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Newspapers in Times of Low Advertising Revenues[†]

By CHARLES ANGELUCCI AND JULIA CAGÉ*

We model the consequences on newspapers' content and prices of a reduction in advertising revenues. Newspapers choose the size of their newsroom, and readers are heterogeneous in their ideal amount of journalistic-intensive content. We show that a reduction in advertising revenues lowers newspapers' incentives to produce journalistic-intensive content. We also build a unique dataset on French newspapers between 1960 and 1974 and perform a difference-in-differences analysis exploiting the introduction of advertising on television, which affected national newspapers more severely than local ones. We find robust evidence of a decrease in the amount of journalistic-intensive content produced and the subscription price. (JEL L11, L82, M37)

As legacy newspaper companies have steadily decreased their employment of journalists in recent years, there is growing concern about the industry's ability to produce high-quality information in the face of smaller newsrooms, fewer investigative reporters, and increased reliance on wire services (see, e.g., Henry 2007, Starkman 2014, Hamilton 2016).

In the United States, for example, the average number of journalists per newspaper decreased sharply from 39 in 2001 to 23.5 in 2015.¹ Meanwhile, US newspaper advertising revenues have shrunk from nearly \$50 billion in 2000 to less than \$20 billion today, and the advertising share in total revenues has declined from 82 percent to 65 percent.² Of course, with the rise of the Internet, these trends—illustrated

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¹The total number of journalists has also decreased due to the exit of many publications. Unfortunately, more recent data are unavailable since the decision in 2016 by the American Society of News Editors to no longer collect information on the number of journalists employed.

²Total revenues have declined by 50 percent since 2000, driven both by the decrease in advertising revenues and fall in the revenues from sales. Figure C1 in the online Appendix represents the evolution of newspaper advertising revenues in the United States over the same period, as a share of GDP.

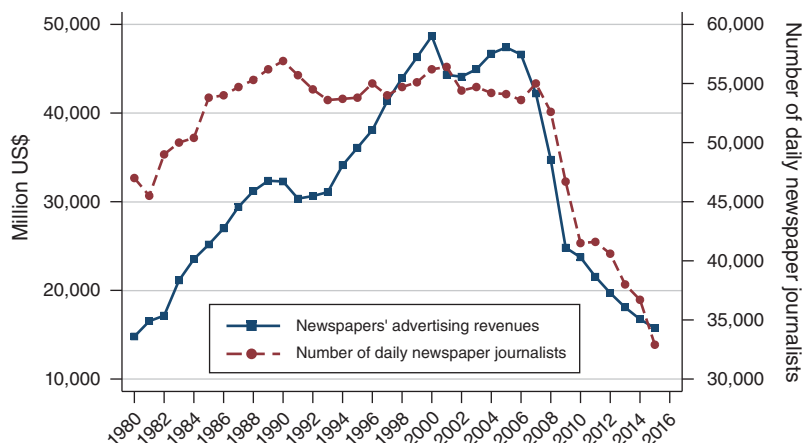


FIGURE 1. NEWSPAPER ADVERTISING REVENUES (IN DOLLARS) AND NUMBER OF JOURNALISTS IN THE UNITED STATES, 1980–2015

Notes: This figure represents the evolution of newspaper advertising revenues in dollars (blue square, left axis) and of the number of daily newspaper journalists (red dots, right axis) in the United States between 1980 and 2015. Data on newspaper revenues are from the Newspaper Association of America (NAA). Data on the number of journalists are from the American Society of News Editors.

in Figure 1—have transpired amidst a backdrop of rapid technological change in the ways journalists and individuals produce and consume news.³

Yet while there is broad agreement that the newspaper industry is in a state of economic turmoil, the precise causes remain contested. For instance, it has been argued that the Internet decreased newspapers' advertising revenues, which may directly have caused journalist jobs to dry up. But a third factor, such as changing consumer preferences, may be responsible for driving both trends. Similarly, the Internet may have enhanced journalists' productivity, rendering fewer of them necessary to produce content, while at the same time lowering advertisers' willingness to pay for readers' attention (e.g., because of the rise of alternative advertising platforms such as search engines and social media, or greater consumer switching behavior online⁴). Or, perhaps, the main factor driving down both advertising revenues and the size of newsrooms was the surge in competition made possible by the Internet. All of these hypotheses are plausible, and they are neither exhaustive nor mutually exclusive.

In this paper, we shed light on this debate by analyzing the relationship between advertising revenues and newspapers' choices regarding the size of their newsroom, the quantity of news to produce, and their pricing strategies. Specifically, we investigate the consequences of a decline in advertisers' willingness to pay for readers' attention triggered by the arrival of an alternative advertising platform, which does

³E.g., according to new findings by Boczkowski, Mitchelstein, and Matassi (2017), young users mainly consume news on social media "incidentally": rather than engaging with the news content, they no longer differentiate it from the rest of the social and entertainment information.

⁴See, e.g., Athey, Calvano, and Gans (2013).

not produce journalistic content, but allows the targeting of individuals for advertising purposes (e.g., a search engine).

Inspired by the literature on two-sided markets, we build a model in which a monopoly newspaper chooses not only the prices it charges to readers and advertisers, but also the size of its newsroom. The novelty of our approach lies in our treatment of the newspaper's content: we let readers be heterogeneous in the relative amount of journalistic-intensive content they prefer (some readers prefer more international coverage, others more "soft" news), and also assume that producing more journalistic-intensive content increases costs (because it requires a larger newsroom).^{5,6} This framework generates new insights regarding the relationship between advertising revenues, the number of journalists, and the composition of readership. In particular, it predicts that a drop in advertising revenues may cause a decline in the amount of journalistic-intensive content produced, a decrease in reader prices, and a readjustment toward a less affluent readership.

We test the empirical predictions of the model using a rich new dataset on French daily newspapers and French television built from historical records. This dataset contains annual data on local and national newspapers between 1960 and 1974, as well as detailed information on television content. In 1967, the French government announced it would relax long-standing regulations that prohibited television advertising. We provide evidence that this reform can be plausibly interpreted as an exogenous and negative shock to the advertising side of the newspaper industry.

Our empirical analysis takes advantage of two historical facts. First, the policy change allowed for only a few minutes of advertising per day. Second, although the advertising revenues raised by the broadcasting agency were significant, they did not lead to an adjustment in the quality of television content around 1967. Rather, the reform aimed both at keeping the public broadcasting agency financially afloat and at introducing a new channel a few years later. To substantiate this claim, we present evidence on television set ownership, the size of the television broadcasting agency's newsroom, the content of programming, and the number and quality of television transmitters. Taken together, these two facts suggest it is likely that the introduction of television advertising constituted a direct shock to the advertising side of the newspaper industry and only an indirect shock to the reader side. Because television advertising did not directly affect newspapers' marginal costs or journalists' productivity, our empirical setting constitutes a unique opportunity to isolate the consequences of a decrease in newspapers' advertising revenues on their choices regarding the size of their newsroom, the amount of information to produce, and the prices they charge to both sides of the market. To the best of our knowledge, this paper is the first to use this "quasi-natural" experiment.⁷

⁵In the Appendix, we present a simplified duopoly version of the model.

⁶Formally, we model the newspaper's content as both a "horizontal" attribute (in the sense that readers are heterogeneous in their ideal content) and a "vertical" attribute (in the sense that producing more journalistic-intensive content is more costly). In the online Appendix, we construct an alternative model in which journalistic content is a pure vertical attribute, that is, all readers are better off when the journalistic content increases.

⁷Relatedly, Seamans and Zhu (2014) exploits an empirical setting (the entry of Craigslist) that enables them to isolate the consequences of a negative shock to newspapers' advertising revenues on the latter's pricing and content.

A key identifying assumption in our analysis is that the negative shock on advertising revenues affected national daily newspapers more severely than local daily newspapers. We provide evidence to support this assumption by studying the actual content of advertisements broadcast on television and published in newspapers. National newspapers rely to a greater extent on advertisements for brands, whose owners may also wish to advertise on television. By contrast, advertisements in local newspapers tend to feature classified ads or promote local establishments. Moreover, national ads provide a larger fraction of revenue for national newspapers than for local ones. We thus use national newspapers as our treatment group and local newspapers as our control group.

The empirical analysis employs a difference-in-differences design to compare the change in advertising revenues of national daily newspapers to the change in advertising revenues of local daily newspapers over the same period. We find the introduction of advertising on television led to a 24 percent decrease in the advertising revenues of national newspapers compared to those of local newspapers, and that national newspapers lowered their advertising price by 14 to 40 percent (depending on the advertising price measure we use) relative to local newspapers. We next show the drop in advertising revenues propagated to the reader-side of the newspaper market. The number of journalists employed by national newspapers decreased by 21 percent compared to that of local newspapers, but the amount of space dedicated to news (any content other than advertising)—the so-called “newshole”—remained unchanged. These two findings suggest that—relative to local newspapers—national newspapers reacted to the drop in advertising revenues by producing less journalistic-intensive content. To the extent that the size of the newsroom is a good proxy for news quality (see, e.g., Hamilton 2006; Berry and Waldfogel 2010; Fan 2013; Cagé 2017; Cagé, Hervé, and Viaud 2017), our results highlight a positive relationship between advertising revenues and quality of information. Also, we study the front page content of a subsample of newspapers and find suggestive evidence that national newspapers decreased their provision of hard news following the introduction of television advertising.

We also show that national newspapers decreased their subscription price by 11 percent compared to local newspapers (but not their newsstand price, which remained stable). Overall, the decrease in the subscription price increased the share of subscribers by 23 percent and left the total number of daily units sold unchanged.⁸ Finally, we study the composition of readership on a subsample of newspapers, and provide suggestive evidence that national newspapers’ readership became less educated and less affluent following the decrease in subscription prices and change in content.

We interpret these results in light of our model’s predictions. In the theoretical setting, a newspaper can increase its readership not only by lowering its price, but also by hiring additional journalists. The latter raises the demand from readers

⁸The absence of change in the total number of daily units sold may in part be due to the adoption of a more subscriber-based readership, which mechanically raises this reported number. By the same logic, the actual number of distinct daily readers may have decreased in case subscribers are less likely to read an issue delivered to their doorstep compared to occasional readers who make newsstand purchases.

because a more journalistic-intensive content attracts readers who are relatively less price-sensitive. When advertisers' willingness to pay for readers' attention declines, newspapers have lower incentives to attract a large readership and they thus decrease the size of the newsroom in order to save on costs. The consequent reduction in journalistic content, in turn, leads to a more price-elastic demand from readers, which pushes the subscription price downwards.⁹

In an extension, we let the newspaper sell both subscriptions and individual issues. We show the newspaper has incentives to sell subscriptions in order to engage in second-degree price discrimination. The model predicts that a decline in advertising revenues increases the extent of price discrimination, measured by the difference between the newsstand/unit price and the average subscription price. This result may rationalize our empirical finding whereby national newspapers decreased their subscription price without modifying their newsstand price, relative to local newspapers.¹⁰

Our findings have implications for the modern media industry and inform ongoing debates about the quality of twenty-first-century journalism. In particular, our analysis highlights that a decrease in advertisers' willingness to pay for readers' attention—whatever its causes—may reduce a media company's incentives to invest in news quality. If advertising revenues continue to decline in the Internet era, as many observers deem likely, our model suggests the quality of information *at the media outlet level* will decrease as well.¹¹ While these predictions may be concerning, we advise caution in drawing strong welfare implications. Indeed, many factors that tend to decrease advertising revenues, such as digitization, changes in reader habits, or enhanced journalists' productivity, also tend to reduce the media industry's barriers to entry.

Literature Review.—Our analysis builds on the theoretical literature on two-sided markets (Caillaud and Jullien 2001, 2003; Rochet and Tirole 2003, 2006; Armstrong 2006; Weyl 2010). A strand of this literature has modeled media markets to analyze the relationship between advertising revenues and the extent of “horizontal” differentiation in the market (e.g., ideological or content diversity) or audience targeting (Gabszewicz, Laussel, and Sonnac 2001, 2004; Gal-Or and Dukes 2003; Strömberg 2004; Anderson and Coate 2005; Armstrong and Wright 2007; Peitz and Valletti 2008; Crampes, Haritchabalet, and Jullien 2009; Gal-Or, Tansev Geylani, and Yildirim 2012). Another strand of the literature investigates the relationship

⁹Note that the decrease in the subscription price occurs despite the “waterbed effect.” The waterbed effect embodies the two-sided market phenomenon mentioned by Rysman (2009) whereby changes in fundamentals (in our case, a decrease in marginal advertisers' willingness to pay) that lead prices to decrease on one side of the market often lead prices to increase on the other side of the market. See also Godes, Ofek, and Sarvary (2009); Hagiu (2009); and Seamans and Zhu (2014). This phenomenon is related to the “see-saw effect” also specific to two-sided markets (see, e.g., Peitz and Valletti 2008, Anderson and Peitz 2015).

¹⁰Anecdotal evidence suggests that the difference between the newsstand/unit price and the average subscription price (the “price gap”) has increased in recent years. Although straightforward changes in marginal costs and preferences (readers' or advertisers') could, in principle, explain this trend, our rationale points to a causal relationship between advertising revenues and the scope for price discrimination.

¹¹Athey, Calvano, and Gans (2013) explore the extent to which the changes in readers' habits triggered by the Internet explain the recent collapse in advertising revenues. Similarly, Gentzkow (2014) investigates how the Internet has reduced the advertising revenues of news outlets.

between media's quality choices and their reliance on advertising revenues. In these models, quality is a "vertical" attribute (see, e.g., Spence 1975): all readers agree on what constitutes an improvement in content. In this vein, Armstrong (2005) builds a duopoly model of the TV industry to investigate the level of quality provided under two alternative funding mechanisms (advertising-only revenues versus both advertising and subscriptions revenues).¹²

In our benchmark model, the newspaper chooses the quantity of journalistic-intensive content to produce. Journalistic content combines features of both horizontal and vertical attributes: readers are heterogeneous in the amount of journalistic-intensive content they prefer, and producing more journalistic content raises the newspaper's costs (e.g., because it requires a larger newsroom). In the online Appendix, we provide an alternative model in which the newspaper chooses the quality of its content and formulates predictions regarding the relationship between quality and advertising. These predictions are consistent with those of the benchmark model.

A recent strand of literature studies the relationship between media bias and advertising revenues. In these models, readers dislike media bias, and a reduction in bias can thus be interpreted as an increase in quality (e.g., Gentzkow, Glaeser, and Goldin 2006). In Ellman and Germano (2009), for instance, increases in advertising revenues intensify newspaper competition for readers, thereby increasing accurate reporting. In Petrova (2012), increases in advertising revenues can either increase or decrease media bias depending on market conditions and characteristics of interest groups.

Our paper is also related to the empirical literature on two-sided markets. For instance, Rysman (2004) analyzes the market for yellow pages and Jin and Rysman (2015) studies US sports card conventions. Using data from the German magazine industry, Kaiser and Wright (2006) and Kaiser and Song (2009) find evidence of network effects, and Song (2015) shows readers are charged below marginal cost.¹³ Argentesi and Filistrucchi (2007) assesses the extent of market power in the Italian national newspaper industry. Using data on the Canadian newspaper industry, Chandra and Collard-Wexler (2009) finds greater market concentration does not imply higher reader or advertising prices. Fan (2013) structurally estimates a model of competition between newspapers using US data and finds that greater market concentration increases subscription prices. Seamans and Zhu (2014) analyzes the impact of the entry of Craigslist on local US newspapers, and finds that newspapers reacted by increasing their subscription price (as predicted by the standard waterbed effect), decreasing their classified ad rates, and decreasing their advertising rate (due to lower circulation). Similarly to ours, their empirical setting allows them to study the consequences of a negative shock that affects one side of a multi-sided market.¹⁴ By contrast, we find newspapers react to the introduction of advertising on French

¹² Interestingly, Armstrong (2005) argues that relaxing existing caps on the number of advertising minutes per day may lead to higher quality. According to his logic, such a policy would give TV channels higher incentives to attract readers with high-quality programs.

¹³ Song (2015) also finds that greater market concentration has an ambiguous impact on prices.

¹⁴ Also exploiting Craigslist's entry, Kroft and Pope (2014) shows that print newspapers react by decreasing their quantity of advertising.

television by decreasing their subscription prices, a finding seemingly contradictory with the “waterbed effect.”¹⁵ However, we also find newspapers react by lowering their quality, which we argue can rationalize a decrease in subscription prices.¹⁶ Indeed, in our model, subscription prices can either increase or decrease depending on the extent to which readers are sensitive to quality. This result is consistent with new evidence by Shiller, Waldfogel, and Ryan (2017) who show that the use of ad blocking leads to a decrease in websites’ quality.

Finally, our paper is a contribution to the empirical literature that uses historical data to study the newspaper industry and its impact on society. Gentzkow, Glaeser, and Goldin (2006) show that the increase in the size of the newspaper market occurring between 1870 and 1920 increased newspaper competition and generally led to better information at the outlet level. Further, Petrova (2011) studies the US newspaper market between 1880 and 1885 to show that the then increasing advertising market promoted editorial independence from political influences. Using data on US daily newspapers from 1869 to 2004, Gentzkow, Shapiro, and Sinkinson (2011) finds the entry of the first newspaper in a county has a positive effect on political participation. Using French data, Cagé (2017) obtains a negative effect of competition (the entry of the second or third newspaper in the market) on political participation, due to a decrease in the quality of news. Further, exploiting data on the US newspaper industry from the early twentieth century, Gentzkow, Shapiro, and Sinkinson (2014) estimates a model of demand, entry, and choice of ideology, in which newspapers compete to attract readers and advertisers. They show that newspapers differentiate themselves through ideology, and that readers prefer news that are congruent with their own opinions.

The remainder of the paper is organized as follows. Section I develops a two-sided model of the newspaper industry. Section II introduces the new dataset we built for this study and provides descriptive statistics. In Section III, we discuss the historical context of the introduction of advertising on French television, and provide anecdotal evidence regarding its impact on the newspaper industry. In Section IV, we estimate the relationship between newspapers’ reliance on advertising revenues and their pricing and quality choices using a difference-in-differences analysis based on the introduction of advertising on French television. In Section V, we interpret and discuss our results, and provide various robustness checks. Section VI concludes.

I. Theory Section

We suppose a monopoly newspaper, a mass 1 of readers, and a mass 1 of advertisers exist.¹⁷ The advertisers’ willingness to pay for an advertisement in the newspaper increases with the size of the readership. We assume readers are indifferent

¹⁵Filistrucchi, Luini, and Mangani (2012) studies the consequences on private television channels of the 2009 partial ban on advertising on French public television.

¹⁶Sun and Zhu (2013) analyzes the relationship between the quality of blogs and advertising concerns. They find bloggers exert more effort on content when motivated by advertising revenues.

¹⁷In the Appendix, we present a simple duopoly version of the model.

regarding the quantity of advertising in the newspaper.¹⁸ The newspaper chooses not only the price p^R charged to readers and the price p^A charged to advertisers, but also its content $q \in [0, 1]$, where q can be interpreted as the share of original, investigative journalism versus commodity or plain vanilla news, or the share of hard news versus soft news. Producing higher content q requires hiring more journalists and thus increases costs (see e.g., Jones 2011, Hamilton 2016). In the model, there thus exists a one-to-one relationship between size of the newsroom and choice of content.¹⁹

Although presumably a higher q has positive spillover effects on society—for instance, because investigative journalism leads to improved political accountability (Starkman 2014, Hamilton 2016)—the choice whether to model a newspaper’s share of hard news as a “horizontal” or a “vertical” attribute is not obvious. In our model, readers are heterogeneous in their *ideal* content. Some readers are deterred from buying a newspaper that covers too few international stories, while others prefer more entertaining news. At the same time, however, we suppose that producing a higher q raises the newspaper’s costs (because it requires a larger newsroom). In the online Appendix, we provide an alternative setting in which q is a pure vertical attribute (i.e., quality), and show that our main predictions hold.

Finally, we also assume that readers with a stronger taste for journalistic-intensive content exhibit a higher willingness to pay; for instance, because interest in international or financial news tends to be positively correlated with education and income (see, e.g., Pew Research Center 2012, for empirical support). An implication of this assumption will be that the price-elasticity of readers’ demand is decreasing with q .

A. Setup

Readers.—The payoff to reader i from purchasing the newspaper whose content is q is $U_i = \epsilon + x_i - \gamma|q - x_i| - p^R$, where x_i determines both reader i ’s ideal content and her highest potential willingness to pay $\epsilon + x_i$, that is, her willingness to pay when q exactly coincides with her most preferred content. For simplicity, we assume x_i is independently and uniformly distributed on $[0, 1]$ across readers. The dual role played by x_i in readers’ payoff function is not innocuous: it implies that readers with a higher taste for journalistic-intensive content also exhibit a higher willingness to pay. The parameter $\epsilon > 0$ denotes readers’ content-independent taste for the newspaper and $\gamma > 0$ captures readers’ sensitivity to the distance between q and x_i . We refer to γ as the readers’ sensitivity to q . We assume readers have a common outside option equal to zero.

¹⁸We ignore externalities from advertisers to readers to focus squarely on the role played by the newspaper’s choice of content. Assuming readers care about advertisements complicates the analysis and may generate a multiplicity of equilibria. On this issue, see the discussions and techniques in Caillaud and Jullien (2003), Armstrong (2006), Weyl (2010), Filistrucchi and Klein (2013), and White and Weyl (2016).

¹⁹We emphasize the relationship between the size of the newsroom (an input) and the produced content (an output) because measuring quality, or distinguishing hard from soft news, is an inherently subjective and contentious empirical exercise. In the empirical section, we thus use the number of journalists as a proxy for q .

Advertisers.—The payoff to advertiser j from purchasing an ad is $V_j = \alpha d^R - p^A$, where d^R represents the fraction of readers who make a purchase (see below). The parameter $\alpha > 0$ affects the advertisers' willingness to pay for readers' attention. Advertisers are heterogeneous in their outside option: each advertiser j has an outside option v_j uniformly and independently distributed on $[0, 1]$. Notice we assume advertisers are indifferent about the composition of readership; they only care about the number of readers.

The parameter α allows us to carry out comparative statics related to the newspaper's reliance on advertising revenues. In the spirit of our empirical setting, a decrease in α can represent the arrival of a new advertising platform that does not affect readers' willingness-to-pay for the newspaper directly because it does not produce journalistic content.²⁰

Newspaper.—The newspaper incurs a fixed cost equal to $\frac{1}{2}q^2$. The newspaper also incurs a marginal cost $c^R = 0$ to serve readers and a marginal cost $c^A = 0$ to serve advertisers. The newspaper chooses the reader price p^R , the advertising price p^A , and the content q to maximize profits:

$$(1) \quad \Pi(p^R, p^A, q) = p^R d^R(p^R, q) + p^A d^A(p^R, p^A, q) - \frac{1}{2}q^2,$$

where $d^R(p^R, q)$ and $d^A(p^R, p^A, q)$ represent the demand from readers and the demand from advertisers, respectively.

Assumptions.—To ensure that the reader price p^R is nonnegative and that the profit function (1) is strictly concave in (p^R, p^A, q) , we assume

$$(2) \quad \gamma > \max \left[\frac{1}{4} \left(2 + \alpha^2 + \sqrt{20 + 4\alpha^2 + \alpha^4} \right), \frac{1}{2} \left(\alpha^2 + \sqrt{4 + \alpha^4} \right) \right].$$

Notice (2) implies $\gamma > 1$. Moreover, to ensure neither side of the market is covered we impose $\epsilon \leq \frac{2\gamma^2 - 2 - \gamma(2 + \alpha^2)}{1 + 3\gamma}$, where the right-hand side is positive given inequality (2).²¹ To focus on the case that generates the richest set of predictions, we suppose $\alpha < \sqrt{2}$. The case in which $\alpha \geq \sqrt{2}$ is almost identical and available upon request.²²

²⁰One could also model a change in the advertisers' willingness to pay for newspaper readers through a change in their outside option. This alternative approach yields qualitatively identical insights, but complicates expressions.

²¹Formally, this inequality will imply that, at the optimum, there are some readers who do not make a purchase because they find q to be too high and others that do not make a purchase because they find q to be too low.

²²If $\alpha \geq \sqrt{2}$, one of our comparative statics result changes. Specifically, when $\alpha \geq \sqrt{2}$, $\frac{\partial}{\partial \alpha} p^R < 0$ always. Intuitively, this occurs because a higher α makes advertising revenues larger and thus the "waterbed" effect stronger. By contrast, when $\alpha < \sqrt{2}$, a change in α may either increase or decrease p^R depending on the value γ takes (see Proposition 1 below).

B. The Newspaper's Problem

Demand from Readers.—There exist two kinds of readers indifferent whether to purchase the newspaper. The marginal reader to the right of q , denoted \tilde{x}_r , is found by rearranging

$$(3) \quad \epsilon + \tilde{x}_r - \gamma(\tilde{x}_r - q) - p^R = 0,$$

which yields $\tilde{x}_r = \frac{\epsilon - p^R + \gamma q}{\gamma - 1}$. Notice \tilde{x}_r shifts to the left as p^R increases and to the right as q increases. Similarly, the marginal reader to the left of q , denoted \tilde{x}_l , is found by rearranging

$$(4) \quad \epsilon + \tilde{x}_l - \gamma(q - \tilde{x}_l) - p^R = 0,$$

which yields $\tilde{x}_l = \frac{p^R - \epsilon + \gamma q}{\gamma + 1}$. Notice \tilde{x}_l shifts to the right as either p^R or q increase.

The demand from readers is thus equal to

$$(5) \quad d^R(p^R, q) = \tilde{x}_r - \tilde{x}_l = \hat{\gamma}(\epsilon + q - p^R),$$

where $\hat{\gamma} = \frac{2\gamma}{\gamma^2 - 1}$. The demand is increasing in q and decreasing in p^R and the sensitivity parameter γ . All else equal, choosing a higher q increases the overall demand from readers because readers whose ideal content is close to one exhibit a higher willingness to pay. In other words, the demand from readers becomes less price-elastic as q increases. The latter effect is stronger the lower γ is, because the sensitivity of the average marginal reader $\frac{1}{2}(\tilde{x}_l + \tilde{x}_r)$ to changes in q is decreasing in γ .

Demand from Advertisers.—Advertiser j purchases an advertisement if and only if $V_j = \alpha\hat{\gamma}(\epsilon + q - p^R) - p^A \geq v_j$. It follows, $d^A(p^R, p^A, q) = \alpha\hat{\gamma}(\epsilon + q - p^R) - p^A$. The demand for advertisements is increasing in d^R and α , and decreasing in p^A . Because the demand from readers $d^R(p^R, q)$ is increasing in q , choosing a higher q also raises the demand for advertisements.

To summarize, the newspaper chooses p^R , p^A , and q to maximize its profits:

$$(6) \quad \Pi(p^R, p^A, q) = p^R\hat{\gamma}(\epsilon + q - p^R) + p^A(\alpha\hat{\gamma}(\epsilon + q - p^R) - p^A) - \frac{1}{2}q^2.$$

The associated system of first-order conditions is given by

$$(7) \quad \frac{\partial}{\partial p^R}\Pi(p^R, p^A, q) = 0 \Leftrightarrow 2p^R = \epsilon + q - \alpha p^A,$$

$$(8) \quad \frac{\partial}{\partial p^A}\Pi(p^R, p^A, q) = 0 \Leftrightarrow 2p^A = \alpha\hat{\gamma}(\epsilon + q - p^R),$$

$$(9) \quad \frac{\partial}{\partial q}\Pi(p^R, p^A, q) = 0 \Leftrightarrow q = \hat{\gamma}(p^R + \alpha p^A).$$

Solving the system of equations (7), (8), and (9) for p^R , p^A , and q yields the solution to the newspaper's problem, which we state in the next proposition together with the main comparative statics of interest.

PROPOSITION 1: *It is optimal for the newspaper to set*

$$p^R = \frac{\gamma^2 - \gamma\alpha^2 - 1}{2\gamma^2 - 2 - (2 + \alpha^2)\gamma} \epsilon, \quad p^A = \frac{\alpha\gamma}{2\gamma^2 - 2 - (2 + \alpha^2)\gamma} \epsilon,$$

$$q = \frac{2\gamma}{2\gamma^2 - 2 - (2 + \alpha^2)\gamma} \epsilon.$$

A decrease in α —that is, a decrease in the advertisers' willingness to pay for readers' attention—(i) lowers the size of the newsroom q , (ii) lowers the price p^A charged to advertisers, and (iii) lowers the price p^R charged to readers if and only if $\gamma \leq 1 + \sqrt{2}$; that is, if and only if the demand from readers is sufficiently sensitive to the choice of content.

PROOF:

See Appendix Section A. ■

Not surprisingly, a decrease in the advertisers' willingness to pay α lowers the price p^A the newspaper is able to charge advertisers. More interesting is the relationship between α and both the choice of content q and the reader price p^R .

A decrease in the advertisers' willingness to pay for readers' attention reduces the newspaper's incentives to attract a large readership. Because the size of the readership is increasing in q , it follows the newspaper has an incentive to downsize its newsroom and choose a lower q —to save on costs—when advertising revenues decline.

Further, a decrease in α may either increase or decrease the price charged to readers. On the one hand, holding the choice of content constant, a decline in the advertisers' willingness to pay induces the newspaper to increase the price it charges readers. This result is the standard "waterbed effect," whereby the newspaper has lower incentives to attract readers through low prices when the marginal advertising revenues decrease.²³ On the other hand, the decline in q leads to a more price-elastic readership, which pushes the reader price downward. When γ is low (i.e., $\gamma \leq 1 + \sqrt{2}$), the latter effect dominates and a decrease in q lowers p^R . By contrast, when γ is high (i.e., $\gamma > 1 + \sqrt{2}$), a decrease in q does not affect the demand from readers much and the waterbed effect prevails: the reader price p^R increases.

²³ See Seamans and Zhu (2014) for empirical support.

We conclude our analysis by commenting on the relationship between the newspaper's reliance on advertising revenues and the composition of its readership. The average reader's ideal content is given by

$$(10) \quad \hat{x} := \frac{1}{2}(\tilde{x}_l + \tilde{x}_r) = \frac{\epsilon + \gamma^2 q - p^R}{\gamma^2 - 1} = \frac{2\gamma + 1}{2\gamma^2 - 2 - (2 + \alpha^2)\gamma} \epsilon.$$

COROLLARY 1: *The average reader's ideal content \hat{x} increases with the advertisers' willingness to pay for readers' attention.*

This result follows directly from equation (10). If one believes taste for higher journalistic-intensive content to be positively correlated with income and education, our model suggests that a decrease in advertising revenues may lead to a less affluent and/or educated readership. The intuition for this result is most clearly seen for the case in which $\gamma \leq 1 + \sqrt{2}$. There, a decrease in advertising revenues induces the newspaper to become cheaper and reduce the size of its newsroom. These changes in pricing and content attract readers who were previously deterred from the high reader price and/or the high share of journalistic-intensive content.

Empirical Predictions.—We end with a summary of the model's main findings:

- **Prediction 1:** A decline in advertising revenues triggers a decrease in newspapers' newsrooms and amount of journalistic-intensive content.
- **Prediction 2:** A decline in advertising revenues leads to a less affluent and educated readership.
- **Prediction 3:** A decline in advertising revenues may lead to either an increase or a decrease in reader prices.

C. Extensions

We briefly summarize the main findings of the three extensions provided in the Appendix and online Appendix.

Duopoly.—In the Appendix, we present a simple duopoly version of the model. The newspapers differentiate themselves, with one newspaper producing relatively little journalistic-intensive content and the other producing a relatively large quantity of it. The newspaper that produces the higher share of journalistic-intensive content is able to command a higher price and enjoy larger profits. In this model, we confirm the main predictions of the monopoly benchmark by showing that a decrease in advertising revenues lowers the average quantity of journalistic-intensive content produced and consumed in the market, the average price charged to readers, and the average reader's taste for journalistic-intensive content.

Increases in Competition.—The insights from the duopoly model allow us to conjecture with some confidence the relationship between the *magnitude* of our main comparative statics of interest and the number of newspapers present

in the market. Formulating such conjectures is useful in light of the empirical analysis below, where we compare outcomes in the national newspaper market to outcomes in the arguably less competitive local newspaper market.²⁴ To begin with, starting with two newspapers, any further increase in the number of newspapers lowers the average newspaper's size of newsroom q because of increasingly severe business stealing effects. The average fixed cost $\frac{1}{2}q^2$ in the market decreases with the number of newspapers, and thus also the marginal benefit of removing one journalist. As a result, the higher the total number of newspapers, the lower the incentives to reduce costs by downsizing newsrooms following a drop in advertising revenues. We thus expect decreases in journalistic content of *lower magnitude* in more competitive markets. Because it is the reduction in journalistic content that triggers a reduction in reader prices, it follows that decreases in reader prices of *lower magnitude* should be expected in more competitive markets.²⁵ Overall, therefore, we conjecture that falls in advertising revenues that occur in more competitive markets lead to changes in our main variables of lower magnitude.

Quality Provision.—In the online Appendix, we model journalistic-intensive content as a pure vertical attribute (i.e., quality). Quality then serves to attract readers, and the newspaper's incentives to provide quality depend on advertisers' preferences. We show that a decline in advertising revenues leads to a decrease in the newspaper's quality.

Price Discrimination.—In our dataset, the unit price charged to occasional readers is higher than the average subscription price. Selling subscriptions is a means to engage in second-degree price discrimination. Current industry trends include a widening gap between the unit price and the average subscription price (the "price gap").²⁶ Although several factors may induce newspapers to widen the price gap (e.g., changes in marginal costs, preferences, etc), in the online Appendix, we investigate whether a drop in advertising revenues may plausibly explain an increase in newspapers' incentives to price discriminate. In the model, readers are uncertain about their willingness to pay for future issues, and those who choose to subscribe purchase a "bundle" of several issues before knowing their willingness to pay for it.²⁷ We provide conditions under which it is profit-maximizing to (i) induce readers with a high expected willingness to pay to subscribe and (ii) charge the readers with a low expected but high realized willingness to pay a high unit price. We show that lower advertising revenues always increase the price gap, that

²⁴Unfortunately, fully solving a model with more than two newspapers is intractable.

²⁵This last effect is further strengthened by the observation that the average newspaper's residual demand becomes *less* price-elastic as the total number of newspapers increases, which occurs because each newspaper caters to an increasingly small and captive niche.

²⁶Suggestive evidence for the US newspaper industry is available upon request.

²⁷See Glazer and Hassin (1982) (whose models logic we incorporate in our framework) for a detailed discussion on the scope for subscriptions to be used as a means to price discriminate between readers.

is, the extent of price discrimination. We are then able to formulate the following additional empirical prediction:²⁸

- **Prediction 4:** A decline in advertising revenues increases the extent of second-degree price discrimination, as measured by the difference between the unit price and the average subscription price (the “price gap”).

II. Industry and Data Characteristics

In this section, we briefly introduce the new dataset we built for this study, and describe the newspaper industry characteristics. We discuss further details of the construction of the data in the online Appendix Section B.

A. Newspaper Industry Characteristics

The French daily newspaper industry is divided into two segments: the *local* daily newspaper industry (“*Presse quotidienne régionale*,” PQR) and the *national* daily newspaper industry (“*Presse quotidienne nationale*,” PQN). National newspapers can be purchased in the entire French territory. By contrast, the natural news market for a local daily newspaper is a county.²⁹ By and large, national newspapers have a much greater focus on international events, financial news, and national politics than local newspapers. By contrast, local newspapers tend to cover local politics and local events.³⁰ Our period of interest (1960–1974) has around 100 (national and local) daily general information newspapers.

Fourteen national newspapers exist at the beginning of the period, and twelve at the end.³¹ The total national newspaper circulation is stable during this time period, with around 4.2 million copies sold every day. The number of local newspapers during the same period varies around 90, with a total circulation amounting to around 7.8 million copies (see Cagé 2017 for more details on the historical evolution of the French local daily newspapers industry). On average, the circulation of national daily newspapers amounts to nearly 300,000 copies a day, whereas the circulation of local daily newspapers amounts to 100,000. Also, there were on average 3.1 newspapers circulating in each French county from 1960 to 1974, so that

²⁸ Interpreting changes in the price gap as changes in the extent of price discrimination is valid in the DD setting as long as the introduction of advertising on television did not affect other factors that may explain part of the difference in prices (e.g., costs). See Clerides (2004) for a discussion regarding measures of price discrimination.

²⁹ A county (“*département*” in French) is a French administrative division. The median land area of a county is 2,303 square miles, which is slightly more than three-and-a-half times the median land area of a county in the United States.

³⁰ Moreover, the use of wire stories by local newspapers is much less prevalent in France compared to the United States.

³¹ *Libération*, *Paris Presse*, and *Paris Jour* exited the industry in 1964, 1970, and 1972, respectively. *Libération*—same title but entirely distinct newspaper from the aforementioned *Libération*—entered the industry in 1973. We chose not to include the “first” *Libération* in the dataset because it exited four years before the introduction of advertising on television. For the same reason, we exclude the “second” *Libération*. In Section VC, we show our results are robust to dropping *Paris Presse* and *Paris Jour*.

TABLE 1—SUMMARY STATISTICS: NATIONAL DAILY NEWSPAPERS

	Mean	Median	SD	Min	Max	Observations
<i>Prices</i>						
Unit buyer price	3.6	3.5	1.3	2.4	9.3	152
Subscription price per issue	2.8	2.7	0.7	1.9	5.6	148
Display ad rate (listed price)	121.1	114.5	81.0	17.5	274.2	121
<i>Revenues and journalists</i>						
Total revenues (million €)	425	271	403	19	1,482	162
Revenues from advertising (million €)	228	103	258	7	864	161
Revenues from sales (million €)	199	145	181	12	657	162
Share of advertising in total revenues (percent)	47.4	51.1	21.3	8.0	81.0	162
Number of journalists	117	85	81	21	326	158
<i>Circulation</i>						
Total circulation	295,210	181,574	292,838	16,112	1,143,676	162
Share of subscribers (percent)	25.6	18.5	26.3	0.7	92.3	163
<i>Content</i>						
Number of pages	19	17	7	8	38	138
Newshole (nonadvertising space)	13	13	4	6	25	138
Advertising space	5	4	4	0	16	138

Notes: The table gives summary statistics. The time period is 1960–1974. Variables are values for newspapers. The observations are at the newspaper/year level. Unit price, subscription price per issue, and list price are in constant (2014) euros. Revenues and costs are in million constant (2014) euros.

both the national newspaper market and the average local newspaper market are oligopolies.³²

Copies are sold either at the newsstand to unit buyers or through subscription. The average daily share of unit buyers is 73 percent. (Tables 1 and 2, respectively, provide descriptive statistics on newspaper prices, revenues, and the number of journalists, as well as on circulation and newspaper content for the national daily newspaper industry and for the local daily newspaper industry.)

Overall, national daily newspapers generate €425 million³³ in total revenues each year, whereas local daily newspapers generate €145 million. Total revenues are the sum of sales/circulation revenues and advertising revenues. On average, between 1960 and 1974, the share of advertising revenues in total revenues is 47 percent. The quantity of advertising in newspapers represents around 3 pages per newspaper issue, that is, 19 percent of the content of the newspaper.

³²During the same time period, only two newspapers, *La Nouvelle République Du Centre Ouest* and *Ouest France*, were consistently in a monopolistic situation in the county in which they were headquartered. This was also the case for *La Dépêche du Midi*, but only in 1960 and 1961; for *La Montagne* from 1966 to 1972; and for *L'Union* beginning in 1967. Online Appendix Table D10 shows that our results are robust to dropping the newspapers that are in a monopolistic situation.

³³Euros here are constant 2014 euros.

TABLE 2—SUMMARY STATISTICS: LOCAL DAILY NEWSPAPERS

	Mean	Median	SD	Min	Max	Observations
<i>Prices</i>						
Unit buyer price	3.2	3.3	0.8	0.8	5.7	911
Subscription price per issue	2.8	2.9	0.7	0.7	4.7	896
Display ad rate (listed price)	80.3	57.7	72.6	3.8	327.2	688
<i>Revenues and journalists</i>						
Total revenues (million €)	146	65	176	1	1,026	888
Revenues from advertising (million €)	67	30	79	1	416	891
Revenues from sales (million €)	79	36	102	0	751	884
Share of advertising in total revenues (percent)	46.5	45.9	8.3	7.1	70.4	878
Number of journalists	53	27	58	1	297	907
<i>Circulation</i>						
Total circulation	101,487	50,586	119,774	1,480	654,992	908
Share of subscribers (percent)	27.5	23.3	22.0	1.0	100.1	909
<i>Content</i>						
Number of pages	15	15	6	2	66	908
Newshole (nonadvertising space)	12	12	4	2	34	908
Advertising space	3	2	3	0	32	908

Notes: The table gives summary statistics. The time period is 1960–1974. Variables are values for newspapers. The observations are at the newspaper/year level. Unit price, subscription price per issue, and list price are in constant (2014) euros. Revenues and costs are in million constant (2014) euros.

B. Data

We construct an annual balanced panel dataset on local and national newspapers in France between 1960 and 1974. The data are paper data that we digitize and merge from various historical sources.

Prices, Circulation, and Revenues.—We collect data on prices, revenues, and circulation from the French Ministry of Information’s non-publicly available records in the National archives. The Ministry of Information required newspapers to report annually their revenues and prices. We collect data by having direct access to the responses to these queries.

We obtain information on the unit price, the subscription price—defined as the annual subscription price divided by the total number of issues in the year—the number of issues per year, sales revenues, and advertising revenues, as well as information on circulation with the share of unit buyers and the share of subscribers. Our dataset includes data for 68 local newspapers, that is, a large fraction of the local daily newspaper industry. These newspapers are the ones for which the data are available in the archives. Our sample of national newspapers include all 12 national newspapers circulating between 1960 and 1974.

Number of Journalists.—We use annual data on the number of journalists at the newspaper level from the non-publicly available paper records of the “*Commission de la carte d’identité des journalistes professionnels*” (CCIJP), the organization that issues press cards to journalists in France since 1936. These unique data are from Cagé (2016). The CCIJP delivers press cards to “any person whose

primary, regular, and remunerated professional activity is associated with one or more daily or periodical publications or news agencies.” Importantly, media companies are forbidden by law to employ a professional journalist who does not hold a press card for a period exceeding three months. Finally, journalists must renew their press card annually. Our dataset includes data for 63 out of the 68 local newspapers for which we have revenue data, and 11 out of the 12 national newspapers. For each of these newspapers, we know the number of journalists (including both monthly paid salaried workers and freelancers) on an annual basis as well as their compensation, i.e., their monthly gross salary. The number of journalists is one of the variables we use to proxy for newspapers’ quality and/or quantity of journalistic-intensive content. On average, newspapers employ 63 journalists during our time period. Finally, we also collect information on the number of journalists working for the French television and radio broadcasting agency (ORTF) for the years 1960, 1964, 1965, 1966, 1967, 1968, 1969, 1970, 1971, and 1974. Exactly as for newspaper journalists, television journalists must hold a press card. We use this information as a proxy for television quality below.

Advertising Prices and Quantity.—A change in advertising revenues can be driven by a change in advertising prices and/or a change in advertising quantity. We collect data on both the price and the quantity of advertising to disentangle the two effects.

A first source of information for advertising prices is the official list price per column inch of advertising space. We digitize these data from “*Tarif Media*,” an annual publication that provides information regarding advertising rates.³⁴ “*Tarif Media*” provides information on a menu of prices (specifically, prices vary depending on the page on which the ad is displayed). In this analysis, we use the rate for front-page ads, which is the rate for which we have the highest number of observations.³⁵

A downside of using list prices is that discounts are common in the newspaper industry: the listed price is not the actual transaction price, which is usually lower (see, e.g., Chandra 2009). Price lists are hence a relevant measure of advertising prices as long as we assume the potential bias between list prices and actual prices does not differ too much across newspapers and over time.

Given this caveat, we use another measure of advertising prices common in the literature, which consists of the total advertising revenues divided by the newspaper circulation. The two measures are strongly correlated (the correlation between them is equal to 0.5 and is significant at the 1 percent level).

We collect data on the amount of advertising per issue directly from the paper version of the newspapers available in the French National Library. For each year and each newspaper, we study the content of the newspaper issues during two entire weeks (the third week of March and the third week of December).³⁶ We measure

³⁴“*Tarif Media*” is the French equivalent of the *SRDS Newspaper Advertising Source* in the United States, a source that has been used in a number of media studies (see, e.g., Seamans and Zhu 2014).

³⁵We do so to maximize the number of observations in our sample; our results are robust to constructing an average rate from the menu of prices and are available upon request.

³⁶We chose the third week of March because it is the week the INSEE (the French national statistics agency) selected to run its surveys, and the third week of December because Christmas is a suitable time for advertising.

the quantity of advertising on each page (i.e., the share of the page's surface devoted to ads), as well as the number of advertisements. We thus have information on the total number of advertisements in the newspaper, and on the share of the newspaper devoted to advertising (the advertising space).

For the year 1967, we go further and distinguish between national ads and local ads. National ads are defined as advertisements for branded products or services. Local ads mainly consist of classified ads and ads for local shops or events. We use this information to substantiate our claim that national newspapers rely, to a greater extent, on national ads relative to local newspapers. Finally, to provide anecdotal evidence on the substitution effect of television, we collect information for a subset of newspapers (see below) on the category (e.g., food and beverage, cars, household electrical goods, etc.) of each published advertisement.

Newshole.—The content data we collected also allows us to compute the newshole, i.e., the amount of space dedicated to news (any content other than advertising). To investigate changes in content, we also collect extra information for 37 local newspapers and all national newspapers in our sample. For each of these newspapers and year, we compute the share of hard news stories and the share of soft news stories on the front page of each issue for the third week of March from 1964 to 1972.³⁷

Readership Data.—Finally, for a subset of the newspapers included in our sample, we obtain information on readers' characteristics. The data we exploit come from the *Centre d'Etude des Supports de Publicité* (CESP), an association composed of all of the main companies active in the advertising industry. The CESP has published a report on French newspaper readers every five years between 1957 and 1967 and annually starting in 1968. The survey results are available in paper format, and we digitized them for the following years: 1957, 1962, 1967, 1968, 1969, 1970, 1972, and 1974. Details regarding the methodology of the survey are provided in the online Appendix, Section B.

III. Background on the Introduction of Advertising on French Television

We first discuss the historical background to the introduction of advertising on French television (announced in 1967 and implemented in 1968), and then provide some anecdotal evidence regarding the impact of the shock on both the advertising revenues of national newspapers and the nature of the advertisements they published. We also show that this introduction did not affect the quality of television content, nor the quantity of news it broadcasts. We exploit this feature in our empirical analysis to isolate the consequences of a shock that likely affected, in a direct way, only the advertising side of the newspaper industry.

³⁷ Following Cagé (2017), the share of articles on hard news is defined as the number of articles on agriculture, economics, education, environment, international affairs, or politics divided by the total number of articles we are able to classify. The share of articles on soft news is defined as the number of articles on movies, culture, leisure activities, sports, news in brief, religion, or health divided by the total number of articles we are able to classify.

A. French Television in the 1960s

French Television was state-owned from 1945 to 1981.³⁸ A national agency—the “*Office de Radiodiffusion-Télévision Française*” (ORTF)—was in charge of providing radio and television content.³⁹ The agency was not-for-profit and funded by revenues from television license fees. Only one channel (“*La première chaîne*”—the “First Channel”) was available until 1963. A second TV channel (“*La deuxième chaîne*”—the “Second Channel”) was introduced in 1964, and a third one (“*La troisième chaîne*”—the “Third Channel”) in 1972. TV penetration gradually increased during this period.⁴⁰ In 1970, nearly 70 percent of French households owned a television (Parasie 2010). Channels were financed mostly through a tax (*redevance*) until 1968. By law, *commercial* or *brand* advertising was forbidden.⁴¹

The transition to color on the Second Channel and the need to produce an increasing number of programs led the ORTF to experience severe financial difficulties – it was “on the edge of the abyss” (Bellanger, Godechot, and Guiral 1976). The French government’s secret decision in March 1965 to introduce advertising on television was made public on October 20, 1967, thereby provoking a strong controversy both in Parliament and within the newspaper industry. The then-Prime Minister, George Pompidou, argued that the ORTF had no choice but to find new sources of revenues to continue developing the Second Channel and eventually create a third one. He also argued that enabling firms to advertise on television would “revitalize production by giving [them] the possibility to develop their domestic market” (address in Parliament on April 24, 1968).⁴² The first advertisement was broadcast in October 1968.

The content broadcast on television during our period of interest was almost exclusively national (see, e.g., Bourdon 1990, Brochand 1994, Ledos 2007). We illustrate this lack of local content with information obtained from the annual ORTF reports. Online Appendix Figure C2 shows the number of hours of local content broadcast on the first and on the second channels. This number is consistently lower than 25 hours *per year* for the first channel and 16 hours *per year* for the second channel. On either channel, local content never represented more than 2 percent of total content (measured in hours).

A third channel was introduced in 1972. Contrary to the existing channels, the goal of this new channel was to be a “regional” channel, precisely to compensate for the existing lack of regional coverage. We show in Section VC that our results

³⁸During this period, all TV channels in the United States were privately owned, whereas two TV channels were state-owned (BBC 1 and BBC 2) and one was private (ITV) in the United Kingdom.

³⁹The first national agency, the “*Radiodiffusion Française*” (RDF), was created in 1945. It was renamed “*Radiodiffusion-Télévision Française*” (RTF) in 1949 and replaced by the ORTF in 1964.

⁴⁰See, e.g., online Appendix Figure C3. While TV penetration is increasing at the time, it is important to highlight that there is no change in this trend around the time of the shock.

⁴¹An exception is “collective advertising,” which promotes products, say, fruits, without mentioning a brand (Duchet 2005). They were not very important, however. In 1959, for example, the time devoted to collective advertising was only five hours and ten minutes per year (Parasie 2010).

⁴²Commercial advertising was allowed much earlier in almost all other developed countries: 1941 in the United States, 1955 in the United Kingdom, 1956 in Germany, and 1957 in Italy and Spain (Parasie 2010).

are robust to focusing on the 1960–1971 period, i.e., before the introduction of the third channel.

B. *A Threat to Newspapers?*

Left-leaning political parties and the newspaper industry were firmly against the reform. The Federation of the Democratic and Socialist Left (“*Fédération de la gauche démocrate et socialiste*”)—a conglomerate of French left-wing non-Communist forces—introduced various bills to ban commercial advertising on television by arguing it would lead to a decrease in the quality of television content. More importantly—and consistent with the identification strategy we use in this paper—very much present is the idea that the reform would lead to a decrease in newspaper advertising revenues.⁴³ In fact, as early as 1964, the then-Minister of Information, Alain Peyrefitte, was aware of this issue and claimed the introduction of advertising on television would be worth considering only if the press could survive it (Bellanger, Godechot, and Guiral 1976).

Not surprisingly, newspapers were also against the reform. For instance, the Federation and the Confederation of the French Press estimated in a report that the press would lose between 40 percent and 50 percent of its advertising revenues, that is, between 20 percent and 40 percent of total revenues depending on the newspaper.

C. *A Substitution Effect on the Advertising Side of the Market*

The quantity of advertising broadcast on television during our period—as measured by the number of minutes of advertising per day—is regulated and very low. The first commercial advertisement was broadcast on French television in October 1968. The time devoted to advertising was two minutes per day in 1968—and only on the First Channel—four in 1969, eight in 1970 (i.e., 2,720 minutes per year; 1970 is also the year in which advertising is introduced on the Second Channel), and more than 12 in 1971 (Bellanger, Godechot, and Guiral 1976). Such a low daily quantity of advertising suggests the impact on television viewers likely was limited in practice. Advertising revenues generated by the ORTF increased by €82.3 million between 1967 and 1968 (despite the broadcasting of less than 184 minutes of advertising in total), and by €216 million between 1968 and 1969. In 1971, advertising revenues represented 22 percent of the ORTF’s total revenues (Bellanger, Godechot, and Guiral 1976). The average revenue per minute of advertising was around €0.45 million in 1968 and around €0.15 million in 1969. Thus, although the limited quantity of advertising the reform introduced is unlikely to have significantly affected the preferences of TV viewers and newspaper readers, it was manifestly sufficient to generate large revenues for the ORTF. Below, we exploit this unique feature to isolate the consequences of a decrease in newspapers’ advertising revenues on the size of their

⁴³The Federation of the Democratic and Socialist Left argued the government wished to introduce advertising on television so as to weaken newspapers, the only independent media industry (Parasie 2010). In an address to the Parliament on April 24, 1968, Jacques Chambaz (from the Communist Party) claimed that “the introduction of commercial advertising on television is, but a new way to deal a blow to the broadsheet newspapers that you consider not docile and flexible enough.”

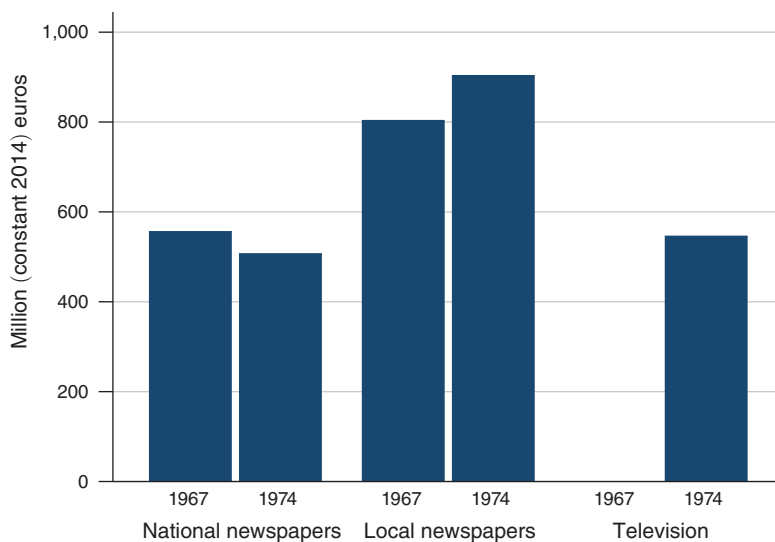


FIGURE 2. ADVERTISING REVENUES BY MEDIA OUTLETS, 1967 AND 1974

Notes: The figure shows, for 1967 and 1974, the value of advertising revenues in France by media outlets (local and national daily newspapers, and television) in million (constant 2014) euros. Data are from the *Institut de Recherches et d'Etudes Publicitaires* (IREP), a French research institute devoted to the study of advertising.

newsroom, their choice of content, and their pricing. Also, the shock to the advertising market was significant and immediate and, perhaps not surprisingly, it seems the first companies to advertise on television were those with the largest willingness to pay for it (as suggested by the fall in the *average* advertising revenue).

We first provide aggregate evidence at the industry level to give a sense of the magnitude of the effect of the introduction of advertising on television on the advertising revenues of local and national daily newspapers.⁴⁴ Total advertising revenues of national daily newspapers decreased by €49.5 million between 1967 and 1968 (compared to the €82.3 million of additional revenues raised by television over the same period). Note that national newspapers' advertising revenues decreased even though the total advertising market was rapidly expanding in France between 1967 and 1974. By contrast, local newspaper advertising revenues increased during the same period (Figure 2). Moreover, the share of national daily newspapers in total advertising revenues decreased from 14 percent in 1967 to 11 percent in 1974, as shown in Figure 3.

The introduction of advertising on television can be considered a significant negative shock to the advertisers' side of the newspaper industry. However, its impact was heterogeneous in that it affected national newspapers more severely than

⁴⁴In Section IV, we provide econometric evidence of this shock, computing difference-in-differences estimates to show that this shock affected the advertising revenues of the national daily newspapers more severely than the revenues of the local daily newspapers.

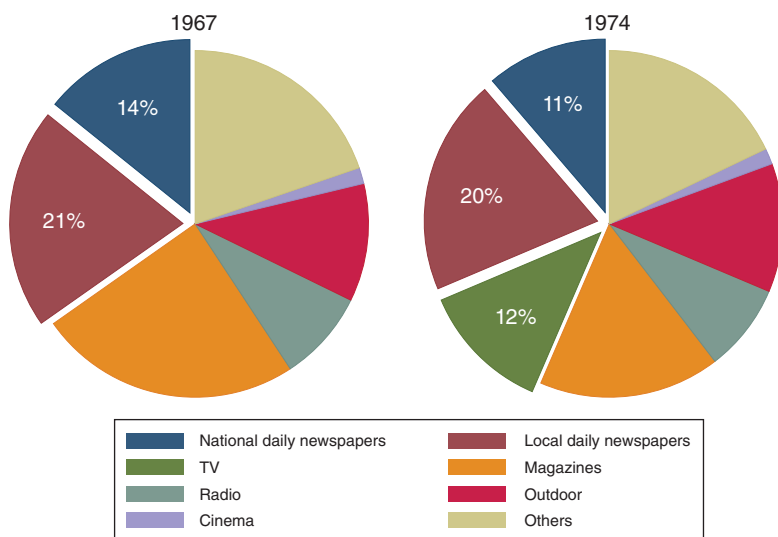


FIGURE 3. SHARE OF TOTAL ADVERTISING REVENUES BY MEDIA OUTLETS, 1967 AND 1974

Notes: The figure shows, for 1967 and 1974, the share of total advertising revenues by media outlets (national daily newspapers, local daily newspapers, magazines, television, radio, cinema, outdoor, and others). Data are from the *Institut de Recherches et d'Etudes Publicitaires* (IREP), a French research institute devoted to the study of advertising.

local newspapers. The reason behind this heterogeneous effect lies in the distinct nature of the advertisements published in national and local newspapers. National newspapers rely to a greater extent on advertisements for brands (“national ads”), whose owners may also wish to advertise on television. By contrast, a large share of advertisements in local newspapers is local in nature (local commercial advertisements and classified advertisements).

Classifying Advertisements.—To provide anecdotal evidence regarding the impact of the introduction of advertising on television on newspapers, we classify advertisements according to 25 categories (food and beverage, cars, household electrical goods, etc.).

Television.—We collect data on all the advertisements broadcast on French television between 1968 and 1974 from the website of the *Institut National de l'Audiovisuel* (INA—National Audiovisual Institute). For each advertisement, we know the date of its first airing, its length, and its category. Between 1968 and 1974, 7,337 different advertisements were broadcast on television (142 in 1968, 919 in 1969, and over 1,000 per year for every subsequent year, as shown in online Appendix Figure C5). Online Appendix Figure C6 illustrates the relative prevalence of the various categories of television advertisements (e.g., 31 percent of all advertisements broadcast on television in 1971 were about food or nonalcoholic drinks).

Newspapers.—To compare the advertisements broadcast on television with those published in newspapers, we similarly classify all the advertisements published in newspapers according to the same 25 categories. Specifically, for a subset of newspapers (four national newspapers⁴⁵ and five local newspapers⁴⁶), we classify all the advertisements published in the newspaper between 1964 and 1972. To do so, we use the same method as the one described above regarding the quantity of advertising (i.e., we select the third week of March and third week of December). In addition, we classify each newspaper advertisement as either local or national. According to our findings, 24 percent of the advertisements found in national newspapers were local advertisements, whereas 44 percent of the advertisements found in local newspapers were local advertisements.⁴⁷ Online Appendix Figure C7 illustrates the relative prevalence of the various categories of advertisements in both local and national newspapers in 1967 and 1971. The figures are built so that the categories correspond to those for TV.

Anecdotal Evidence.—The introduction of advertising on television likely has had an effect on both the intensive and the extensive margins of the advertising side of the newspaper industry (i.e., on the inframarginal and marginal advertisers). On the intensive margin, the introduction of a new advertising platform may have led to a reduction in the willingness to pay of many advertisers, for instance, those who opt to advertise through both media. On the extensive margin, it may have induced a number of advertisers to advertise exclusively on television. We use the information collected on the nature of advertisements to anecdotally document an effect on the extensive margin for national newspapers. Between 1964 and 1972, this substitution pattern appears clearly, as illustrated in Figure 4 for electronic devices and OTC drugs. Between 1966 and 1971, national newspapers reduced drastically the share of “clothing” and “house electrical goods” advertisements they published (online Appendix Figures C7a and C7b), which were significant sources of advertisements broadcast on television (see online Appendix Figure C6). By contrast, they published more “leisure” advertisements. In the next section, we provide econometric evidence of a decrease in advertising prices and revenues, which may be due to the effect on both the intensive and extensive margins.

D. No Change in the Quality of Television Content

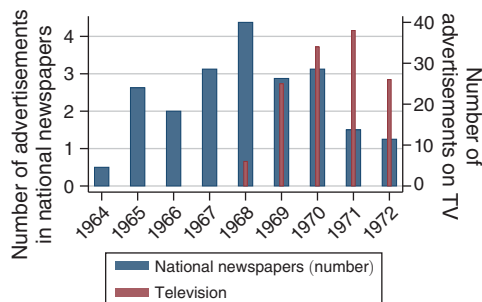
Although the reform introduced only a few minutes of advertising per day (and is thus unlikely to have directly affected preferences in a significant manner), one may be concerned that the extra revenues generated through advertising were used to increase the quality of television programming and induce newspaper readers to stop reading. Naturally, we are not claiming the quality of television was not

⁴⁵ *France Soir, L'Aurore, Le Figaro, and Le Monde.*

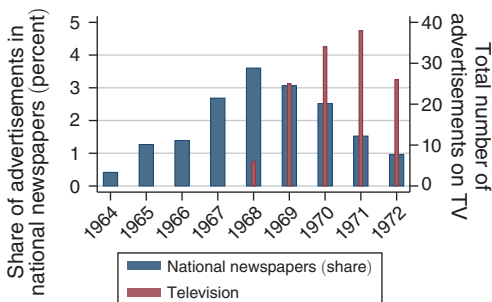
⁴⁶ *La Liberté De Normandie, La Marseillaise, Le Maine Libre, Le Méridional, and Le Midi Libre.*

⁴⁷ These estimates are consistent with existing aggregate data on revenues: according to IREP, the share of local advertisements in advertising revenues of local daily newspapers was equal to 43 percent in 1967.

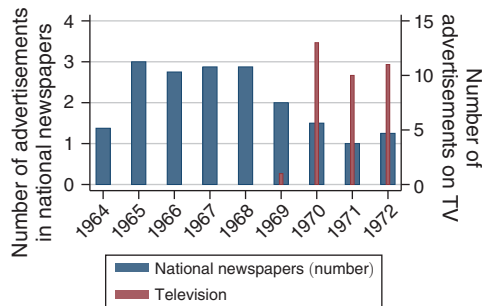
Panel A. Electronic devices and computer hardware (number)



Panel B. Electronic devices and computer hardware (share)



Panel C. OTC Drugs (number)



Panel D. OTC Drugs (share)

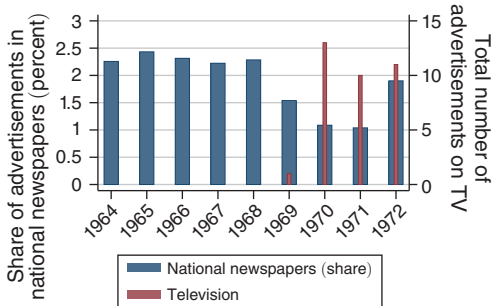


FIGURE 4. ANECDOTAL EVIDENCE: ADVERTISEMENTS IN NATIONAL NEWSPAPERS AND ON TELEVISION

improving over time. However, what matters for our purposes is that existing trends in television quality did not change around 1967–1968 as a result of the reform. In addition to noting that the officially stated reason for the reform was to help the state-owned television agency remain financially viable and to introduce a third channel a few years later, we collected information on three different and complementary measures of television quality from various ORTF reports (the sources are described in the online Appendix). Specifically, we collected information on the number of transmitters and their power/reach, the number of hours of content produced and broadcast (including news reports), and the number of journalists employed by the ORTF.

Figure 5 presents our results. The number of transmitters (results are similar if we focus on their power) gradually increased during the time period, but without any shock around the introduction of advertising on television (the increase in 1972 is due to the creation of the third channel). The number of hours of programming broadcast is flat for the first channel during our period of interest (if anything, it slightly decreased at the end of the 1960s), and increased linearly on the second channel. There was no change in the number of hours of news broadcast. Finally, the number of journalists working for the ORTF increased linearly throughout our period (with perhaps a slightly more rapid increase starting in 1970, due to the

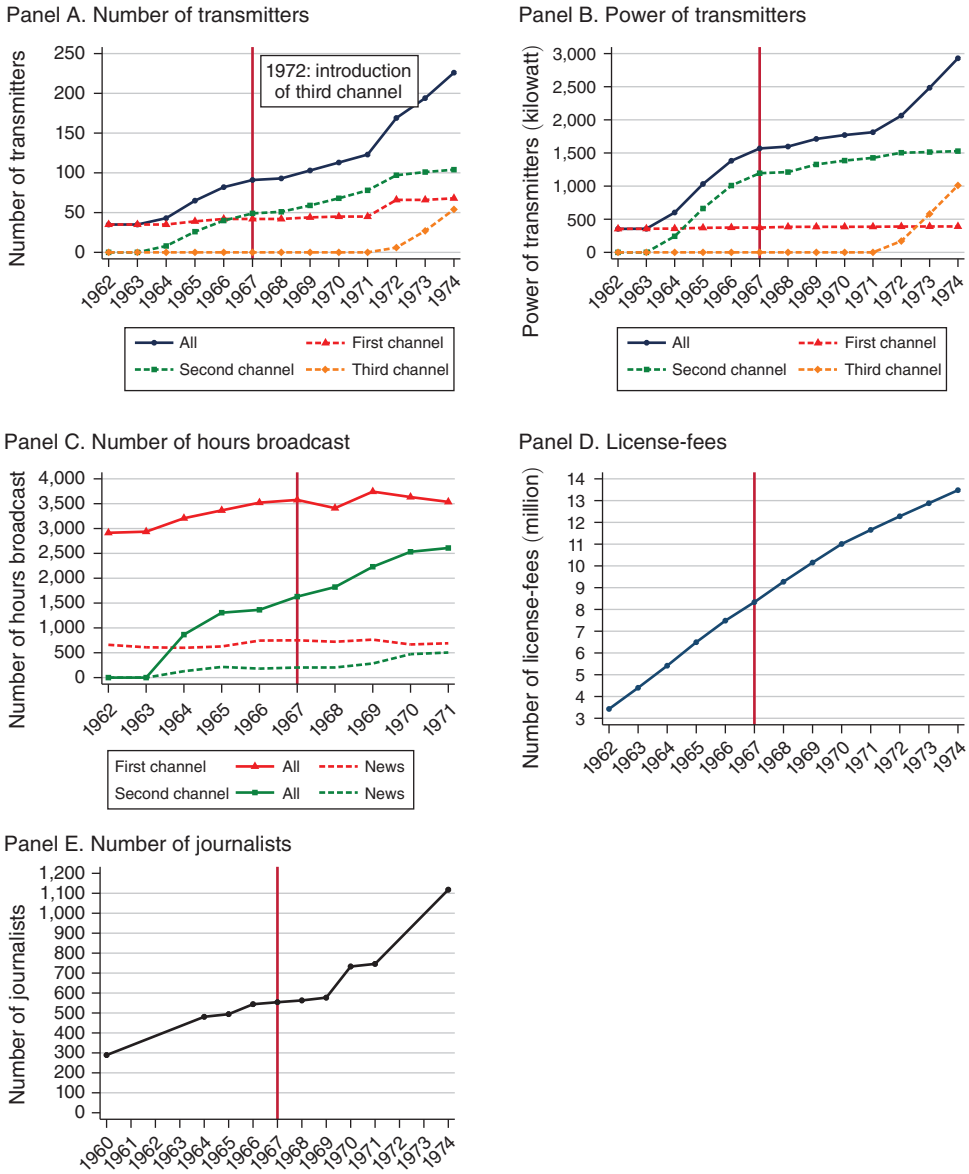


FIGURE 5. MEASURES OF TELEVISION QUALITY: NO CHANGE AROUND 1967

Notes: The figure shows the evolution of five different measures of television quality from 1962 to 1974: the number of transmitters (panel A), the power of these transmitters (panel B), the total number of hours broadcast (panel C), the number of license-fees (panel D), and the number of journalists (panel E).

introduction of the third channel). This last measure is particularly important, given that we proxy newspapers' quality with the size of their newsroom.⁴⁸

⁴⁸ Only a very small share of the journalists working for the ORTF were previously working for local or national daily newspapers. Using data from Cagé (2016) as well as additional information we collected for this paper, we have documented the professional origin of the journalists working for the ORTF in 1974. As illustrated in the

We also show the total number of license-fees collected on all television set owners from 1962 to 1974. There exists a linear trend that does not vary around the introduction of advertising on television.

Finally, although the first programs in color were broadcast on French television in 1967, this likely had a negligible impact on preferences around the time of the shock. Only a tiny share of French households were equipped with adequate TV sets initially, for instance, 386,026 households had such equipment in 1971 (i.e., less than 4 percent of households owning a television). Moreover, programs in color represented only a small share of total programming (e.g., less than five minutes per day in 1969).

Clearly, though, quality can come in various forms, and we cannot claim to capture all relevant dimensions. Nevertheless, it is reassuring that for the observed measures of quality we have, there is no sudden change occurring in 1967–1968. Similarly, it also seems unlikely that improvements in quality (if any) would have affected differentially readers of national and local newspapers. Overall, therefore, the introduction of advertising on French television provides us with a unique empirical setting in which to study the consequences of a negative shock to the newspaper industry that plausibly affected in a direct manner only the advertising side of the market.⁴⁹

IV. Empirical Analysis

The model we built in Section I provides us with a framework with which to think about the determinants of newspapers' choices regarding the size of their newsroom (or production of journalistic-intensive content), their pricing, and the composition of their readership. Noting that in our dataset newspapers sell their content both to subscribers and occasional readers, in the online Appendix, we also model newspapers' incentives to charge different prices to different groups of readers. In this section, we study empirically how these various choices and outcomes are affected by newspapers' reliance on advertising revenues. To the best of our knowledge, our paper is the first to use this quasi-natural experiment.

A. Estimation Strategy

We use our panel data to compute DiD estimates of the effect of the introduction of advertising on television. Our identifying assumption is that the negative shock on advertising revenues has affected mostly national daily newspapers and to a lower extent local daily newspapers. We take advantage of the treatment heterogeneity and

online Appendix Figure C8, 49 percent of them obtained their first job as a journalist at the ORTF, and 22 percent were already working for the ORTF in 1960 (at the beginning of our period of interest). Out of the 1,120 journalists working for the agency in 1974, only 62 were previously working for a local daily newspaper, and 32 for a national daily newspaper (i.e., 2.9 percent). To give an order of magnitude, 32 journalists, that corresponds to about 3 percent of the total number of journalists working for national daily newspapers at the time, and a third of the typical size of a national daily newspaper newsroom.

⁴⁹By contrast, the introduction of an ad-financed television channel would affect both sides of the market (readers and advertisers), thereby making it more difficult to establish the causal relationship between advertising revenues and newspapers' quality and pricing choices. See Seamans and Zhu (2014) for a similar approach.

use national newspapers as our “treated group” and local newspapers as our “control group.” We then compare the pre-1967-to-post-1967 change in the variables of interest of national daily newspapers to the change in the same variables of interest of local daily newspapers over the same period. Note that because local newspapers may also have suffered from the shock (albeit to a lower extent), our estimates are a lower bound. Finally, we also assume that the introduction of television advertising constituted a direct shock to only the advertising side of the newspaper industry.

Let $D_{national\ news}$ be an indicator variable for national newspapers and D_{after} be a time dummy that switches on for observations post 1967 (i.e., the year the reform is announced). Our analysis is based on the following regression equation:

$$(1') \quad y_{n,t} = \alpha + \beta_1(D_{after} \times D_{national\ news}) + \lambda_n + \gamma_t + \epsilon_{n,t},$$

where n indexes newspapers and t indexes years ($t = 1960, \dots, 1974$). For all specifications in our analysis, we introduce fixed effects for newspaper (λ_n) as well as time dummies (γ_t).⁵⁰ This approach prevents cross-sectional variations from driving our results. The term $\epsilon_{n,t}$ is a newspaper-year shock. Standard errors are clustered at the newspaper level.

The variable $y_{n,t}$ is our outcome of interest. In all the specifications, we use the logarithms of the dependent variable. We first investigate the effect of the introduction of advertising on television on the advertising side of the market—advertising revenues, price, and quantity—then turn to prices on the reader side, and finally consider content and size of the newsroom choices. Due to the inclusion of newspaper and year fixed effects, the coefficient β_1 —our coefficient of interest—measures the annual effect for national newspapers of the introduction of advertising on television compared to the general evolution of our dependent variable (e.g., the number of journalists) for local newspapers. The key identifying assumption here is that the trends of the dependent variables would be the same for both categories of newspapers (local and national) in the absence of the treatment. The treatment induces a deviation from this common trend. We present econometric evidence in support of the parallel trend assumption below.

Finally, the unbiasedness of the DiD estimates requires the strict exogeneity of the introduction of advertising on television. As we underline above, French television was state-owned from 1945 to 1981. Therefore, no interaction occurred between television owners and newspaper owners, whether national or local. The French government unilaterally decided to introduce advertising on television to answer the concerns of the ORTF. This decision is exogenous to the newspaper industry.

B. Results

Effect on the Advertising Side of the Market.—Our identifying assumption is that the introduction of advertising on television was a negative shock to advertising revenues that affected national daily newspapers more severely than local daily

⁵⁰Note that we do not introduce the $D_{national\ news}$ and the D_{after} indicator variables separately given that their effect is captured by the newspaper and time fixed effects.

TABLE 3—ADVERTISING SIDE

	Advertising revenues	Ad revenues/ circulation	(Listed) ad price	Advertising space
National × Post-TV ad	−0.24 (0.12)	−0.15 (0.08)	−0.40 (0.10)	−0.03 (0.13)
Newspaper fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
R^2	0.52	0.53	0.19	0.38
Adjusted R^2	0.52	0.52	0.17	0.37
Observations	1,052	1,051	809	1,046

Notes: Time period is 1960–1974. Models are estimated using OLS estimations. Standard errors are clustered at the newspaper level. All the estimations include newspaper and year fixed effects. The dependent variables are in logarithm. Variables are described in more detail in the text.

TABLE 4—READER SIDE

	Subscription price	Unit price	Circulation	Share of subscribers	Revenues from sales
National × Post-TV ad	−0.11 (0.02)	0.00 (0.04)	−0.08 (0.09)	0.23 (0.14)	−0.13 (0.07)
Newspaper fixed effects	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes
R^2	0.89	0.92	0.06	0.12	0.68
Adjusted R^2	0.89	0.91	0.05	0.11	0.67
Observations	1,044	1,044	1,070	1,044	1,046

Notes: Time period is 1960–1974. Models are estimated using OLS estimations. Standard errors are clustered at the newspaper level. All the estimations include newspaper and year fixed effects. The dependent variables are in logarithm. Variables are described in more detail in the text.

newspapers. Table 3 reports estimates of equation (1'). Our outcomes of interest are advertising revenues (column 1), prices (columns 2 and 3), and quantity (column 4).

We find the shock leads to a 24 percent decrease in the advertising revenues of national newspapers compared to the revenues of local newspapers. The decrease in advertising revenues is driven by the fall in the price of advertising. We obtain a 14 percent decrease following the shock when we use the total advertising revenues normalized by circulation (column 2); the decrease is stronger when we consider the list price measure of advertising prices (column 3). However, we find no statistically significant change in the quantity of advertising.

Effect on the Reader Side of the Market.—We analyze how the shock to advertising revenues affected newspapers' pricing choices and their circulation. Table 4 presents the results. We find an 11 percent decrease in the subscription price of national newspapers compared to the subscription price of local newspapers following the introduction of advertising on television. This decrease is statistically significant at the 1 percent level. We find no statistically significant change in the unit price. Therefore, national newspapers increased the extent of price discrimination (as measured by the price gap) following the shock.

TABLE 5—QUALITY

	Number of journalists	Average payroll	Number of pages	Newshole	Share of hard news on front page (percent)
National × Post-TV ad	−0.21 (0.06)	0.06 (0.06)	−0.03 (0.08)	−0.04 (0.08)	−0.11 (0.07)
Newspaper fixed effects	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes
R^2	0.50	0.28	0.61	0.52	0.11
Adjusted R^2	0.49	0.26	0.61	0.52	0.09
Observations	1,046	723	1,046	1,046	418

Notes: Time period is 1960–1974. Models are estimated using OLS estimations. Standard errors are clustered at the newspaper level. All the estimations include newspaper and year fixed effects. The dependent variables are in logarithm. Variables are described in more detail in the text.

Regarding total circulation, it remained unchanged, but we obtain a statistically significant increase in the share of subscribers, which went up by 23 percent. Finally, revenues from sales decrease (by 13 percent) following the shock.

Effect on “Quality”.—Two features of newspapers have been repeatedly used in the literature as measures of newspaper quality (or at least production of journalistic-intensive content): the number of journalists and the so-called newshole (the amount of space in the newspaper devoted to anything but advertising) (see, e.g., Hamilton 2006; Berry and Waldfogel 2010; Fan 2013; Cagé 2017; Cagé, Hervé, and Viaud 2017).⁵¹ Anderson and Waldfogel (2015) for instance note that “(i)n newspapers, some of the direct input cost measures—page length and staff size—are directly suggestive of quality.” Table 5 presents estimates of the impact of the shock on these two measures, as well as on the average payroll and the total number of pages.

We show that the introduction of advertising on television leads to a 21 percent decrease in the number of journalists (column 1). We find no effect on the average payroll (column 2). This may be due to the fact that the relative reduction in the size of the newsroom impacted all the journalists, regardless of their experience. However, this result has to be interpreted cautiously given that the non-significance of the estimate may also be due to a lack of power (our coverage is lower for the payroll than for the total number of journalists, hence, the lower number of observations).

In addition, we obtain no statistically significant change in the number of pages (column 3) or in the newshole (column 4), our alternative measure of quality (see, e.g., Gentzkow, Glaeser, and Goldin 2006, who use both the number of stories and the size of the stories as measures of news quality). This absence of change in the newshole, for a given number of pages, is consistent with the absence of change in the amount of space devoted to advertising we obtain above.

⁵¹ When controlling for measures of newspaper quality, Gentzkow and Shapiro (2010) similarly use the number of pages in the paper as well as the number of journalists.

Obviously, measuring quality is not straightforward, and news quality may encompass other dimensions we are not capturing here.⁵² Nevertheless, the fact that newspapers would choose to produce the same newshole with significantly fewer journalists is suggestive of a decrease in the amount of original journalistic-intensive content produced (for instance, through a switch toward more soft news⁵³). In column 5, we provide some suggestive evidence of a decrease in the share of hard news produced by national newspapers compared to local newspapers after the introduction of advertising on television.⁵⁴ This evidence should be interpreted with caution: it is statistically significant at the 10 percent level and the number of observations is low (we only have data for 37 local daily newspapers and 10 national newspapers from 1964 to 1972). Moreover, to compute the share of hard news, we relied exclusively on front pages (as opposed to newspapers' full issues). Nevertheless, we find it reassuring that this suggestive evidence regarding hard versus soft news is consistent with the observed drop in the size of the newsroom.

Effect on Readership.—Finally, we study the extent to which the drop in advertising revenues affected the composition of readership. To do so, we use the readership data described above. This data is available for only 38 newspapers (but for all national newspapers), and results should thus simply be considered as suggestive. Table 6 presents the results. Following the collapse in advertising revenues and readjustment of content and prices, national newspapers seem to have switched to a less-educated and affluent readership relative to local newspapers, with fewer educated readers and white-collar workers and more blue-collar workers and farmers. (Note that the magnitude of the point estimates is higher than in the other tables. Because the outcome variable is here a percentage—e.g., the share of readers with tertiary education—we use the level rather than the logarithm of the outcome variable in the estimation.)

Heterogeneity of Effects and Reliance on Advertising Revenues.—All national newspapers were not relying on advertising revenues to the same extent in the first half of the 1960s. Hence, we should not expect them to have been affected in the same way by the introduction of advertising on television. In particular, the shock should have been weaker for newspapers that were not depending a lot on advertising revenues, while newspapers whose reliance was high should have experienced a greater shock. To test whether this is the case, we split our sample of national

⁵²For example, unlike Gentzkow and Shapiro (2010), we do not have information regarding the number of prizes won by newspapers. Neither do we have information on newspaper reputation or slant, although research has shown consumers tend to rate the quality of news outlets whose slant matches their own views higher (Gentzkow and Shapiro 2006, 2008).

⁵³According to Bennett (1983), “*serious political news costs more to report because it often requires the time and initiative of experienced journalists who know who to call, what to ask, and where to follow the leads. Soft news often requires no reporters at all, save perhaps sending a camera crew to shoot fires, floods, accidents, and other disasters that can be scripted back at the studio.*” In this article, we do not claim that producing soft news does not require journalists, but that it requires *fewer* journalists than producing hard news, consistent with the existing literature (see, e.g., Hamilton 2006; Henry 2007; Starkman 2014; Hamilton 2016; Cagé 2017; Cagé, Hervé, and Viaud 2017). The lower cost of soft-news production partly comes from the fact that, as highlighted by Baum (2002), part of this production happens through “*repackaging news.*”

⁵⁴We thank an anonymous referee for suggesting to us to perform this content analysis.

TABLE 6—READERSHIP

	No diploma	Primary education	Secondary education	Professional education		
<i>Panel A. Education</i>						
National × Post-TV ad	0.66 (1.54)	1.55 (2.26)	-2.44 (0.95)	0.38 (1.40)		
Newspaper fixed effects	Yes	Yes	Yes	Yes		
Year fixed effects	Yes	Yes	Yes	Yes		
R^2	0.05	0.72	0.38	0.62		
Adjusted R^2	0.02	0.71	0.35	0.60		
Observations	413	413	413	413		
	Farmers	Artisans and shopkeepers	Senior executives	Employees	Laborers	Inactive
<i>Panel B. Socio-professional category</i>						
National × Post-TV Ad	2.70 (0.97)	-0.12 (0.62)	-1.40 (0.83)	-8.29 (2.15)	4.44 (1.37)	0.18 (1.15)
Newspaper fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.44	0.19	0.11	0.62	0.13	0.75
Adjusted R^2	0.42	0.16	0.07	0.60	0.10	0.74
Observations	413	413	413	413	413	413

Notes: Time period is 1960–1974. Models are estimated using OLS estimations. Standard errors are clustered at the newspaper level. All the estimations include newspaper and year fixed effects. The dependent variables are in level. Variables are described in more detail in the text.

TABLE 7—HETEROGENOUS EFFECTS: RELIANCE ON ADVERTISING OF NATIONAL DAILY NEWSPAPERS BEFORE THE SHOCK

	Ad revenues		(Listed) ad price		Subscription price		Share of subscribers		Number of journalists		Newshole	
	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High
National × Post-TV ad	-0.08 (0.19)	-0.37 (0.12)	-0.33 (0.13)	-0.50 (0.08)	-0.14 (0.03)	-0.08 (0.03)	0.20 (0.22)	0.28 (0.14)	-0.18 (0.07)	-0.24 (0.09)	-0.01 (0.12)	-0.10 (0.05)
Newspaper FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.58	0.57	0.19	0.19	0.89	0.89	0.14	0.16	0.54	0.51	0.53	0.56
Adjusted R^2	0.57	0.56	0.18	0.18	0.89	0.89	0.13	0.15	0.54	0.50	0.53	0.55
Observations	968	975	760	737	975	965	975	965	975	959	992	962

Notes: Time period is 1960–1974. Models are estimated using OLS estimations. Standard errors are clustered at the newspaper level. All the estimations include newspaper and year fixed effects. The dependent variables are in level. Variables are described in more detail in the text. In “Low” columns, only the national daily newspapers whose reliance on advertising revenues were below the median in 1966 are included. In “High” columns, only the national daily newspapers whose reliance on advertising revenues were above the median in 1966 are included.

newspapers between those that were highly reliant on advertising revenues before the shock (in 1966) and those whose reliance was lower.⁵⁵ The threshold is simply defined using the median of the share of advertising in total revenues in 1966 (we use the median to guarantee a sufficient number of national daily newspapers in both categories). Table 7 presents the results. The “low” columns show the effect of the introduction of advertising on television when we only considered national

⁵⁵We would like to thank an anonymous referee for suggesting this test.

daily newspapers whose reliance on advertising revenues in 1966 is below the median, and the “high” columns this effect for the national daily newspapers whose reliance is above the median (the control group consists of the same sample of local daily newspapers in all the columns). With the exception of the subscription price, we find that the shock was stronger for “high” national newspapers, i.e., national newspapers whose reliance on advertising revenues was above the median in 1966, than for “low” newspapers. E.g., we observe a 24 percent decrease in the number of journalists of the national daily newspapers highly reliant on advertising revenues, compared to a 18 percent decrease in this number for national daily newspapers whose reliance is lower. Moreover, for national newspapers highly reliant on advertising revenues, we obtain a 10 percent decline in the newshole compared to local newspapers, and this decrease is statistically significant at the 5 percent level. These results should be interpreted with caution given the low number of national daily newspapers in each category, but they are consistent with the empirical strategy we use in this paper that suggests a heterogeneous effect of the introduction of advertising on television depending on the reliance on advertising before the shock.

C. Controlling for Parallel Trends

The before-after event study approach enables us to control for time-invariant, newspaper-specific effects and general time trends. As a validity check of our DiD identification strategy, we present visually the coefficients of the following specification where we interact the year fixed effects with the national newspapers indicator variable:

$$(2') \quad y_{n,t} = \alpha + \sum_{t=1960}^{1974} \delta_t (\gamma_t \times D_{national\ news}) + \lambda_n + \gamma_t + \epsilon_{n,t}$$

where 1960 is the base year and γ_t are as before year fixed effects. Figure 6 presents the results for our outcome variables of interest.

We find no statistically significant effect (with a point estimate close to zero) for the interaction between the year fixed effects and the national newspapers indicator variable before the shock, whether we consider advertising revenues, advertising price, subscription price, circulation, the number of journalists, the newshole, or the share of employees among readers and the share of farmers and laborers among readers. This is reassuring as to the validity of our DiD strategy. Moreover, as expected given the results of Tables 3, 4, and 5, we show that the introduction of advertising did not affect newspapers' circulation nor their newshole. By contrast, we observe a decrease in both advertising revenues and the advertising (listed) price, as well as in the subscription price. For all these variables, the shock is “on impact” and lasts (at least) until 1974. Furthermore, we also find an increase in the share of farmers and laborers as well as a decrease in the share of employees “on impact.” However, given the lower number of observations for these variables, these results have to be interpreted with caution.

Note that the drop in subscription and ad prices occurs the year of the policy announcement (i.e., 1967). This is not surprising given (i) the ease with which

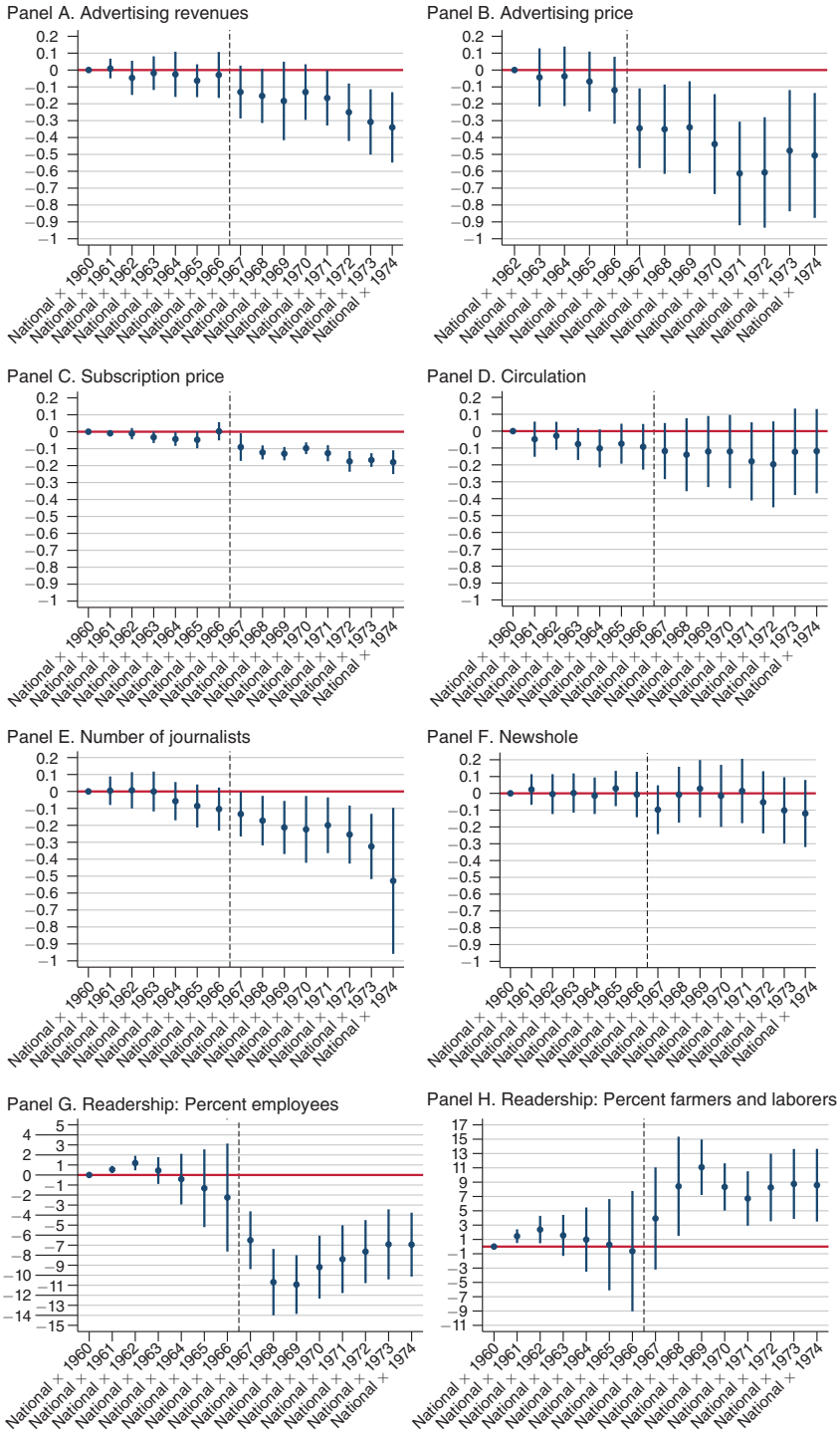


FIGURE 6. CONTROLLING FOR PARALLEL TRENDS

Notes: The figure shows the coefficients from the following estimation: $y_{n,t} = \alpha + \sum_{t=1960}^{1974} \delta_t (\gamma_t \times D_{national\ news}) + \lambda_n + \gamma_t + \epsilon_{n,t}$. 1960 is the base error except for panel B given that listed price data is not available in 1960 and 1961. Standard errors are clustered at the newspaper level. Statistical significance is measured at the 10 percent level.

newspapers can adjust their prices and (ii) that there was uncertainty as to the immediacy of the reform when it was announced. Presumably, the observed price adjustments also reflect the sudden and large shock to advertisers' willingness to pay for newspaper readers' attention. Recall from Section IIIC that the ORTF increased its advertising revenues by €82.3 million between 1967 and 1968 with the airing of only 184 minutes of advertising in total (by comparison, national newspapers lost €49.53 million over the same period). Clearly, companies intent on advertising on television (an entirely new platform) invested significant time and sums of money in the process, and the €82.3 million of additional advertising revenues raised by the television agency in 1968 are but a lower bound on the cost they must have incurred. This large investment made by the advertising companies in the new platform, in turn, translated into a sudden and significant negative shock to newspapers' ad revenues, thereby also suggesting a somewhat large degree of substitutability between the two advertising platforms.⁵⁶

Finally, regarding the number of journalists, the relative decrease in the size of the newsroom becomes statistically significant only in 1968, and the magnitude of the effect becomes stronger with time. The fact that employment decisions would take longer to materialize was to be expected given the rigidity of the French labor market.

V. Interpretation, Discussion, and Robustness Checks

A. Interpreting the Results

The model developed in Section I highlighted how a drop in advertising revenues had the potential to reduce the newspaper's production of journalistic-intensive content and lead to a less affluent and educated readership. Our desire to carry out comparative statics limited the generality of the model we could construct. In particular, it implied we could accommodate only limited dimensions of heterogeneity of preferences. In this section, we interpret our empirical findings in light of the predictions of our theoretical framework and, when necessary, in light of possible extensions.⁵⁷

The fall in advertising revenues and advertising prices is explained by the arrival of an alternative advertising platform. Explaining our apparent absence of change in the quantity of advertising despite the lower advertising prices is less straightforward. One possible rationalization is as follows. Suppose companies wishing to advertise not only value large readerships but also exclusivity (i.e., they are willing to pay to prevent their rivals from advertising in the same newspaper). Then, advertisers' lower willingness to pay for *exclusive* access to readers' attention will lower

⁵⁶ Recall from Section IIIC that total television advertising revenues increase year after year as the daily number of minutes of ads is gradually raised, but that average advertising revenues (per minute of advertising) decrease over time, which may either reflect the fact that the first companies to advertise on television are those with the highest willingness to pay for it or suggest the existence of negative externalities among advertisers.

⁵⁷ The Appendix includes an extension in which we analyze the robustness of our predictions in a duopoly setting. In the online Appendix, we model journalistic-intensive content as quality and again derive a positive relationship between journalistic-intensive content and advertising revenues. Finally, we also allow the newspaper to sell subscriptions in addition to individual issues in order to engage in second-degree price discrimination.

the newspapers' incentives to grant exclusivity, which may offset the temptation to decrease the quantity of advertising that follows from lower prices.⁵⁸

To continue, the decrease in the number of journalists employed by national newspapers combined with the absence of change in the newshole imply a readjustment toward less journalistic-intensive content. This finding suggests that national newspapers either decreased the average quality of their stories—it took fewer journalists to produce them—and/or printed fewer hard stories and more soft stories. In our empirical analysis, we provided suggestive evidence of the latter mechanism. A third possibility is that national newspapers chose to rely more on wire services instead of producing their own original content, which, although may not imply a fall in quality per se, would still raise questions about the industry's ability to produce diverse information.⁵⁹ This decrease in the production of journalistic-intensive content therefore lends support to our theoretical predictions. Providing quality or original journalistic-intensive content is costly but has the potential to both increase the size of the readership and/or attract readers who are more appealing to advertisers. When advertising revenues decline, newspapers' incentives to invest in news quality thus fall. Consistent with this interpretation, we also provided empirical evidence suggestive of a readjustment towards a less affluent and educated readership.

The fact that newspapers would react to lower advertising revenues by increasing the gap between the unit price and the average subscription price is not difficult to rationalize. This pricing readjustment could, for instance, reflect changes in the preferences of the average marginal advertisers (see, e.g., Weyl 2010). In the online Appendix, we build a model in which a newspaper can sell both subscriptions and individual issues. We then investigate the relationship between the price gap and the reliance on advertising revenues. We show that a drop in advertising revenues always increases the price gap.

Further, the fact that national newspapers would *decrease* their subscription price is striking. Indeed a robust prediction of two-sided models (with empirical support; see, e.g., Seamans and Zhu 2014) is that newspapers should react to lower advertising revenues by increasing reader prices (the “waterbed” effect). In Section I, we showed that newspapers had incentives to reduce their production of journalistic-intensive content when faced with lower advertising revenues, and that this change in content could translate into a lower subscription price. Coherent with this interpretation, as discussed above, we find empirical support for a decrease in news quality (as measured by the size of the newsroom) and the adoption of a less affluent readership.

To continue, we find that newspapers' changes in prices and content leave their total number of units sold unaffected, but increase their share of subscribers. The latter finding is consistent with the decrease in the subscription price and absence of change in the newsstand price. The absence of change in the total number of units sold is seemingly at odds with our theoretical predictions whereby newspapers have lower incentives to attract a large readership when advertising revenues decline.

⁵⁸ A simple model in which this effect is at play is available from the authors upon request.

⁵⁹ To the best of our understanding and our content analysis, unlike in the United States, French newspapers relied on wire services to obtain information and facts, not to print entire stories.

Given that advertisers likely cared not only about the number of readers but also about their characteristics (e.g., their wealth), it is plausible that newspapers reacted to the drop in advertising revenues by adopting a less affluent but potentially larger readership.⁶⁰ Finally, we note that the increase in the share of subscribers mechanically inflates the number of units sold reported (since the typical occasional reader does not purchase every single issue of the newspaper). In case the probability that a subscriber reads a given issue is lower than the probability that an occasional buyer reads a purchased issue, an absence of change in total units sold actually implies a fall in the average number of *distinct* readers.

B. Discussion

Comparability of National and Local Newspaper Markets.—Both the national newspaper market and the average local newspaper market are oligopolies, which is reassuring as to the comparability of both segments. However, one may be concerned that these two segments still differ in their *degree* of competition, which may potentially bias our results given that local newspapers were also affected by the introduction of advertising on television (albeit to a much lesser extent). We address this issue in two ways. First, in online Appendix Table D10, we show that our results are robust to dropping the few newspapers that are in a monopolistic situation from 1960 to 1974, thereby making both segments more alike.⁶¹ Second, in Section I, we built upon our theoretical framework to argue that the magnitudes of the changes in reader prices and numbers of journalists should be *lower* in more competitive markets, essentially because of greater market fragmentation. In practice, determining which of the national or the average local newspaper market is more competitive is challenging. If, as many believe, competition is overall more intense in the national newspaper segment (as, for instance, suggested by national newspapers' smaller operating margins), the resulting bias would work against us and our findings would be under-estimates of the real effects.

Subsidies.—During our period, daily newspapers were subsidized through reduced VAT rates, subsidized paper prices (also through a reduced VAT rate), and reduced rates for transport services provided by the state postal and train agencies. These subsidies applied indiscriminately under the same terms to all local and national newspapers until 1973, independently of their political orientation, profitability, etc.

Given that the same VAT rates and paper prices applied to both local and daily newspapers, we are not concerned about threats to our identification strategy.

⁶⁰To be clear, we are not claiming that advertisers post-1967–1968 targeted a less affluent readership, but rather that newspapers catered less to what advertisers desired. If advertisers targeted consumers belonging to a (relatively) high-income group, newspapers' incentives to reach these readers must have been lower post-1967–1968. Consistent with this view, it seems unlikely that the composition of newspaper advertisers changed dramatically following the introduction of a few minutes of television advertising. This observation leads us to think that the readjustment toward a less affluent readership is not driven by changes in ad targeting. Unfortunately, the information we gathered concerning newspaper ads does not allow us to test the validity of this hypothesis directly.

⁶¹*La Nouvelle République Du Centre Ouest* and *Ouest France* were monopolies in the counties where their headquarters were located.

However, although both local and national newspapers relied on postal services to deliver subscriptions, only national newspapers needed transportation by train to ship newspapers from their printing facilities in Paris to provincial towns. One may thus be concerned about differential trends in postage and train rates. To address this concern, we collected annual data on postage and train rates from an annual industry publication. Details regarding the data and sources are provided in the online Appendix Section B.

Online Appendix Figure C9 shows the evolution of postage and train rates from 1963 to 1974. The evolution of both rates suggests that, if anything, from a costs perspective, adopting a subscriber-based readership must have become *less* tempting to national newspapers relative to local newspapers after 1967.

The French government introduced subsidies to newspapers with low advertising revenues and/or a low circulation in 1973. We do not have information on the recipients of these direct subsidies. However, as we explain below, in Table D3 in the online Appendix, we show that our results are robust to focusing on the 1960–1971 period.

External Validity.—Our analysis relied on French data and an event that occurred some fifty years ago, and may thus raise concerns about our ability to shed light on today's trends. Could it be that the French newspaper industry is unique in some fundamental ways? Or could it be that the industry's current migration online has entirely changed the economics of journalism?

The print newspaper industry—which, although in decline, still represents a sizable share of the news media industry⁶²—is similar across Western countries. The distinction between national newspapers and local newspapers is ubiquitous. Although the number of national newspapers in France may seem high in comparison to the United States, it is equivalent to that found, for instance, in the United Kingdom or Italy.⁶³ Everywhere the reliance on advertising revenues is significant, and everywhere advertising revenues are in decline. Further, the ability to purchase newspapers via subscriptions or at newsstands is also common across countries.⁶⁴ Finally, although subsidies are perhaps more prevalent in France than elsewhere, fortunately for us, the types of subsidies that may make the French newspaper industry distinct in some respects are introduced only at the very end of our period of interest (see above).

Undoubtedly, the migration online of news companies has led to significant changes in the market for news. Though a large number of journalists have become independent, we take the view that the need to share resources, develop a brand/reputation, the gains from specialization, and the returns from the bundling of diversified content, all suggest that news companies are unlikely to disappear in the years

⁶² For instance, the Pew Research Center reports in its 2016 *State of the News Media* report that 51 percent of Americans who read a newspaper read it exclusively in print.

⁶³ There were 10 national newspapers circulating in 2016 in the United Kingdom: *Daily Express*, *Daily Mirror*, *Financial Times*, *Independent*, *Times*, *Daily Mail*, *Daily Star*, *Guardian*, *The Sun*, and *Telegraph*. There were 9 national newspapers circulating in Italy in 2017: *Corriere della Sera*, *La Repubblica*, *La Stampa*, *Il Sole 24 Ore*, *Il Messaggero*, *La Nazione*, *Il Fatto Quotidiano*, *Il Tempo*, and *Il Manifesto*.

⁶⁴ One difference between the United States and France is the former's relatively high share of subscribers, which, we conjecture, may be due to the larger share of population living in suburbs.

to come. If anything, the decrease in fixed and marginal costs brought about by the Internet has increased the number of news companies. This increase in competition for consumers has made it harder for online news companies to charge for their content, which exacerbates their reliance on advertising revenues to finance journalism and thus magnifies the mechanisms we have highlighted in this paper.

C. Robustness

We perform several robustness checks. This section briefly describes them; the detailed results for these tests are available in the online Appendix.

Bootstrap.—The low number of national newspapers may be a potential threat to our empirical estimation given the supposedly high degree of auto-correlation in the considered outcomes variables. To deal with this issue, we show that our results are robust to using bootstrap standard errors. Online Appendix Table D1 presents the results. Our estimates are robust to accounting for autocorrelation.

Dropping 1968.—The year 1968 was troubled in France, with a period of civil unrest, demonstrations, and numerous strikes. We show our results are robust to dropping this year from our sample of analysis (online Appendix D2).

Focusing on 1960–1971.—As we highlighted in Section III, a third television channel was introduced in 1972. This additional channel may have affected readers' preferences. In the online Appendix Table D3, we show that our results are robust to focusing our analysis on the 1960–1971 period. All our results hold despite the lower number of observations, except for the change in the subscription price, which is no longer statistically significant. The effect on the number of journalists is still statistically significant at the 1 percent level: the number of journalists employed by national newspapers now decreases by 15 percent compared to that of local newspapers. The relatively lower magnitude of the effect (compared to the 21 percent estimation in Table 5) was to be expected given that hiring/firing decisions in France are rather rigid. Moreover, our results are equally robust to reducing even further the historical window used to capture the effect of the introduction of advertising on television, and this despite a much lower number of observations. If we focus on the 1964–1971 period (i.e., the years during which both and only the first and the second television channels were broadcasting), our results remain unchanged (online Appendix Table D4).

Dropping Paris Jour and Paris Presse.—As highlighted in Section IIA, two daily national newspapers, *Paris Jour* and *Paris Presse*, exit during our period of interest (in 1972 and 1970, respectively). In online Appendix D5, we show that our results are robust to dropping these two national newspapers. If anything, the increase in the share of subscribers is stronger.⁶⁵

⁶⁵ More generally, our results are robust to dropping any national newspaper. No particular national newspaper drives our results.

Industry-Specific Time Trend.—As an additional robustness check, we show that our results are robust to controlling for industry-specific time trends. Specifically, we estimate

$$(3') \quad y_{n,t} = \alpha + \beta_1(D_{after} \times D_{national\ news}) + \mu_{1national}t + \lambda_n + \gamma_t + \epsilon_{n,t}$$

where $\mu_{1national}t$ is a national newspapers industry-specific trend coefficient multiplying the time trend variable t . The introduction of these industry-specific time trends allows treatment and control newspapers to follow different trends in a limited but potentially revealing way. Online Appendix Table D6 shows that our results are robust to adding this control.

Large Regional Newspapers.—A number of local daily newspapers in our dataset can be considered as “regional” newspapers because they circulate across many counties. Specifically, on average, local daily newspapers circulate across more than 3 counties and across 1.7 regions.⁶⁶ However, these numbers are driven by a few outliers: the median number of regions across which local newspapers circulate is one. Only six newspapers circulate across more than three regions during our period of interest: *Centre Presse*, *Le Dauphiné Libéré*, *La Dépêche Du Midi*, *L’Echo Du Centre*, *La Montagne*, and *La Tribune Le Progrès*. Online Appendix Table D7 shows that our estimates are robust to dropping these large regional newspapers.

Weighting Newspapers by Their Circulation.—In the main analysis, we gave each newspaper the same weight in the regressions. As appears clearly in the summary statistics table, some newspapers are much larger than others. As an additional robustness check, we recompute our estimates by weighting newspapers with their circulation at the beginning of our period. Online Appendix Table D8 presents the results. Our main findings are unaffected by this alternative approach. Moreover, the decline in the newshole is now statistically significant, but only at the 10 percent level.

Balanced Sample.—Finally, in the main analysis, the number of observations varies depending on the dependent variables under consideration. This is due to the fact that for some newspapers-years there are missing values for some dependent variables but not others (this occurs because we have used different data sources for different dependent variables). As a robustness check, we recomputed our estimates on a sample that has every dependent variable non-missing. Online Appendix Table D9 presents the results. Despite the lower number of observations (695), our main findings are unaffected by this alternative specification, to the exception of the increase in the share of subscribers (but the effect on the share of subscribers is only statistically significant at the 10 percent level in our main specification). In particular, we find a 41 percent decrease in the advertising price, a 13 percent decrease in the subscription price, and a 17 percent decrease in the number of journalists

⁶⁶A region is a French territorial administrative unit that comprised a little over four counties (*départements*) on average during our period of interest.

employed by national newspapers compared to that of local newspapers, all statistically significant at the 1 percent level.

VI. Conclusion

The newspaper industry is in the midst of a severe crisis. A factor often invoked to explain this state of distress is the strong drop in advertising revenues legacy newspapers have experienced following the advent of the Internet. Concomitant to this decrease in advertising revenues, the industry's business model is evolving with, among other changes, a tendency for newspapers to reduce the size of their newsroom. In this paper, we build a model in which a monopoly newspaper extracts revenues both from readers and advertisers. The newspaper chooses the size of its newsroom/quality of its content, and readers are heterogeneous in the relative amount of journalistic-intensive content they prefer. We show that a drop in advertising revenues induces the newspaper to lower the quality of its content, which, concurrent with a decrease in the subscription price, changes the composition of the readership.

These predictions are consistent with the empirical evidence we obtain using data on the French daily newspaper industry between 1960 and 1974. Using novel annual data and the introduction of advertising on television, we compare the pre-to-post-advertising on television change in advertising revenues of national daily newspapers to the change in advertising revenues of local daily newspapers. We find the introduction of advertising on television leads to a decrease in advertising revenues of national newspapers compared to local newspapers. This shock propagates to the reader side of the newspaper market with a fall in the subscription price. We also show the introduction of advertising on television leads to a sharp decrease in the number of journalists employed, but no change in the quantity of news. We infer from these findings that national newspapers reacted to the drop in advertising revenues either by decreasing the quality of their content or by producing fewer hard news. In the course of the analysis, we provided evidence suggestive of the latter mechanism.

The impact of the Internet on advertising markets for news media is receiving increasing attention (see, e.g., Athey, Calvano, and Gans 2013). However, despite the intrinsic policy importance of the news industry, empirical evidence regarding the consequences of declining advertising revenues on the pricing and quality choices of the media is scant. Although our empirical strategy exploits a moment in French history that ended 50 years ago, our findings have clear relevance and implications for the twenty-first-century media industry. They suggest media outlets will have lower incentives to invest in journalism if advertising revenues are to continue to decline. Our results also point toward an increasingly subscriber-based readership.

In addition to reducing advertisers' willingness to pay for newspaper readers' attention, the Internet has also altered the media industry's structure in other ways, for instance, with the introduction of targeted advertising technologies (Athey and Gans 2010), with increasing consumer switching between media platforms (Athey, Calvano, and Gans 2013), and with an increasing ability for rival news

outlets to appropriate stories (Cagé, Hervé, and Viaud 2017). Exploiting the introduction of advertising on French television helps us isolate the consequences of a decline in advertisers' willingness to pay for readers' attention from the consequences of these other powerful changes, thereby shedding light on a number of important mechanisms at play.

APPENDIX

A. Proof of Proposition 1

PROOF:

We first derive the conditions stated in the main body that ensure $0 \leq p^R$, $0 \leq p^A$, $0 \leq q \leq 1$, $0 < \tilde{x}_l$, $\tilde{x}_r < 1$, $0 \leq d^R(p^R, q) \leq 1$, and $0 \leq d^A(p^R, p^A, q) \leq 1$. One verifies $p^R \geq 0$ if and only if

$$(A1) \quad \gamma \geq \max \left[\frac{1}{4} \left(2 + \alpha^2 + \sqrt{20 + 4\alpha^2 + \alpha^4} \right), \frac{1}{2} \left(\alpha^2 + \sqrt{4 + \alpha^4} \right) \right].$$

If (A1) holds, then it is also the case that $0 \leq p^A$ and $0 \leq q$. Equation (A1) also implies $0 < \tilde{x}_l = \frac{\gamma+1}{2\gamma^2-2-(2+\alpha^2)\gamma} \epsilon$. To ensure $\tilde{x}_r = \frac{3\gamma+1}{2\gamma^2-2-(2+\alpha^2)\gamma} \epsilon < 1$, we also require

$$(A2) \quad \epsilon < \frac{2\gamma^2-2-(2+\alpha^2)\gamma}{3\gamma+1},$$

which implies $q \leq 1$. The right-hand side of (A2) is positive because of (A1). Finally, (A1), $0 < \tilde{x}_l$, and $\tilde{x}_r < 1$ jointly imply $0 < d^R(p^R, q) = \frac{2\gamma}{2\gamma^2-2-(2+\alpha^2)\gamma} \epsilon < 1$.

Substituting the solution stated in Proposition 1 into $d^A(p^R, p^A, q)$ yields

$$(A3) \quad d^A(p^R, p^A, q) = \frac{\alpha\gamma}{2\gamma^2-2-(2+\alpha^2)\gamma} \epsilon.$$

Condition (A1) implies $d^A(p^R, p^A, q)$ is positive. To ensure $d^A(p^R, p^A, q) < 1$, we also require

$$(A4) \quad \epsilon < \frac{2\gamma^2-2-(2+\alpha^2)\gamma}{\alpha\gamma}.$$

Finally, our maintained assumption $\alpha < \sqrt{2}$ implies $3\gamma+1 > \alpha\gamma$, so that (A2) implies (A4).

We conclude the proof by verifying that the objective function (6) is strictly concave in (p^R, p^A, q) . The Hessian matrix H associated to (6) is given by

$$\begin{pmatrix} \frac{\partial^2 \Pi}{\partial p^R \partial p^R} & \frac{\partial^2 \Pi}{\partial p^R \partial p^A} & \frac{\partial^2 \Pi}{\partial p^R \partial q} \\ \frac{\partial^2 \Pi}{\partial p^A \partial p^R} & \frac{\partial^2 \Pi}{\partial p^A \partial p^A} & \frac{\partial^2 \Pi}{\partial p^A \partial q} \\ \frac{\partial^2 \Pi}{\partial q \partial p^R} & \frac{\partial^2 \Pi}{\partial q \partial p^A} & \frac{\partial^2 \Pi}{\partial q \partial q} \end{pmatrix} = \begin{pmatrix} -\frac{4\gamma}{\gamma^2 - 1} & -\frac{2\alpha\gamma}{\gamma^2 - 1} & \frac{2\gamma}{\gamma^2 - 1} \\ -\frac{2\alpha\gamma}{\gamma^2 - 1} & -2 & \frac{2\alpha\gamma}{\gamma^2 - 1} \\ \frac{2\gamma}{\gamma^2 - 1} & \frac{2\alpha\gamma}{\gamma^2 - 1} & -1 \end{pmatrix}.$$

We verify H is negative definite. Because H is real and symmetric, it has three real eigenvalues. To compute these eigenvalues, we solve for the polynomial $P(\lambda)$ representing the determinant of

$$\begin{vmatrix} -2\hat{\gamma} - \lambda & -\hat{\gamma}\alpha & \hat{\gamma} \\ -\hat{\gamma}\alpha & -2 - \lambda & \hat{\gamma}\alpha \\ \hat{\gamma} & \hat{\gamma}\alpha & -1 - \lambda \end{vmatrix},$$

where $\hat{\gamma} = \frac{2\gamma}{\gamma^2 - 1}$.

We obtain $P(\lambda) = \lambda^3 - (3 + 2\hat{\gamma})\lambda^2 - (6\hat{\gamma} + 2 - 2\alpha^2\hat{\gamma}^2 - \hat{\gamma}^2)\lambda - (4\hat{\gamma} - \alpha^2\hat{\gamma}^2 - 2\hat{\gamma}^2)$. Let λ_1, λ_2 , and λ_3 denote the three real solutions of $P(\lambda) = 0$. By definition, these solutions are the three eigenvalues of H . If all three eigenvalues of H are positive, all coefficients in $P(\lambda)$ must either be positive or negative. One obtains that all coefficients are non-positive if and only if

$$\gamma > \max \left[\underbrace{\frac{1}{6} \left(1 + 2\alpha^2 + \sqrt{37 + 4\alpha^2 + 4\alpha^4} \right)}_I, \underbrace{\frac{1}{4} \left(2 + \alpha^2 + \sqrt{20 + 4\alpha^2 + \alpha^4} \right)}_{II} \right].$$

One verifies $II > I$ if and only if $\alpha < \sqrt{2}$, which we have assumed throughout. To conclude, therefore, expression (6) is strictly concave in (p^R, p^A, q) if and only if $\gamma > II$.

Last, one also shows that $\alpha < \sqrt{2}$ implies both $1 + \sqrt{2} > II$ and $1 + \sqrt{2} > \frac{\alpha^2 + \sqrt{4 + \alpha^4}}{2}$, so that the case in which $\frac{\partial}{\partial \alpha} p^R > 0$ (i.e., $\gamma \in \left[\max \left[II, \frac{\alpha^2 + \sqrt{4 + \alpha^4}}{2} \right], 1 + \sqrt{2} \right]$) exists. ■

B. Competition

We here sketch the duopoly version of the model presented in Section I. There are two newspapers: N_1 and N_2 . Each newspaper N_i ($i = 1, 2$) chooses (p_i^R, q_i) . For simplicity, the marginal advertising revenue is constant and equal to $\alpha > 0$. Also, readers do not “multi-home:” they only purchase a single newspaper. Finally, to shorten expressions and ensure concavity of the newspapers’ optimization problems we set $\gamma = 4$ and assume the cost function is equal to $4q^2$. The rest of the setting is identical to that of Section I.

We focus on the feasible market configuration that is closest to the monopoly benchmark. In the configuration of interest, $q_1 < q_2$, that is, N_1 chooses a smaller newsroom than N_2 . Moreover, the market is not covered to the right of q_2 : the readers with the highest ideal content do not make a purchase.⁶⁷

We solve the model by assuming that newspapers choose their content in a first stage, observe each other's choice, and subsequently select their prices in a second stage. To ensure that all quantities satisfy the model's restrictions we impose $\alpha + \epsilon \leq 1/4$.

The reader indifferent between the two newspapers, denoted \tilde{x} , is found by rearranging

$$(A5) \quad \epsilon + \tilde{x} - 4(\tilde{x} - q_1) - p_1^R = \epsilon + \tilde{x} - 4(q_2 - \tilde{x}) - p_2^R,$$

which yields $\tilde{x} = \frac{1}{8}(4(q_1 + q_2) + p_2 - p_1)$. We solve the model by backward induction. In the second stage, N_1 chooses p_1 to maximize

$$(A6) \quad \Pi_1(p_1^R, p_2^R, q_1, q_2) = (p_1^R + \alpha)\tilde{x} - 4q_1^2,$$

and N_2 chooses p_2 to maximize

$$(A7) \quad \Pi_2(p_1^R, p_2^R, q_1, q_2) = (p_2^R + \alpha)(\tilde{x}_r - \tilde{x}) - 4q_2^2,$$

where the expression for \tilde{x}_r can be found in Section I. Solving the corresponding system of first-order conditions yields

$$(A8) \quad p_1^R = \frac{1}{41}(8\epsilon - 33\alpha + 76q_1 + 108q_2), \quad p_2^R = \frac{1}{41}(16\epsilon - 12q_1 - 25\alpha + 52q_2).$$

Substituting these prices in (A6) and (A7), we solve for the first stage of the game (i.e., the content choices). The corresponding computations yield

$$(A9) \quad q_1 = \frac{389}{15,988}(\alpha + \epsilon), \quad q_2 = \frac{20,735}{303,772}(\alpha + \epsilon).$$

Consistent with the market configuration, $1 > q_2 > q_1$. Moreover, $\partial(q_2 - q_1)/\partial\alpha > 0$, that is, an increase in advertising revenues leads to greater content differentiation. Finally, one also shows $p_2 > p_1$, that is, the newspaper which produces the greater share of journalistic-intensive content is able to charge a higher price to readers (because its residual demand is less price-elastic). Finally, one also shows $\Pi_2 > \Pi_1$: the newspaper with the larger newsroom enjoys higher profits in equilibrium.⁶⁸

⁶⁷ In the duopoly version of the model, there does not exist a market configuration in which readers with a low ideal content q are not served. This occurs because competition with N_2 to attract readers is such that N_1 's incentives to raise its demand through an increase in q_1 are lower than in the monopoly case.

⁶⁸ To show this market configuration, prices, and content choices constitute an equilibrium, we also show no company has an incentive to deviate in the first stage (e.g., N_1 choosing $q_1 > q_2$). Computations are available upon request.

Empirical Predictions.—In a duopoly market, a decrease in advertising revenues lowers:

- The average size of the newsroom $\frac{1}{2}(q_1 + q_2)$,
- The average price $\frac{1}{2}(p_1^R + p_2^R)$, and
- The average reader's ideal content $\bar{x}_r/2$.

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