \pi_{ft}^{\mathrm{I}} / \partial c_{nt}^{L}$

$$\sum_{k \in \mathcal{N}_{ft}} \left\{ \frac{\partial \pi_{kt}^{\mathrm{II}}}{\partial c_{nt}^{L}} + \sum_{k' \in \mathcal{N}_{g(nt)}} \frac{\partial \pi_{kt}^{\mathrm{II}}}{\partial p_{k't}} \frac{\partial p_{k't}}{\partial c_{nt}^{L}} \right\} - \frac{\partial F_{nt}^{L}}{\partial c_{nt}^{L}} = 0 \tag{16}$$

where $\mathcal{N}_{ft}$ is the set of newspapers owned by n's owner f in year t, and $\mathcal{N}_{g(nt)}$ is the set of competing newspapers in the game that newspaper n belongs to and in year t. Adjustment in news content has a direct effect on the variable profit of newspaper k owned by the same owner as newspaper n, and an indirect impact on the variable profit of newspaper k by affecting prices of all newspapers in the market.

The partial derivatives $\frac{\partial \pi_{kt}^{\mathrm{II}}}{\partial c_{ntL}}$ and $\frac{\partial \pi_{kt}^{\mathrm{II}}}{\partial p_{k't}}$ in (16) are computed by taking derivatives of the second stage profit function in (8). The main computational difficulty arises from $\frac{\partial p_{k't}}{\partial c_{nt}^{L}}$. When choosing news coverage in the first stage of the supply game, news publishers take into account the effect of their content decisions and their rivals' on the second stage pricing decisions. Therefore, the first stage content optimality conditions require knowledge of the impact of news reporting decisions on equilibrium subscription prices. I follow Berto Villas-Boas (2007) and Fan (2013)'s approach in noting that only values of the gradient of equilibrium subscription prices with respect to the endogenous

product characteristics at the observed data points are needed to form (16).[11] To this end, I apply the implicit function theorem by taking the total derivative of the first order condition with respect to prices in (13) to compute $\frac{\partial p_{k't}}{\partial c^L_{nt}}$. Additional computational details are in Appendix B.2.

The first-order condition for national news content, $\partial \pi^{\text{I}}_{ft} / \partial c^N_{nt}$, is similarly defined

$$\sum_{k \in \mathcal{N}_{ft}} \left\{ \frac{\partial \pi^{\text{II}}_{kt}}{\partial c^N_{nt}} + \sum_{k' \in \mathcal{N}_{g(nt)}} \frac{\partial \pi^{\text{II}}_{kt}}{\partial p_{k't}} \frac{\partial p_{k't}}{\partial c^N_{nt}} \right\} - \frac{\partial F^N_{nt}}{\partial c^N_{nt}} = 0 \tag{17}$$

5 Estimation

5.1 Estimation Method

The set of parameters to be estimated, Θ, include the parameters in the newspaper demand function, θ, the marginal cost parameters, γ, and the parameters entering the costs of producing local and national news content, τ^L and τ^N. I estimate demand and supply jointly, adapting the nonlinear GMM procedure of Berry et al. (1995), and compute asymptotic standard errors. This section first presents the estimation strategy and then discusses the identification of the parameters.

Let $z = \{z^d, z^s\}$ be a set of instruments for the endogenous variables in the demand and cost specifications respectively. The GMM estimator is derived from the following

[11] This approach makes the assumption that the optimal price function is smooth with respect to local and national news content. Since this method relies on the observed product characteristics, it requires to rule out corner solutions where the first order condition (13) does not hold. In addition, this approach only works for continuous characteristics. The news content measures used in this paper are continuous.

population moments

$$\begin{cases} \mathbb{E}[z^{d\prime}\xi(\theta_0)] = 0 \\ \mathbb{E}[z^{s\prime}\omega(\theta_0, \gamma_0)] = 0 \\ \mathbb{E}[z^{s\prime}\zeta^L(\theta_0, \gamma_0, \tau_0^L, \tau_0^N)] = 0 \\ \mathbb{E}[z^{s\prime}\zeta^N(\theta_0, \gamma_0, \tau_0^L, \tau_0^N)] = 0 \end{cases} \tag{18}$$

Let $g(\Theta)$ be the stacked vector of the empirical analogues to the above moments. I obtain the parameters by minimizing the GMM criterion

$$\hat{\Theta} = \arg\min g(\Theta)' W g(\Theta) \tag{19}$$

where W is a weighting matrix. I use the standard two-step GMM estimation procedure where in the first step I set $W = (z'z)^{-1}$ and in the second step use the first step estimate to construct an optimal weighting matrix.

The estimation equations are derived from newspaper demand function (4), and the first order conditions with respect to subscription prices in (13) and to local and national news content in (16) and (17). Specifically, I solve for the structural errors as a function of the model parameters and the data. The errors include the unobserved characteristic, ξ_{nmt}, the shock to the marginal cost of circulation, ω_{nt}, and the shocks to the cost of providing news content, ζ_{nt}^L and ζ_{nt}^N.

I obtain the newspaper demand shock, $\xi_{nmt}(\theta)$, by first using a contraction mapping as in Berry (1994) and Berry et al. (1995) to find the mean utility levels, $\delta_{nmt}(\theta)$, that equate predicted market shares in (7), $s_{nmt}(\delta_{mt}, c_t, p_t; \theta)$, to the observed market shares, $s_{nmt} = \sum_{m \in \mathcal{M}_{nt}} q_{nmt}/H_{mt}$, q_{nmt} being the observed quantity of newspaper n in market m and year t.[12] In vector notation, the demand side can be described by the following market share system

$$s_t = s_t(\delta_t, c_t, p_t; \theta) \tag{20}$$

[12]More specifically, I use a nested-fixed point algorithm with a tight convergence criterion (1e−14) to solve for $\xi_{nmt}(\theta)$ and I compute the integral over individual market shares using quadrature.

The structural demand error term is then recovered as a residual from projection of the mean utility levels on observed characteristics

$$\xi_{nmt}(\theta) = \delta_{nmt}(\theta) - c_{nt}\beta_0^c - x_{nt}\beta^x - \alpha p_{nt} - \phi d_{mt} + \rho \text{ Internet}_{mt} + \lambda_t \tag{21}$$

The shock to the marginal cost of circulation, ω_{nt}, is derived from the price optimality condition at the second stage of the supply-side game in (13)

$$\omega_{nt}(\theta, \gamma) = p_{nt} + \Omega_{ft}^{-1} s_{nt} - (\gamma_0 + \gamma_1 x_{nt}) \tag{22}$$

Lastly, the shocks to the costs of providing local and national news content, ζ_{nt}^L and ζ_{nt}^N, are recovered from the news content optimality conditions at the first stage of the supply-side game in (16) and (17) as follows

$$\begin{aligned}\zeta_{nt}^L(\theta, \gamma, \tau^L, \tau^N) = \sum_{k \in \mathcal{N}_{ft}} \left\{ \frac{\partial \pi_{kt}^{\text{II}}}{\partial c_{nt}^L} + \sum_{k' \in \mathcal{N}_{g(nt)}} \frac{\partial \pi_{kt}^{\text{II}}}{\partial p_{k't}} \frac{\partial p_{k't}}{\partial c_{nt}^L} \right\} - \Big(& \tau_0^L + \tau_1^L c_{nt}^L \\ & + \tau_2^L \mathbb{1}\{\text{Conglomerate Owner}\}_{nt} \\ & + \tau_3^L \mathbb{1}\{\text{Small Chain Owner}\}_{nt} \\ & + \tau_4^L \{\text{Owner Size}\}_{nt} \Big)\end{aligned} \tag{23}$$

$$\begin{aligned}\zeta_{nt}^N(\theta, \gamma, \tau^L, \tau^N) = \sum_{k \in \mathcal{N}_{ft}} \left\{ \frac{\partial \pi_{kt}^{\text{II}}}{\partial c_{nt}^N} + \sum_{k' \in \mathcal{N}_{g(nt)}} \frac{\partial \pi_{kt}^{\text{II}}}{\partial p_{k't}} \frac{\partial p_{k't}}{\partial c_{nt}^N} \right\} - \Big(& \tau_0^N + \tau_1^N c_{nt}^N \\ & + \tau_2^N \mathbb{1}\{\text{Conglomerate Owner}\}_{nt} \\ & + \tau_3^N \mathbb{1}\{\text{Small Chain Owner}\}_{nt} \\ & + \tau_4^N \{\text{Owner Size}\}_{nt} \Big)\end{aligned} \tag{24}$$

5.2 Choice of Instruments

Newspaper publishers observe the newspaper- and market-specific tastes, ξ_{nmt}, and the cost shocks, ω_{nt}, ζ_{nt}^L and ζ_{nt}^N, before they make decisions over news coverage and

subscription prices for the newspapers they own. Therefore, the newspaper publisher choices are likely correlated with the unobservable tastes and cost shocks, creating a standard endogeneity problem.

The first set of instruments I use to address the endogeneity of news content and subscription prices consists of average local and national news coverage and average subscription prices of other newspapers owned by the same publisher. These variables are assumed to be uncorrelated with the unobserved local newspaper-market characteristics, ξ_{nmt}, but are valid proxies for the news coverage and subscription prices of a local newspaper. These Hausman-type instruments exploit common cost shocks across a publisher's newspapers for identification. Such instruments have been used in previous studies, such as Nevo (2001) and Crawford et al. (2019). The validity of these instruments relies on the assumption that the unobserved demand shocks, ξ_{nmt}, are not correlated across markets.

The second set of instruments I use is based on the ownership structure of the newspaper industry. More specifically, I use as instruments an indicator for whether a newspaper is owned by a publisher that consolidated, an indicator for whether a newspaper's publisher is a national conglomerate, an indicator for whether a newspaper's publisher is a regional chain, and a newspaper's publisher size. The relevance of these instruments is suggested by the observed changes in local and national news coverage post consolidation of ownership documented in Section 3. The key identifying assumption is that the unobserved local demand shocks, ξ_{nmt}, are uncorrelated with the ownership structure. This assumption is reasonable since the majority of acquisitions and consolidation of newspaper ownership over the last 20 years occurred at the national level and are unlikely to be endogenous to the unobserved local demand conditions. Similar identification arguments have been made by Hastings (2004), Houde (2012) and Miller and Weinberg (2017).

I test for weak instruments in Appendix B.1. Table 8 present the first-stage regressions. The F-test statistics indicate that the instruments are valid at 99 percent significance level.

The demand parameters to be estimated include $\theta = (\beta, \sigma, \alpha, \phi, \rho, \lambda)$ in (4) and (6). The instruments described above provide exogenous variation to identify the effects of local and national political coverage as well as subscription prices, β, σ and α. The time fixed effects in the outside choice, λ_t, are identified from changes in newspaper total circulation over time. The parameter governing internet access in the outside option, ρ, is identified from variation in internet access rates and total market shares across counties and over time. The remaining demand parameters, ϕ are identified from variation in exogenous demand covariates and market shares.

Given identification of the demand system, the optimality condition for prices in (13) allows me to back out the implied marginal costs of subscriptions. The marginal cost parameters, γ, are then identified from changes in the implied marginal costs and observed marginal cost shifters. Similarly, after identification of the marginal costs of circulation, the optimality conditions for local and national content in (16) and (17) allow me to recover the implied costs of providing local and national political news coverage. Variation in observed content cost shifters and implied costs of news coverage identify the parameters entering the cost functions of providing local and national content, τ^L and τ^N.

6 Empirical Results

Tables 4 presents the estimated demand parameters and estimated cost parameters are in Table 5.

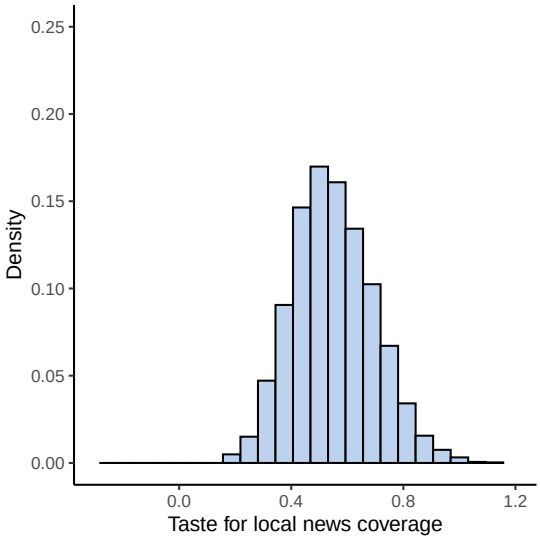
On the demand side, I find substantial heterogeneity in reader preferences for local and national political news coverage. Demographic characteristics are important determinants of preferences for local and national news coverage. The estimates indicate that older readers, more educated readers and readers living in more rural areas tend to prefer more local news. Younger individuals, as well as individuals living in urban areas tend to exhibit higher preferences for national politics.

Table 4: Demand Estimates

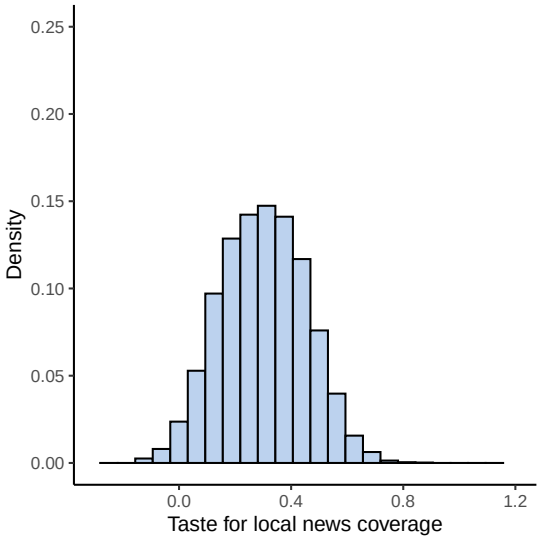
Parameter		Estimate	S.E.
Utility			
Local news coverage (1,000 news articles)	β_0^L	0.482	0.023
Local news coverage, Time trend	β_1^L	-0.011	0.000
Local news coverage, Pct. age > 60	β_2^L	0.210	0.081
Local news coverage, Pct. college education	β_3^L	0.375	0.121
Local news coverage, Pct. urban	β_4^L	-0.203	0.096
Local news coverage, Sigma	σ^L	0.171	0.041
National news coverage (1,000 news articles)	β_0^N	0.023	0.009
National news coverage, Time trend	β_1^L	-0.004	0.035
National news coverage, Pct. age > 60	β_2^N	-0.079	0.024
National news coverage, Pct. college education	β_3^N	-0.193	0.121
National news coverage, Pct. urban	β_4^N	0.540	0.18
National news coverage, Sigma	σ^N	0.102	0.054
Subscription price ($100)	α	-0.449	0.124
Morning edition	β_1^x	0.152	0.021
Number of pages per issue	β_2^x	0.083	0.003
Households (log)	ϕ_1	-1.231	0.019
Pct. age > 60	ϕ_2	2.024	0.256
Pct. college education	ϕ_3	-0.889	0.125
Median income (log)	ϕ_4	-0.317	0.037
Pct. urban	ϕ_5	1.248	0.064
Constant	β_0	15.229	0.625
Outside option			
Pct. internet	ρ	0.467	0.171

Note: This table presents the GMM parameter estimates of the demand model. Asymptotic standard errors are reported.

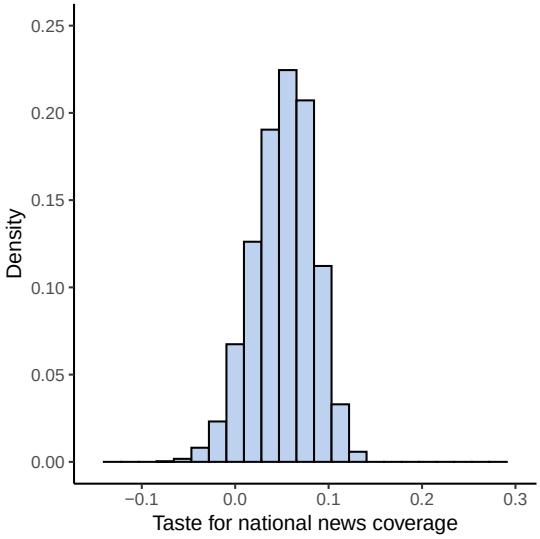
Figure 4: Distribution of Average Tastes for Local and National Politics



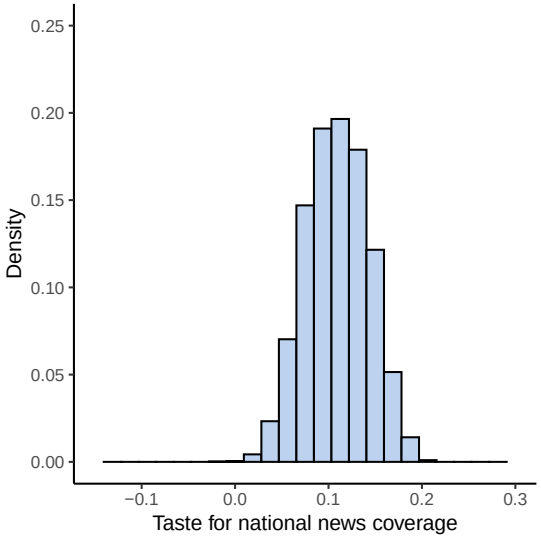
(a) Local Political Coverage, Pre 2010



(b) Local Political Coverage, Post 2010



(c) National Political Coverage, Pre 2010



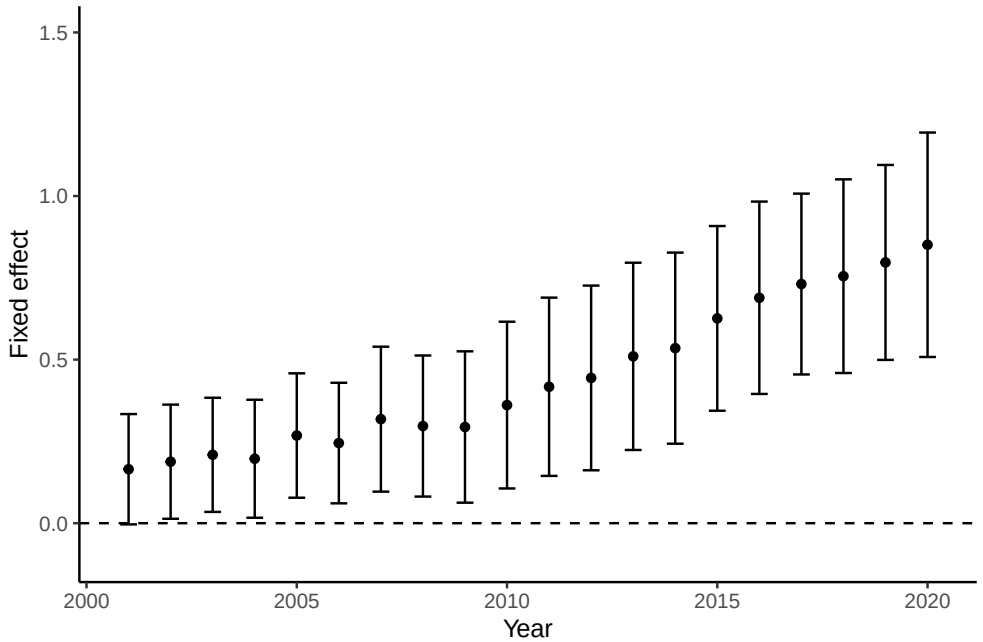
(d) National Political Coverage, Post 2010

Note: The plots present the frequency distribution of the average taste coefficients by market. Panels (a) and (b) show average tastes for local news coverage for pre and post 2010, respectively. Similarly, panels (c) and (d) plot average tastes for national news coverage, pre and post 2010.

Figure 4 plots the distributions of average tastes for local and national content across markets, both for the first and second halves of the sample period. Overall, average tastes for local politics are higher than for national news. In addition, the plot shows that accounting for changes in reader tastes for local politics is clearly important. The time trend in the random coefficient for local news coverage, β_1^L is negative, indicating that preferences for local politics declined over the sample period. At the same time, the non-significant estimate for β_1^N suggests that tastes for national political reporting did not change much over the sample period.

The estimate for ρ is positive, indicating that readers' utility from subscribing to traditional newspapers declines with improved internet access rates. In addition, the estimated year fixed effects in the outside option are positive and increasing, suggesting that readers' valuation for the outside choice improved over time. This consistent with the advent of online news sources over the sample period.

Figure 5: Estimated Year Fixed Effects in the Outside Choice Equation



Note: This plot shows the estimated year fixed effects included in the utility from the outside choice. 95 percent confidence intervals are reported.

Turning to the supply side, cost shifters in the marginal cost of circulation equation have the expected sign. Increasing a local newspaper's frequency of publication increases the marginal cost, which partly reflect costs of printing. In addition, as the average number of pages per issue rises, so does the marginal cost of printing publications.

The estimated cost parameters of providing local political coverage differ from the cost parameters of national political reporting. Allowing for different cost structures was therefore crucial. The constant terms measure the marginal effect of local and national political coverage on the production cost. I find that local news reporting is on average more costly than national news coverage.

Table 5: Supply Estimates

Parameter		Estimate	S.E.
Marginal cost of circulation			
Constant	γ_0	-0.532	0.201
Frequency of publication	γ_1	0.202	0.041
Number of pages per issue	γ_2	0.013	0.004
Slope of the fixed cost of local news coverage			
Constant	τ_0^L	7.376	0.073
Local news coverage	τ_1^L	0.200	0.016
Conglomerate owner	τ_2^L	0.145	0.062
Small chain owner	τ_3^L	-0.089	0.033
Owner size	τ_4^L	-0.020	0.006
Slope of the fixed cost of national news coverage			
Constant	τ_0^N	7.312	0.091
National news coverage	τ_1^N	0.127	0.036
Conglomerate owner	τ_2^N	-0.879	0.093
Small chain owner	τ_3^N	-0.677	0.107
Owner size	τ_4^N	-0.041	0.009

Note: This table presents the GMM parameter estimates of the supply model. Asymptotic standard errors are reported.

The negative τ_3^L parameter in the cost of local news content indicates that there are cost efficiencies in the production of local coverage for small chains compared to independently owned newspapers. This is reasonable since the small newspaper groups in my sample are quite local or regional in nature and can combine local reporting resources.

In contrast, I find that τ_2^L is positive, implying that local content provision by newspapers owned by media conglomerates is more expensive compared to newspapers owned independently or by smaller newspaper groups. Indeed, media conglomerates tend to pursue aggressive cost-cutting methods, laying off local reporters and closing down local newsrooms. In turn, newsrooms find themselves under-resourced, journalists less specialized to a coverage area, and local reporting becomes comparatively more expensive to produce.

Lastly, the negative τ_2^N, τ_3^N and τ_4^N parameters in the fixed cost of providing national political content indicate significant cost efficiencies for both media conglomerates and smaller newspaper chains, consistent with the fact that media chains pool journalistic resources in the production of national news.

7 Decomposing the Decline of Local News Coverage

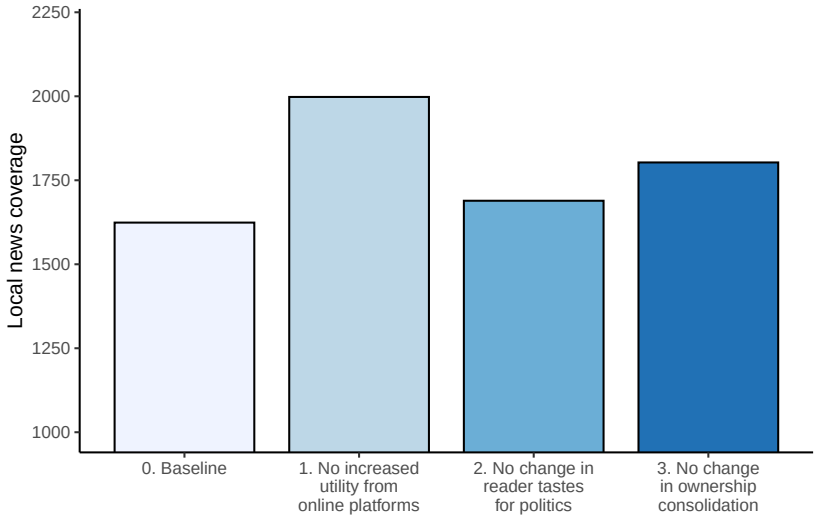
In the model, news publishers' content choices are driven by several forces. On the demand side, readers' utility from subscribing to traditional print newspapers declined over the sample period while demand for alternative online news platforms improved. At the same time, readers' preferences for local political coverage declined over the sample period. Both this factors have contributed the decrease in local news coverage. On the supply side, growing consolidation of newspaper ownership meant that local news coverage became more expensive comparatively to national content for newspapers acquired by media conglomerates, amplifying the declining trend in local reporting. Yet, the magnitude of these three forces is unclear.

I use counterfactual analysis to disentangle the roles of increased competition from online platforms, changes in readers' preferences for local news, and increased ownership consolidation in explaining the changes in local and national news reporting over the past two decades. Specifically, I simulate publishers' equilibrium news content choices in 2020, at baseline and under three counterfactual scenarios that isolate the effect of each channel.

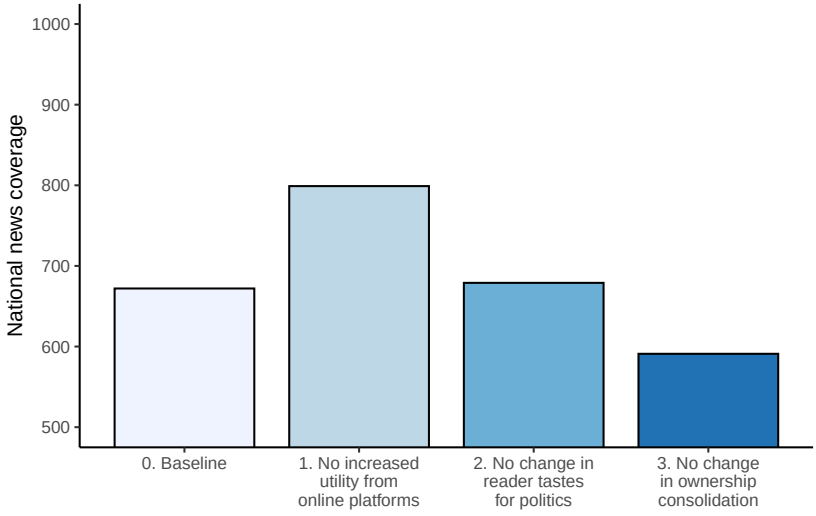
The baseline counterfactual corresponds to the 2020 equilibrium observed in the data. In my first counterfactual, I isolate the effect of increased competition from online platforms on news provision by comparing the baseline counterfactual to a situation where the utility form the outside choice is fixed to its value at the beginning of the sample period. Next, I assume that readers' preferences for local and national news coverage didn't change over last two decades and are equal to their levels in 2000. This counterfactual is used to measure the change in news content induced by evolving reader tastes for local and national politics. Finally, to measure the effect of newspaper consolidation in amplifying the decline of local reporting, I perform a third counterfactual exercise where I assume that the ownership structure reflects ownership at the beginning of the sample period.

Figure 6 shows equilibrium news content choices at baseline and under the three counterfactual scenarios. I find that demand forces have a significant influence on the levels of local and national political coverage. Compared to baseline, removing the effect of growing competition from online sources increases local political news by 23 percent and national news coverage by 19 percent. The effect of ignoring changes in reader preferences for political news is more modest. Relative to baseline, local news reporting increases by 4 percent and national news coverage by 1 percent. Lastly, I find the effect of increased ownership consolidation over the sample period amplifies the influence of demand-side shifts. When the effects of ownership changes over the last two decades are absent, local political coverage increases by 11 percent compared to baseline, while decreasing national coverage by 12 percent.

Figure 6: Decomposing the Changes in Political News Coverage



(a) Local Political Coverage



(b) National Political Coverage

Note: The top panel shows average local political reporting in 2020 over counterfactual simulations at the estimated parameters reported in Tables 4 and 5. Similarly, the bottom panel plots average national news coverage choices. Baseline refers to the simulation of the estimated model. Counterfactual 1 removes the effect of increased competition from online platforms. Counterfactual 2 ignores the effect of changes in reader preferences for local and national politics over the sample period. Counterfactual 3 removes the effect of ownership consolidation.

In sum, counterfactual simulations show that changes in readers' demand for print local newspapers and in preferences for local topics explain about two thirds if the declining trend in local political reporting, while consolidation of newspaper ownership amplified this effect by about 50 percent.

8 The Effect of Further Ownership Consolidation

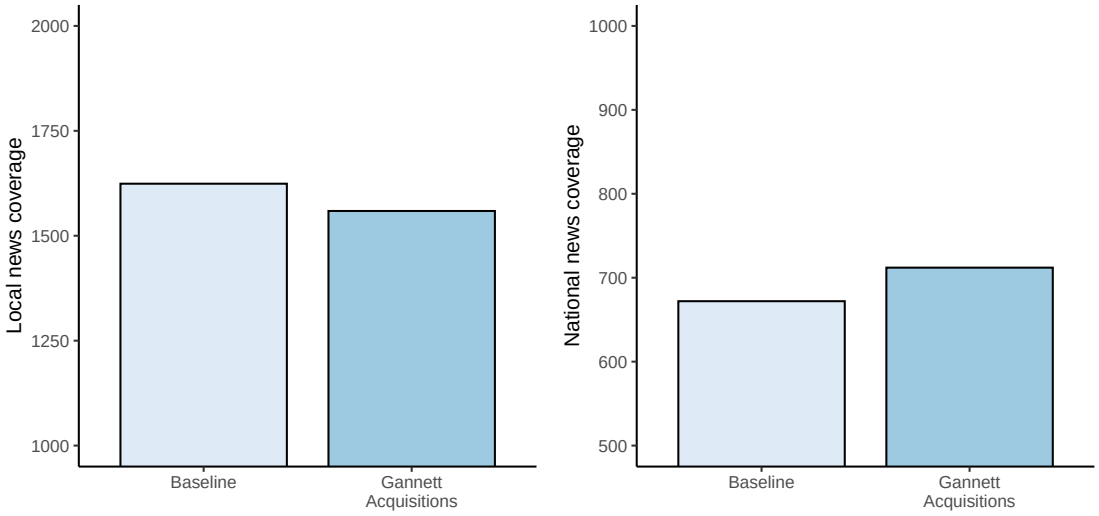
Given the current economic challenges faced by traditional print newspapers, ownership consolidation is likely to pursue. Pundits, policymakers, and regulators are concerned about the survival of local newspapers and local news, and worry that further ownership consolidation may harm content variety and local reporting (Kirchhoff (2009), FCC (2016), Abernathy (2020)).

My results suggest that growing ownership consolidation over the last two decades has had a strong negative impact on local political reporting. To gain more insights, I consider the effect of further hypothetical consolidation. I simulate equilibrium local and national content choices at baseline in 2020 and under a counterfactual scenario where the biggest news conglomerate, Gannett/Gatehouse, acquires all remaining independent newspapers.

As of 2020, fewer than 10 percent of the daily local newspapers in the U.S. were independently owned. In addition, Gannett/Gatehouse was by far the largest owner of daily newspapers. The two chains consolidated in the last quarter of 2019, and as a result, owned more than 20 percent of all local daily newspapers.

Figure 7 shows that post acquisition of the remaining independently owned newspapers by Gannett/Gatehouse, average local political reporting drops by 4 percent, while national coverage of politics increases by 6 percent. These effects are quite important and reflect the fact that the composition of news coverage changes not only for the acquired newspapers, but also for the newspapers that were already part of the Gannett/Gatehouse group.

Figure 7: The Effect of Further Ownership Consolidation



(a) Local Political Coverage

(b) National Political Coverage

Note: The plots report local and national content choices at baseline and at a counterfactual scenario in which the biggest newspaper conglomerate, Gannett, acquires all remaining independent newspapers.

These results speak directly to a broader literature on the influence of media coverage on political information and outcomes. The significant post-consolidation decline in local reporting could be expected to decrease readers' knowledge of the activities of local officials. Existing evidence suggests that, when news coverage is scarcer, citizens are less likely to recall their representative's name, to evaluate their policies, and to vote, and politicians tend to work less for their constituents (Snyder Jr and Strömberg (2010), Hayes and Lawless (2015)).

9 Conclusion

This paper has studied the determinants of news content by U.S. local daily newspapers. I documented a sharp decline in coverage of local politics. Using a difference-in-differences specification, I find that newspapers acquired by media conglomerates tend

to shift content away from local reporting, in favor of national coverage of politics.

I modeled supply and demand in the newspaper industry with endogenous local and national news content by building on prior work by Fan (2013). The demand for local daily newspapers is a differentiated product discrete choice problem featuring heterogeneous reader preferences over local and national news content. To reflect the increased media choice offered by online sources over the sample period, the outside option can change over time and by markets' internet access rates. The supply side is a static two stage game in which publishers choose content for the newspapers they own in the first stage and set prices in the second stage. Newspapers' cost structures are allowed to change pre- and post-consolidation so that newspaper groups can exploit cost efficiencies in the production of news.

I estimated the model using a novel panel of newspapers' local and national coverage of politics, characteristics, and ownership information. I then used the estimated model to quantify the effect of increased demand for online media platforms, changes in reader tastes for local content, or increased ownership consolidation in driving the decline of local news coverage. I find that changes in reader preferences for local news and demand for print newspapers explain about two third of this trend, while consolidation of newspapers amplified these effects by 50 percent. Lastly, I considered a counterfactual experiment in which Gannett, the biggest newspaper conglomerate, acquires all the remaining independent newspapers and find that local news coverage drops by 4 percent.

Taken together, my results suggest that increased competition from online news platforms as well as growing ownership consolidation had a substantial negative impact on local political reporting over the last two decades. My findings have potentially important political economic implications and inform ongoing policy and regulation debates.

There are several important extensions to my analysis. So far, this paper has abstracted from the advertising side of newspapers' operations due to data limitation. However, newspapers derive a significant share of their revenues from selling advertising space to advertisers. I have already collected information on advertising prices

from the Editor and Publisher Year Books, but data on advertising quantities, available from the Standard Rate & Data Service directories, will require additional digitization work. Appendix C outlines how to add advertising decisions into the model. Second, I assumed that market structure is exogenous. However, if news publisher were in fact targeting newspapers in markets with high demand, then my results would underestimate the demand multiplier effect of consolidation on local reporting. Studying the expansion strategies of large media conglomerates by endogenizing acquisitions in a dynamic oligopoly model of the newspaper industry could be a fruitful avenue for future research.

Lastly, my research provides ample scope for future research. While this paper documents a strong effect of ownership consolidation on the composition of news coverage, there are still several questions that remain unanswered. First, it is an open question whether the increasing trend in media ownership consolidation and the accompanied declined in local political reporting has impacted citizen engagement and knowledge, as well as accountability of local public officials. A thorough analysis would shed light on these effects. Second, I find significant cost savings achieved through ownership consolidation. Future research could quantify the extent to which consolidation of local newspapers slows down the rate of newspaper closures and helps provide news coverage to communities that would otherwise live in news deserts.

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A Additional Tables and Figures

Table 6: NewsBank Sample

	All		NewsBank	
	Mean	St. Dev.	Mean	St. Dev.
Circulation	28,280	56,710	36,455	65,857
Annual subscription price	124.59	51.52	136.31	52.28
Frequency of publication	6.26	0.79	6.37	0.77
Morning edition	0.56	0.50	0.67	0.47
Average number of pages per issue	28.78	18.77	33.19	21.64
N	28,675		13,389	

Note: Observations are at the newspaper-year level and cover the time period 2000 to 2020. The left side presents summary statistics for all newspapers present in the E&P Year Books. The right side presents summary statistics for newspapers present in the NewsBank sample. Overall, larger newspapers are more represented in the NewsBank sample.

Table 7: Top 10 Conglomerate Owners

Parent Company (2000)	Number of Newspapers	Total Circulation	National Market Share
Gannett Company, Inc.	72	4,254,486	0.09
Knight Ridder, Inc.	32	3,804,818	0.08
MediaNews Group, Inc.	49	1,958,892	0.04
Thomson Newspapers	44	936,039	0.02
Community Newspaper Holdings, Inc. (CNHI)	82	777,816	0.02
Morris Publishing Group	32	695,743	0.01
Lee Enterprises, Inc.	27	670,813	0.01
Ogden Newspapers, Inc.	35	490,490	0.01
Liberty Publishing Group	62	385,040	0.01
Paxton Media Group	29	328,267	0.01

Parent Company (2020)	Number of Newspapers	Total Circulation	National Market Share
Gannett / GateHouse Media, Inc.	270	4,657,970	0.22
Digital First Media	53	1,464,650	0.07
McClatchy Co.	30	1,027,176	0.05
Lee Enterprises, Inc.	48	752,528	0.04
BH Media Group, Inc.	35	684,531	0.03
Community Newspaper Holdings, Inc. (CNHI)	72	589,491	0.03
Ogden Newspapers, Inc.	47	495,541	0.02
Adams Publishing Group	34	317,067	0.01
Paxton Media Group	40	312,188	0.01
Boone Newspapers, Inc.	28	256,047	0.01

Note: The top panel shows the largest 10 newspaper conglomerates in 2000 while the bottom panel displays the 10 biggest conglomerates in 2020.

Figure 8: A Page of the 2013 Editor and Publisher Year Book

SVP, Admin ..... Gwen Murakami
VP, Communications ..... Nancy Sullivan
EVP Advertising ..... Michael Tannourji
Adv. Dir., Classified, Real Estate ..... Leslie Lindemann
Adv. Dir., Retail ..... Shannon Hanes
Adv. Dir., Retail ..... Jeffrey Young
SVP, Digital ..... Emily Smith
SVP, Advertising and Targeted Media Pompe Scott
VP, Film Advertising ..... Berns Francie
VP, Advertising & Events ..... Burns David
VP, Advertiser Marketing and Events .... Mike Kechichian
VP, Revenue Development . Collins Jennifer
President, COO ..... Kathy Thomson
Editor ..... Davan Maharaj
Managing Editor, Online ..... Orr Jimmy
Managing Editor ..... Marc Duvoisin
Assistant Managing Editor ... Corrigan John
Deputy Managing Editor Colin Crawford
Assistant Managing Editor ..... Joe Eckdahl
Assistant Managing Editor . Michael Whitley
Editor of the Editorial Pages Nicholas Goldberg
Editor, Op-Ed and Sunday Opinion Sue Horton
Assistant Managing Editor Henry Fuhrmann
Assistant Managing Editor ..... Alice Short
Editor at Large ..... Jim Newton
Assistant Managing Editor ..... Ashley Dunn
Vice President, Legal and Deputy General Counsel Karlene Goller
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Equipment DISPLAY: Ad make-up applications — Managing Editor/ALS, NW/Admarc 7.0, Engage/Dataflow, Microsoft/Windows 98; Layout Software — ME!/ALS.; Press Drives — 16; Folders — 32; Pasters — Pasters
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Circulation: 4,379; 4,496(sat)
Last Audit: September 30, 2005
Subscription Price: 9.00/mo; 66.00/yr.
Advertising: Open inch rate $14.00
News services: AP.
Politics: Independent. **Established:** 1892
Days Not Published: New Year's Day; Memorial Day; July 4; Labor Day; Thanksgiving; Christmas.
Special Editions: Madera Business Extravaganza (Apr); Back-to-School (Aug); Last Minute Gift Guide (Dec); FFA Tab (Feb); Brides Guide (Jan); Rural Routes/Salute to Ag Broad Sheet (Jul); Father's Day (Jun); Pride in Madera County (Mar); Mother's Day (May); Holiday Gift Guid
Special Weekly Sections: Financial (Fri); Financial (Mon); Religion (Sat); Financial (Thur); People (Tues); People (Wed).
Magazines: USA WEEKEND Magazine (Sat).
Adv. Dir. ..... Ellen Beach
Ed. ..... Charles P. Doud
Sports Ed. ..... Paul Stanford
Dir., Opns. ..... Leonard Soliz
Market Information: TMC.
Mechanical available: Offset; Black and 3 ROP colors; insert accepted - 3 x 5; page cutoffs - 22 3/4.
Mechanical Specifications: Type page 13 x 21; E - 6 cols, 2 1/16, 1/8 between; A - 6 cols, 2 1/16, 1/8 between; C - 9 cols, 1 3/8, 1/16 between.
Commodity Consumption: Avg. Page Number Per Issue - Daily 20; Avg. Page Number Per Issue - Plates Used 10510; widths 25; Newsprint Used - Metric Tons 300; Printing Ink Used - Black 10623; Printing Ink Used - Color 1843; Printing Ink Used - Pages Printed 10510.
Equipment EDITORIAL: Front-end Software — Baseview/NewsEdit Pro.; Editorial Hardware — APP/Mac; Editorial Printers — APP/Mac CLASSIFIED: Front-end Software — Baseview.; Classified Hardware — COM, APP/Mac; Classified Printers — APP/Mac DISPLAY: Ad make-up applications — Multi-Ad/Creator; Layout Software — APP/Mac.; Display Hardware — APP/Mac; Display Printers — APP/Mac PRODUCTION: Pagination Software — QPS/QuarkXPress 4.0.; Production Equipment — Nuarc; Folders — 2; Bundle tying machines — 1-Bu/16 2X, 1/MLN. BUSINESS COMPUTERS: Business Software — CJ; Business Hardware — IBM/Sys 34, HP/Sys, IBM

MANTECA

MANTECA BULLETIN

531 E Yosemite Ave, Manteca, Calif., 95336-5806; gen tel (209) 249-3500; adv tel (209) 249-3500; ed tel (209) 249-3500; gen fax (209) 249-3559; adv fax (209) 249-3551; ed fax (209) 249-3559; adv e-mail ads@mantecabulletin.com; ed e-mail news@mantecabulletin.com; web site www.mantecabulletin.com
Group: Morris Multimedia, Inc.
Morris Newspaper Corp.
Published: Mon, Tues, Wed, Thur, Fri, Sat, Sun
Weekday Frequency: m
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Circulation: 5,350; 5,350(sat); 5,350(sun)
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Subscription Price: 86.20/yr.
Advertising: $14.33/inch Open rate
Insert rate: 63/m Open rate
News services: AP; MNCC
Politics: 1908
Days Not Published: Christmas.
Own facility?: Y
Special Editions: HS Football Preview (Aug); Pumpkin Fair (Oct); Sidewalk Fair (Apr)
Special Weekly Sections: BulletinExtra On-the-Road (Fridays); Home Guide (Saturday);
Magazines: American Profile (Weekly); Relish (monthly); Spry (monthly)
Profile: Manteca Daily Newspaper serving South San Joaquin Co. California
Editorial Page Ed. ..... Dennis Wyatt
Composing & Commercial Print Mgr. ..... Kay Garcia
Group Publisher ..... Dave Winegarden
Advertising Director ..... Chuck Higgs
Circulation Director ..... Drew Savage
Business Manager ..... Tamara Foreman
Pressroom Manager ..... Howard Santiago
City Editor ..... Rose Albano-Risso
Sports Editor ..... Jonamar Jacinto
I.T. Manager ..... Adam Wright
Pub. ..... Paul Mahony
Adv. Mgr. ..... Teri Garcia
Circ. Mgr. ..... Amy Hitchcock
Prodn. Mgr. ..... Steve Curtis
Market Information: TMC.
Mechanical available: Offset; Black and 3 ROP colors; insert accepted - all; page cutoffs - 22.
Mechanical Specifications: Type page 12 x 21; E - 6 cols, 1 5/8, 1/8 between; A - 6 cols, 1 7/8, 1/8 between; C - 10 cols, 7/8, 1/8 between.
Commodity Consumption: Avg. Page Number Per Issue - Daily 20; Avg. Page Number Per Issue - Plates Used 9000; Avg. Page Number Per Issue - Sunday 26; widths 25; Newsprint Used - Metric Tons 575; Printing Ink Used - Black 15500; Printing Ink Used - Color 3300.
Equipment EDITORIAL: Front-end Software — Baseview/NewsEdit Pro.; Editorial Hardware — 10-APP/Mac G3; Editorial Printers — HP/LaserJet 4MV CLASSIFIED: Front-end Software — Baseview.; Classified Hardware — 6-APP/Mac G3; Classified Printers — APP/Mac Pro 630 DISPLAY: Ad make-up applications — QPS/QuarkXPress, Baseview, Adobe/Photoshop; Layout Software — 6-APP/Mac G4.; Display Printers — HP/8000N PRODUCTION: Pagination Software — QPS/QuarkXPress.; Production Equipment — HP/8000N, Pre Press/Panther, Konica/EV Jetsetter 9100; Cameras — 1-B; Scanners — 4-HP, 2-Umax PRESSROOM: Line 1 — 13-G/Community; Line 2 — 3; Line 3 — 1; Press Drives — Fin/75 h.p., Twin/150 hp; Folders — 1-G/SC. MAILROOM: Counter stackers — 1-BG/Count-O-Veyor; Bundle tying machines — 3/Bu; Addressing machine — 1-/Am. BUSINESS COMPUTERS: Business Software — MAS 90; Business Hardware — 4-Pentium/network with Microsoft Windows 2000
Zip Codes served: 95336, 95337, 95330, 95366, 95231, 95206
Delivery method: Mail, Newsstand, Private Carrier, Racks

MARYSVILLE

APPEAL-DEMOCRAT

1530 Ellis Lake Dr, Marysville, Calif., 95901-4269; gen tel (530) 741-2345; adv tel (530) 741-2345; ed tel (530) 741-2400; gen fax (530) 741-1061; adv fax (530) 741-2086; ed fax (530) 741-0140; gen e-mail appeal@syix.com; web site www.appeal-democrat.com
Group: 2100 Trust
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Weekday Frequency: m
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Circulation: 13,968; 13,968(sat); 14,764(sun)
Last Audit: CAC September 30, 2012
Subscription Price: 33.00/mo; 88.75/yr.
Advertising: Open inch rate $27.80
News services: AP, MCT, TMS.
Politics: Libertarian. **Established:** 1853
Special Editions: Pets (Apr); Medical Directory (Dec); New Neighbors (Feb); Brides (Jan); Y-S Fair (Jul); Graduation (Jun); Home Improvement (Mar); Spirit of Freedom (Nov); Home Improvement (Sept).
Special Weekly Sections: Life (S); Real Estate (Sat); Food (Wed).
Magazines: USA WEEKEND Magazine (S); Weekender (Thur).
Broadcast Affiliations: WLNE New Bedford, MA; WRGB Schenectady, NY; KTVL Medford, OR; WLNE Providence, RI; WTVC Chattanooga, TN; KFDM Beaumont, TX; KFDM Port Arthur, TX.
Profile: Daily newspaper serving the northern California counties of Yuba, Sutter, and Colusa.
Pub. ..... Dave Schmall
Asst. to Pub. ..... Melony Sanchez
Bus. Mgr. ..... Mike Burman
Adv. Dir. ..... Debbie Baggett
Adv. Mgr., Classified ..... Nancy Brown
Adv. Mgr., Nat'l ..... Stephanie Azevedo
Circ. Dir. ..... Joe Kraus
Entertainment Ed. ..... Josh Kendrix
Features Ed. ..... Susan Benitez
News Ed. ..... Todd Hansen
Photo Ed. ..... Chris Kauffman
Sports Ed. ..... Bryan Demain
Prodn. Foreman, Mailroom Cindy Alexander
Prodn. Foreman, Pressroom .. Engel Avalos
Market Information: TMC.
Mechanical available: Offset; Black and 3 ROP colors; insert accepted - sample pouch, poly bag; page cutoffs - 22 3/4.
Mechanical Specifications: Type page 11 5/8 x 21 1/2; E - 6 cols, 1 13/16, 1/8 between; A - 6 cols, 1 13/16, 1/8 between; C - 9 cols, 1 3/16, 1/8 between.
Commodity Consumption: Avg. Page Number Per Issue - Daily 34; Avg. Page Number Per Issue - Plates Used 16000; Avg. Page Number Per Issue - Saturday 34; Avg. Page Number Per Issue - Sunday 48; widths 25; Newsprint Used - Metric Tons 1507; Printing Ink Used - Black 27270; Printi
Equipment EDITORIAL: Front-end Software — Dewar/Sys IV, Baseview.; Editorial Hardware — APP/Mac, Baseview; Editorial Equipment — APP/Power Mac, HP/8000; Editorial Printers — Pre Press/Panther Pro, Varityper CLASSIFIED: Front-end Software — Baseview.; Classified Hardware — APP/Mac, Baseview; Layout Software — MEI.; Display Hardware — APP/Mac PRODUCTION: Pagination Software — Baseview.; Production Equipment — Caere/OmniPage Pro 7.0.1, Pre Press/Panther Pro 36 Imagesetter; Cameras — C/Spartan III; Scanners — Nikon/Coolscan 35mm PRESSROOM: Line 1 — 8-G/Urbanite (1 color hump) 1986; Pasters — 7 MAILROOM: Counter stackers — 1-BG/Count-O-Veyor 108; Inserters and stuffers — 2-MM/227; Bundle tying machines — 1-MLN/ML2EE, 1-MLN/Spirit; Wrapping singles — 1-Id; Mailroom control system — 1/HL. BUSINESS COMPUTERS: Business Software — Great Plains; Business Hardware — PC

MENLO PARK

PALO ALTO DAILY NEWS

255 Constitution Dr, Menlo Park, Calif., 94025-1108, San Mateo; gen tel (650) 391-1000; adv tel (650) 391-1028; ed tel (650) 391-1337; adv fax (650) 391-1011; gen e-mail letters@bayareanewsgroup.com; adv e-mail adsales@dailynewsgroup.com; ed e-mail news@paloaltodailynews.com; web site www.paloaltodailynews.com
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Advertising: Open inch rate $17; $17(Sat)
Insert rate: Single sheet: $35/m
News services: AP, NYT, Bay City News.
Politics: Independent.
Special Editions: Back-to-School (Aug); Holiday Gift Guide (Dec); Bride (Jan); Reader's Choice Awards (Jun); Home Improvement (Monthly); Holiday Gift Guide (Nov); Bride (Sept).
Special Weekly Sections: Autos (Fri); Computing (Mon); Autos (S); Autos (Sat); Autos (Thur); Fashion (Tues); Travel (Wed).
Adv. Mgr., Classified ..... Michael Relayo
Exec. Ed. ..... Mario Dianda
Mng. Ed. ..... Jamie Casini
City Ed. ..... Jason Green
Asst. City Ed. ..... Victor Gonzales
Copydesk Chief ..... Kevin Kelly
Sports Ed. ..... Greg Frazier
Opns. Mgr. ..... Paulo Pereira
Prodn./Creative Servs. Mgr ... Christine Eng
Market Information: TMC.
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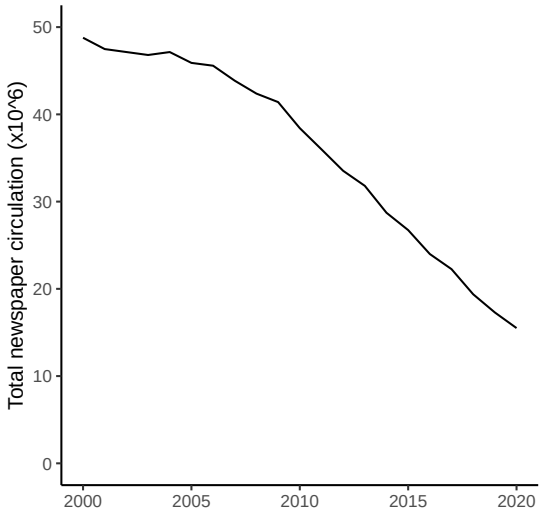
Mechanical Specifications: Type page 13 x 21.
Commodity Consumption: Avg. Page Number Per Issue - Daily 52; Avg. Page Number Per Issue - Saturday 52.
Equipment EDITORIAL: Front-end Software — Baseview/NewsEdit Pro, QPS/QuarkXPress 3.31.; Editorial Hardware — 10-APP/Mac G4; Editorial Printers — HP/5, NewGen/Imager Plus 12xf CLASSIFIED: Front-end Software — Baseview/Class Manager Plus.; Classified Hardware — 2-APP/Power Mac 7200-90; Classified Printers — HP/LaserJet 5mp DISPLAY: Ad make-up applications — QPS/QuarkXPress 3.31.; Display Hardware — 6-APP/Power Mac 7500/100; Display Printers — NewGen/Imager Plus 12xf PRODUCTION: Pagination Software — QPS/QuarkXPress 3.31.; Production Equipment — Lf/AP Leaf Picture Desk; Scanners — HP/ScanJet 3C PRESSROOM: Line 1 — 5-KP/Web Leader single width; Folders — 5; Business Hardware — APP/Mac G4
Zip Codes served: 94070, 94061, 94063, 94025, 94027, 94062, 94028, 94022, 94305, 94301, 94303, 94306, 94043, 94041, 94040

MERCED

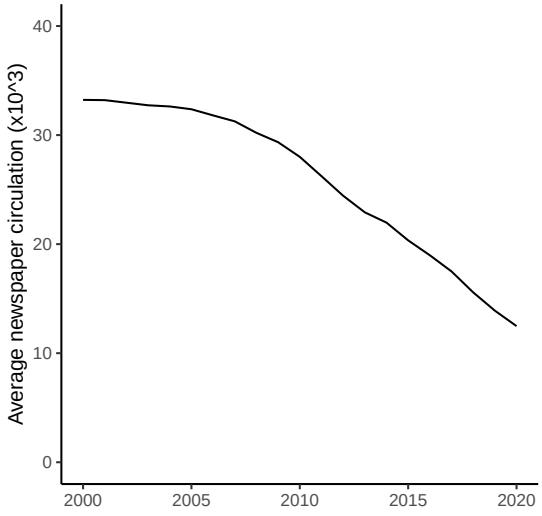
MERCED SUN-STAR

3033 G St, Merced, Calif., 95340-2108; gen tel (209) 722-1511; adv tel (209)

Figure 9: Newspaper Circulation



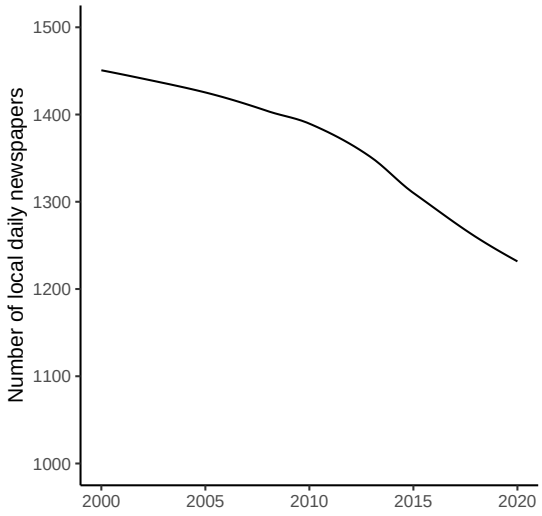
(a) Total Circulation



(b) Average Circulation

Note: Panel (a) plots total local daily newspaper circulation in the U.S. between 2000 and 2020. Panel (b) plots average newspaper circulation.

Figure 10: Number of U.S. Local Daily Newspapers



Note: The figure plots the number of local daily newspapers circulating in the U.S. between 2000 and 2020.

B Estimation Details

B.1 Instruments

The excluded instruments used to estimate demand are the following:

- Number of newspapers in the market
- Number of newspapers owned by the same publisher
- Post-consolidation dummy
- Whether the publisher is a national conglomerate
- Whether the publisher is a regional chain
- Average amount of local news coverage by other newspapers owned by the same publisher
- Average amount of national news coverage by other newspapers owned by the same publisher
- Average subscription prices of other newspapers owned by the same publisher

Table 8 reports the first-stage regression results.

Table 8: First-stage Regressions

	Dependent variable:		
	Subscription price ($100)	Local news coverage (1,000 news articles)	National news coverage (1,000 news articles)
Excluded instruments			
Number of newspapers in the market	−0.043***	0.000	−0.074***
	(0.007)	(0.028)	(0.016)
Post-consolidation	0.071***	−0.043	−0.038*
	(0.009)	(0.037)	(0.021)
Owner size	−0.000***	0.002***	0.001***
	(0.000)	(0.001)	(0.000)
National conglomerate owner	−0.023*	−0.527***	0.102***
	(0.013)	(0.051)	(0.029)
Regional chain owner	−0.056***	0.228***	0.026
	(0.013)	(0.055)	(0.031)
Average local news coverage by other	−0.036***	0.328***	−0.018**
newspapers owned by the same publisher	(0.004)	(0.016)	(0.009)
Average national news coverage by other	0.035***	0.057*	0.373***
newspapers owned by the same publisher	(0.008)	(0.032)	(0.018)
Average subscription prices of other	0.338***	−0.894***	−0.345***
newspapers owned by the same publisher	(0.015)	(0.059)	(0.033)
Included instruments			
Morning edition	0.030	−0.653***	−0.047
	(0.026)	(0.105)	(0.059)
Average number of pages	0.004***	0.045***	0.025***
	(0.0003)	(0.001)	(0.001)
Households (log)	0.060***	0.399***	0.089***
	(0.006)	(0.026)	(0.015)
Pct. age > 60	1.402***	5.053***	0.523**
	(0.097)	(0.394)	(0.222)
Pct. college education	0.279***	−0.320	0.224*
	(0.051)	(0.209)	(0.118)
Median income (log)	0.068***	−0.409***	−0.185***
	(0.013)	(0.052)	(0.029)
Pct. urban	0.380***	0.983***	0.191***
	(0.026)	(0.106)	(0.060)
Pct. internet access	0.220***	0.958***	0.357**
	(0.067)	(0.274)	(0.155)
Constant	−1.299***	0.573	1.087***
	(0.141)	(0.576)	(0.325)
Year FE	Y	Y	Y
Observations	10,668	10,668	10,668
Adjusted R^2	0.432	0.573	0.431
Residual Std. Error (df = 10630)	0.375	1.528	0.862
F Statistic (df = 37; 10630)	220.254***	387.723***	219.262***

Note:: *p<0.1; **p<0.05; ***p<0.01

B.2 Computation Details

The main computational difficulty lies in computing $\frac{\partial p_{k't}}{\partial c_{nt}}$. When choosing news coverage in the first stage of the supply game, newspaper publishers take into account the effect of their content decisions on second stage pricing decisions. Therefore, the first stage optimality condition requires knowledge of the impact of news content decisions on equilibrium prices. Berto Villas-Boas (2007) and Fan (2013) note that only values of the gradient of equilibrium prices with respect to news content at the data points are needed to formulate (**??**) for the observed news content measures. To this end, I apply the implicit function theorem by taking the total derivative of the first order condition with respect to prices, (13), to compute $\frac{\partial p_{k't}}{\partial c_{nt}}$

$$\frac{\partial p_{k't}}{\partial c_{nt}} = -\frac{\left[\frac{\partial s_{k't}}{\partial c_{k't}} + \sum_{l \in \mathcal{N}_{ft}} (p_{lt} - mc^s_{lt}) \frac{\partial^2 s_{lt}}{\partial c_{nt} \partial p_{k't}}\right]}{\left[2 \frac{\partial s_{k't}}{\partial p_{k't}} + \sum_{l \in \mathcal{N}_{ft}} (p_{lt} - mc^s_{lt}) \frac{\partial^2 s_{lt}}{\partial p^2_{k't}}\right]} \tag{25}$$

This requires knowledge of the following first and second partial derivatives

$$\frac{\partial s_{nt}}{\partial p_{kt}} = \begin{cases} \int \alpha \, s_{int} \, (1 - s_{int}) \, dF(D, \nu) & \text{if } n = k \\ -\int \alpha \, s_{int} \, s_{ikt} \, dF(D, \nu) & \text{if } n \neq k \end{cases} \tag{26}$$

$$\frac{\partial s_{nt}}{\partial c_{kt}} = \begin{cases} \int \beta^c_i \, s_{int} \, (1 - s_{int}) \, dF(D, \nu) & \text{if } n = k \\ -\int \beta^c_i \, s_{int} \, s_{ikt} \, dF(D, \nu) & \text{if } n \neq k \end{cases} \tag{27}$$

$$\frac{\partial^2 s_{nt}}{\partial p_{kt} \, \partial p_{lt}} = \begin{cases} \int \alpha^2 \, s_{int} \, (1 - s_{int}) \, (1 - 2 s_{int}) \, dF(D, \nu) & \text{if } n = k = l \\ -\int \alpha^2 \, s_{int} \, s_{ilt} \, (1 - 2 s_{int}) \, dF(D, \nu) & \text{if } n = k \text{ and } n \neq l \\ -\int \alpha^2 \, s_{int} \, s_{ikt} \, (1 - 2 s_{int}) \, dF(D, \nu) & \text{if } n \neq k \text{ and } n = l \\ -\int \alpha^2 \, s_{int} \, s_{ikt} \, (1 - 2 s_{ikt}) \, dF(D, \nu) & \text{if } n \neq k \text{ and } k = l \\ \int 2 \, \alpha \, s_{int} \, s_{ikt} \, s_{ilt} \, dF(D, \nu) & \text{if } n \neq k \text{ and } n \neq l \text{ and } k \neq l \end{cases} \tag{28}$$

$$\frac{\partial^2 s_{nt}}{\partial c_{kt}\,\partial p_{lt}} = \begin{cases} \int \alpha\,\beta_i^c\,s_{int}\,(1-s_{int})\,(1-2s_{int})\,dF(D,\nu) & \text{if } n=k=l \\ -\int \alpha\,\beta_i^c\,s_{int}\,s_{ilt}\,(1-2s_{int})\,dF(D,\nu) & \text{if } n=k \text{ and } n\neq l \\ -\int \alpha\,\beta_i^c\,s_{int}\,s_{ikt}\,(1-2s_{int})\,dF(D,\nu) & \text{if } n\neq k \text{ and } n=l \\ -\int \alpha\,\beta_i^c\,s_{int}\,s_{ikt}\,(1-2s_{ikt})\,dF(D,\nu) & \text{if } n\neq k \text{ and } k=l \\ \int 2\,\alpha\,\beta_i^c\,s_{int}\,s_{ikt}\,s_{ilt}\,dF(D,\nu) & \text{if } n\neq k \text{ and } n\neq l \text{ and } k\neq l \end{cases} \tag{29}$$

C Adding Advertising to the Model

Local newspapers derive revenues from readers and advertisers. So far, this paper has abstracted from the advertising side of newspapers' operations due to data limitation. I have collected data on advertising prices from the Editor and Publisher Year Books, but data on advertising quantities, available in the Standard Rate & Data Service directories, will require additional digitization work.

C.1 Modified Model

Demand side. Following Rysman (2004) and Fan (2013), advertising demand depends on a newspaper's readership, and I assume that readers are indifferent to advertising. The demand for advertising space by advertisers is modeled as a function of a newspaper's advertising rate, total circulation, and number of households in the circulation area

$$a(r_{jt}, q_{jt}, H_{jt}) = e^{\lambda_0} r_{jt}^{\lambda_1} q_{jt}^{\lambda_2} H_{jt}^{\lambda_3} \tag{30}$$

The advertising demand estimation equation is then

$$\log(a_{nt}) = \lambda_0 + \lambda_1 \log(r_{jt}) + \lambda_2 \log(q_{jt}) + \lambda_3 \log(H_{jt}) + \iota_{nt} \tag{31}$$

where ι_{nt} is an i.i.d mean zero error.

Supply side. Newspaper publishers now gain revenues from both selling subscriptions to readers and selling advertising space to advertisers. The supply side is a two stage game in which newspaper owners choose news content in the first stage, and choose subscription and advertising prices in the second stage. Second stage profits become then the sum of circulation and advertising profits. A newspaper owner now chooses subscription and advertising prices to maximize

$$\sum_{n \in \mathcal{N}_{ft}} \pi_{nt}^{\text{II}} = \sum_{n \in \mathcal{N}_{ft}} \{(p_{nt} - mc_{nt}^{s}(x_{nt}; \gamma)) \cdot H_{nt} \cdot s_{nt}(\delta_t, c_t, p_t; \theta) + (r_{nt} - mc_{nt}^{a}) \cdot a_{nt}(r_{nt}, s_{nt}, H_{nt})\} \tag{32}$$

where mc_{nt}^{a} is the marginal cost of advertising, taking the following form:

$$mc_{nt}^{a} = \phi + \eta_{nt} \tag{33}$$

C.2 Equilibrium conditions

Incorporating advertising to the model adds an equilibrium condition for advertising rates, and modifies the equilibrium condition for subscription prices. Starting by taking the derivative of the second-stage profit function with respect to the advertising rate r_{nt} gives the first-order condition $\partial \pi_{ft}^{\text{II}} / \partial r_{nt}$

$$a_{nt} + (r_{nt} - mc_{nt}^{a}) \frac{\partial a_{nt}}{\partial r_{nt}} = 0 \tag{34}$$

Now, taking the derivative of the second-stage profit function with respect to the subscription price p_{nt} gives the first-order condition $\partial \pi_{ft}^{\text{II}} / \partial p_{nt}$

$$s_{nt} + \sum_{k \in \mathcal{N}_{ft}} (p_{kt} - mc_{kt}^{s}) \frac{\partial s_{kt}}{\partial p_{nt}} + \sum_{k \in \mathcal{N}_{ft}} (r_{kt} - mc_{kt}^{a}) \frac{\partial a_{kt}}{\partial s_{kt}} \frac{\partial s_{kt}}{\partial p_{nt}} = 0 \tag{35}$$

The first two terms of equation (35) are part of the usual first-order condition with respect to price, and the last term captures the effect of prices and market shares on advertising profits.

The first-order condition in (35) can be expressed in matrix form. Let $s_{ft} = [s_{1t}, \cdots, s_{|\mathcal{N}_{ft}|}]'$ be the vector of market shares for newspaper owner f in year t, $p_{ft} = [p_{1t}, \cdots, p_{|\mathcal{N}_{ft}|}]'$ the vector of prices, $mc_{ft}^{s} = [mc_{1t}^{s}, \cdots, mc_{|\mathcal{N}_{ft}|}^{s}]'$ the vector of marginal costs of circulation, and $mc_{ft}^{a} = [mc_{1t}^{a}, \cdots, mc_{|\mathcal{N}_{ft}|}^{a}]'$ the vector of marginal costs of advertising. Each have dimension $|\mathcal{N}_{ft} \times 1|$. Define Ω_{ft} as a $|\mathcal{N}_{ft}| \times |\mathcal{N}_{ft}|$ matrix of first-order derivatives of market shares with respect to prices

$$\Omega_{ft} = \begin{bmatrix} \frac{\partial s_{1t}}{\partial p_{1t}} & \cdots & \frac{\partial s_{|\mathcal{N}_{ft}|}}{\partial p_{1t}} \\ \vdots & \ddots & \vdots \\ \frac{\partial s_{1t}}{\partial p_{|\mathcal{N}_{ft}|}} & \cdots & \frac{\partial s_{|\mathcal{N}_{ft}|}}{\partial p_{|\mathcal{N}_{ft}|}} \end{bmatrix} \tag{36}$$

Define Φ_{ft} as a vector of dimension $|\mathcal{N}_{ft}| \times 1$ capturing the effect of prices and market shares on advertising profits,

$$\Phi_{ft} = \left[\frac{\partial a_{1t}}{\partial s_{1t}} (r_{1t} - mc_{1t}^{a}), \cdots, \frac{\partial a_{|\mathcal{N}_{ft}|}}{\partial s_{|\mathcal{N}_{ft}|}} (r_{|\mathcal{N}_{ft}|} - mc_{|\mathcal{N}_{ft}|}^{a}) \right]' \tag{37}$$

Stacking all $\mathcal{N}_{ft}$ newspapers published by owner f together and rearranging the first order condition yields the optimal price equation

$$p_{ft} = mc_{ft} - \Omega_{ft}^{-1} \cdot s_{ft} + \Phi_{ft} \tag{38}$$

Moving to the first-stage game, the necessary optimality conditions for newspaper content are unchanged,

$$\begin{aligned} \sum_{k \in \mathcal{N}_{ft}} \left\{ \frac{\partial \pi_{kt}^{\text{II}}}{\partial c_{nt}^{L}} + \sum_{k' \in \mathcal{N}_{g(nt)}} \frac{\partial \pi_{kt}^{\text{II}}}{\partial p_{k't}} \frac{\partial p_{k't}}{\partial c_{nt}^{L}} \right\} - \frac{\partial F_{nt}^{L}}{\partial c_{nt}^{L}} = 0 \\ \sum_{k \in \mathcal{N}_{ft}} \left\{ \frac{\partial \pi_{kt}^{\text{II}}}{\partial c_{nt}^{N}} + \sum_{k' \in \mathcal{N}_{g(nt)}} \frac{\partial \pi_{kt}^{\text{II}}}{\partial p_{k't}} \frac{\partial p_{k't}}{\partial c_{nt}^{N}} \right\} - \frac{\partial F_{nt}^{N}}{\partial c_{nt}^{N}} = 0 \end{aligned} \tag{39}$$

where π_{kt}^{II} is the second stage profit function that incorporates revenues from advertising.

C.3 Estimation

The set of parameters to be estimated, Θ, now include the parameters in the newspaper demand function, θ, the parameters in the advertising demand function, λ, and the cost parameters γ, ϕ, τ. The GMM estimator is derived from the following population moments:

$$\begin{cases} \mathbb{E}[Z^{d\prime} \xi(\theta_0)] = 0 \\ \mathbb{E}[Z^{d\prime} \iota(\theta_0, \lambda_0)] = 0 \\ \mathbb{E}[Z^{s\prime} \omega(\theta_0, \lambda_0, \gamma_0)] = 0 \\ \mathbb{E}[Z^{s\prime} \eta(\theta_0, \lambda_0, \gamma_0)] = 0 \\ \mathbb{E}[Z^{s\prime} \zeta^{L}(\theta_0, \lambda_0, \gamma_0, \tau_0^{L}, \tau_0^{N})] = 0 \\ \mathbb{E}[Z^{s\prime} \zeta^{N}(\theta_0, \lambda_0, \gamma_0, \tau_0^{L}, \tau_0^{N})] = 0 \end{cases} \tag{40}$$

The advertising demand shock is given by:

$$\iota_{nt}(\theta, \lambda) = \log(a_{nt}) - \lambda_0 - \lambda_1 \log(r_{nt}) - \lambda_2 \log(s_{nt}) - \lambda_3 \log(H_{nt}) \tag{41}$$

The shock to the marginal cost of circulation and marginal cost of advertising are recovered from the optimality conditions at the second stage of the supply-side game:

$$\begin{aligned}\omega_{nt}(\theta,\lambda,\gamma) &= p_{nt} + \Omega_{ft}^{-1} s_{nt} - \Phi_{ft} - (\gamma_0 + \gamma_1 x_{nt}) \\ \eta_{nt}(\theta,\lambda,\gamma) &= r_{nt} - \frac{\partial a_{nt}}{\partial r_{nt}} a_{nt} - \phi\end{aligned} \tag{42}$$

Finally, the demand error term and the shocks to the cost of local and national news content are recovered as in Section 5.