

# Is online newspaper advertising cannibalizing print advertising?

Shrihari Sridhar<sup>1</sup> · S. Sriram<sup>2</sup>

Received: 12 August 2014 / Accepted: 18 August 2015 / Published online: 5 October 2015  
© Springer Science+Business Media New York 2015

**Abstract** During the past decade, the newspaper industry experienced significant erosion of revenues, predominantly in print advertising. The concomitant increase in the less rewarding online advertising has been unable to make up for this loss. As a result, for every \$1 increase in online advertising between 2005 and 2011, newspapers lost \$22 in print advertising. While it is conceivable that the overall change in the advertising landscape (such as the growth of targeted search advertising), contributed to the decline in print advertising, it is not clear whether the growth in online newspaper advertising aggravated or alleviated this global trend. We investigate this concern by studying how advertisers reallocate their media budgets over time between the online and print media within a newspaper. We perform our empirical analysis using unique panel data on account-level advertising expenditures in a Top 50 US newspaper from 2005 through 2011. After accounting for cross-sectional heterogeneity among advertisers and some factors that possibly drove both print and online newspaper advertising, we find a negative relationship between the ad spending in these two media options. Therefore, advertisers exhibit a higher propensity to decrease print spending when they increase their online spending compared to the scenario when online spending either remains unchanged or even decreases. Since we do not rely on exclusion restrictions, we cannot rule out residual factors that drove both print and online advertising and thus contaminated this relationship. However, such potentially confounding factors (e.g., change in total media budget) are likely to have induced a positive correlation between print and online advertising. Therefore, the negative relationship that we recover is suggestive of advertisers perceiving print and online

---

✉ S. Sriram  
ssrira@umich.edu

<sup>1</sup> Smeal College of Business, Pennsylvania State University, University Park, USA

<sup>2</sup> Ross School of Business, University of Michigan, Ann Arbor, MI, USA

newspaper advertising as substitutes. This, in turn, implies that the growth in online newspaper advertising exacerbated the overall decline in print advertising. Overall, we attribute 7-17 % of the decline in print newspaper advertising revenues between 2005 and 2011 to the growth of online newspaper advertising. We conclude that cannibalization should be a credible consideration in the marketing decisions of the newspaper. However, since a large portion of print advertising revenue decline also occurred for advertisers who never purchased online advertising from the newspaper, cannibalization within the newspaper is not solely responsible for the downward trajectory of print advertising .

**Keywords** Advertising · Newspapers · Cannibalization · Offline vs. online advertising · Econometric models

**JEL Classification** M31 · M37 · C31

## 1 Introduction

The newspaper industry has undergone significant decline over the last decade, with most newspapers experiencing eroding profitability or mounting losses. Several reputable newspapers such as the *Los Angeles Times* and the *Chicago Tribune* have even sought bankruptcy protection. Industry reports have identified loss in advertising revenues as the main reason for this trend (e.g., Edmonds et al. (2012)).<sup>1</sup> Notably, between 2005 and 2011, total advertising revenues across all U.S. newspapers fell by 52 %, or approximately \$25 billion. Given that advertising has traditionally contributed close to 80 % of newspaper revenues, this loss is significant. The loss in advertising revenues can be traced back to the steep decline in lucrative print advertising, which accounted for more than 90 % of the total advertising revenue; between 2005 and 2011, print advertising revenues in the newspaper industry declined by 56 % (Edmonds et al. 2012). A silver lining, however, is that with more readers turning to online sources for news, traffic at newspapers' websites has been steadily increasing. At the same time, partly as a result of increased traffic, advertising revenues from their news websites have also grown considerably; between 2005 and 2011, online newspaper advertising increased by 60 %. However, the concomitant increase in online advertising has not been able to make up for the loss in print advertising. For every \$1 increase in online advertising during this period, newspapers lost \$22 in print advertising.<sup>2</sup>

While it is conceivable that the overall change in the advertising landscape (such as the growth in targeted search advertising), contributed to the decline in print

---

<sup>1</sup>Although print circulation volumes have declined across the board, circulation revenues have remained relatively flat because of higher subscription prices (<http://stateofthedia.org/2009/online-intro/content-analysis/>)

<sup>2</sup>These figures were obtained from Newspaper Association of America ([www.naa.org](http://www.naa.org))

advertising, it is not clear whether the growth in online newspaper advertising aggravated or alleviated this global trend. The answer to this question depends on whether advertisers view print and online newspaper advertising as substitutes vs. as complements. If advertisers viewed the two media options within newspapers as *complements*, the growth in online newspaper advertising might have helped avoid an even greater loss of print ad revenue. Extant literature on integrated marketing communications (IMC) (e.g., Naik and Raman (2003) and Chang and Thorson (2004)) provides support for this conjecture. The reasoning is that exposing consumers to ads from multiple media can yield benefits (to advertisers) that are greater than the sum of the effects of advertising in each medium separately (i.e., the benefits are super-additive). In fact, Havlena et al. (2007) provide empirical evidence of synergies between print and online advertising. If advertisers internalize such synergies, they can use both print and online versions of a newspaper to serve impressions to their target audience, especially when there is significant overlap in the readership of these media.

An opposing rationale is that advertisers perceive redundancies in reaching the same audience via print and online newspaper advertising and thus view the two media options within a newspaper as *substitutes*. If advertisers indeed perceive that the two media options within a newspaper are substitutes, the growing attractiveness of online newspaper advertising is likely to have aggravated the decline in print. This is especially true because the rates for online advertising are significantly lower than those for print advertising, making it an inexpensive alternative. Furthermore, due to stiff competition from ad networks as well as from technology giants such as Google, Facebook, and Amazon, the rates for online display ads on newspaper websites have been declining steadily (Olmstead et al. 2012)). Thus, advertisers could be channeling media budgets away from print to online newspaper advertising. A quote from the *Wall Street Journal* (Steel and Ovide 2008)) summarizes this concern:

*“the cannibalization of print ad revenues is ... a problem... One common scenario is that a trusty local print advertiser ... that used to spend \$20,000 a year on advertising might now spend a quarter of that with the newspaper online and nothing in the print product. Thus, the newspaper company is now selling more digital ads, but the new sale is taking away from its bottom line.”* In light of this concern about cannibalization, newspapers, in some instances, are foregoing online ads with the hope of boosting, or at least, maintaining print advertising revenue (Rosenstiel et al. 2012)).

Given this apparent tension regarding the relationship between the two advertising media, our objective is twofold. First, we investigate how newspapers advertisers change their print ad expenditures when they change their advertising in the online version of a newspaper. Based on this evidence, we attempt to infer whether advertisers *perceive* print and online versions of the newspaper as complements or substitutes. Second, if advertisers view the two newspaper media options as substitutes, we seek to quantify the extent to which the growth of online newspaper advertising revenue is primarily responsible for the decline of print newspaper advertising. Furthermore, we identify how the tradeoff between print and online newspaper advertising varies by advertiser type (e.g., local vs. national advertisers). Based on these analyses, we

comment on the veracity of the cannibalization concern between the two media, and heterogeneity in its prevalence.<sup>3</sup>

There are two broad approaches to inferring the relationship between advertising in different media. The first approach focuses on the economic benefits, such as brand awareness (Jagpal 1981), sales (e.g., Naik and Raman (2003)), and purchase intent (e.g., Goldfarb and Tucker (2011a)), that firms actually derive from advertising in multiple media. The results can shed light on whether there are synergies from advertising in multiple media simultaneously, and consequently whether advertisers *ought to* view these media as substitutes or as complements. In the second approach, researchers infer the relationship between advertising in alternative media, as perceived by advertisers, by considering how they reallocate their ad budgets, i.e., based on their revealed preference (e.g., Seldon and C. Jung (1993)), Seldon et al. (2000) and Silk et al. (2002)).<sup>4</sup> We adopt the revealed preference approach to infer the relationship between print and online newspaper, as perceived by advertisers.

In order to infer the perceived relationship between advertising in the print and online versions of newspapers, we need information on how individual firms switch their media budgets between these two options as well with other media outside the newspaper over time. A common empirical strategy in the intermedia substitution literature (e.g., Bresnahan (1984), Seldon and C. Jung (1993), Seldon et al. (2000), and Silk et al. (2002)) is to rely on cross-price effects to identify the nature of the perceived relationship between two media. The rationale behind this approach is that the ad price per impression (analogous to CPM) in a given medium is the main driver of that medium's attractiveness to advertisers and, thus, its budget share. Also, cross-media CPM effects should exist only when advertisers view the two media in question as related. However, price per impression is an endogenous decision made by a newspaper in response to changes in the reader and advertising sides of the market. Therefore, our ability to infer the relationship between these two media options hinges on the quality of the instruments used to correct for this endogeneity (Rossi 2014).

In view of this concern, we adopt a descriptive approach that relies on how advertisers jointly change their ad spending in these two media over time to infer the perceived relationship between print and online newspaper advertising. However, the correlation between print and online spending observed in the data subsumes (a) the true complementary/substituting relationship between the two media, as perceived by advertisers, (b) cross-sectional differences in advertisers' intrinsic propensity to choose a medium, (c) correlated temporal shocks that affected print and online advertising expenditures for all advertisers (e.g., the great recession led to lower print and online ad spending for all advertisers) and (d) advertiser-specific correlated factors driving both print and online ad spending (e.g., the recession forced some advertisers to cut their media budgets more deeply than others).<sup>5</sup> The correlated temporal

<sup>3</sup>Since we do not have data prior to the existence of the online newspaper, we cannot infer how the existence of online newspaper advertising affected the newspaper's overall ad revenues.

<sup>4</sup>Goldfarb and Tucker (2011b) use a variation of this approach and study the effect of advertising bans in one medium (i.e., infinite price) on the demand and hence, ad prices in another medium.

<sup>5</sup>Technically, (d) is general enough to include (c). We present them as separate for clarity of exposition.

shocks between print and online newspaper advertising (i.e., (c) and (d)) partly arise because the period of our analysis saw significant changes in the advertising landscape, including changes in targeting technology, demographic changes in media consumption, and the great recession of 2008-09. Our empirical strategy is to isolate the effect of interest in (a) after accounting for (b), (c), and (d) using a rich set of controls. We control for (b) by considering the within-advertiser first differences in ad spending and for (c) by including time period specific fixed effects. While it is technically impossible to control for all of (d), we use a rich set of controls to account for advertiser-specific correlated variables. Subsequently, we discuss how the residual elements of (d) might affect the direction of our conclusion.

Our empirical analysis is based on data from a top-50 local U.S. newspaper serving a large metropolitan area. The data contain information on advertiser-level expenditures from January 2005 through December 2011 in the print and online versions of the newspaper. During this period, print advertising accounted for 95 % of the total ad revenue, while online advertising brought in the remaining 5 %. Analogous to the industry trend, our data reveal a decline in print advertising revenues accompanied by an increase in ad revenues from the newspaper's website.

Based on model-free analyses of within-advertiser changes in ad spending (i.e., after controlling for cross-sectional differences across advertisers), we find that advertisers exhibit a higher propensity to decrease print spending when they increase their online spending compared to the scenario when online spending either remains unchanged or even decreases. Further, descriptive analyses that account for cross-sectional heterogeneity among advertisers and some correlated unobservables over time, we find that an increase in online spending is associated with decline in print advertising. The negative relationship is especially pronounced for large local advertisers, who account for 64 % of the the newspaper's total ad revenue.

As alluded to earlier, we cannot completely control for all the advertiser-specific factors that possibly drove both print and online newspaper advertising over time. The possible presence of these correlated factors implies that the estimated tradeoff might not solely reflect the perceived relationship between the two media. We discuss two common types of advertiser-specific residual correlated unobservables: (i) change in the total media budgets, driven by exogenous factors such as the recession and (ii) common changes in the preference for the two media options within the newspaper, possibly in response to the growing attractiveness of other media options outside the newspaper. We argue that both these unobservables are likely to induce a positive correlation between the two advertising options within the newspaper. *Our finding of a negative tradeoff between online and print advertising within the newspaper, notwithstanding this untapped positive correlation, is likely to be a credible indicator of a substituting relationship.*

Based on the estimated tradeoff, we attribute 7-17 % of the decline in print advertising revenues between 2005 and 2011 to the growth of online newspaper advertising. Thus, cannibalization should indeed be a credible consideration in the marketing decisions of the newspaper. Our results have tangible implications for the newspaper industry. First, if newspapers devise strategies to prevent cannibalization (such as price bundling and tailored selling strategies), such attempts need to be focused on large, local advertisers where we find that cannibalization is more of a

concern. Second, rather than only worrying about cannibalization, newspapers ought to focus on winning back online and/or print advertising dollars from advertisers that have shifted to outside media options rather than foregoing digital dollars with the hope of gaining print ad revenues. In order to accomplish this, newspapers can focus their efforts on educating the ad sales force about the relative advantages of the newspaper's own online versus outside online media options, increasing sales force efforts at local advertisers, and altering commission structures to motivate salespeople to make both print and online ad sales.<sup>6</sup>

Our results also add to the literature on inter-media substitution. First, we provide a descriptive alternative to a cross-price effects approach to understand the nature of substitution among advertisers' media choices. Second, extant literature on inter-media substitution (e.g., Goldfarb and Tucker 2011a and b) empirically document that at a broad category level, advertisers perceive offline and online advertising as substitutes. In contrast, we differentiate between how advertisers within a newspaper tradeoff print advertising to online advertising, which more directly relates to cannibalization concerns for the newspaper as a platform. We also contribute to the literature on newspaper economics, by complementing work focused broadly on the effect of Internet penetration on print advertising Zentner (2012), and how readers substitute between the print and online versions of the newspaper (Gentzkow 2006)).

The remainder of the article proceeds as follows: We first discuss the data in detail and demonstrate model-free evidence of the reasons behind the decline in print advertising. Next, we present our empirical results and conclude by discussing the implications of our results for practitioners.

## 2 Data

Our data come from a newspaper based in a large, geographically isolated, U.S. city. It ranks among the top 50 in the nation in terms of daily circulation and has a local monopoly in its designated market area (DMA). The newspaper's circulation was in the 200,000–350,000 range, while its website attracted 16 million unique online visits, on average, between 2005 and 2011. The data contain monthly expenditure by each advertiser in the print and online versions of the newspaper from January 2005 through December 2011. The print advertising expenditure data were further broken down into four categories: display (run-of-print, henceforth ROP), pre-printed inserts (henceforth pre-prints), classifieds, and the Sunday magazine/supplement (henceforth magazine).

After excluding one-off advertisers, our sample had a total of 2253 advertisers. In Table 1, we present the composition of the newspaper's ad revenue from 2005–2011. Print advertising accounted for 95 % of the total ad revenue, while online advertising brought in the remaining 5 %. Within print advertising, ROP and pre-prints were the largest and accounted for 58 % and 32 % of the total ad revenue, respectively. Together, these two forms of print advertising were responsible for 90 % of the

---

<sup>6</sup>Although newspapers have increased their reliance on ad networks to sell online ads, 88 % of their digital ad revenues still came from their own sales staff during the period of our analysis (Rosenstiel et al. 2012).

**Table 1** Composition of advertising revenue

Composition of advertising revenue	Total invoice	Pre-prints	ROP	Classifieds	Magazine	Online
Total advertising revenue (millions of \$)	687.9	221.9	396.3	5.4	30	34.3
% of total advertising	100 %	32 %	58 %	1 %	4 %	5 %
# Advertisers	2253	740	1743	279	478	1083
Avg. ad expenditure per advertiser (millions of \$)	0.31	0.30	0.23	0.02	0.06	0.03
Avg. # advertising occasions per advertiser	22.71	11.99	18.12	10.27	11.51	10.33
Avg. ad expenditure per advertising occasion (thousands of \$)	13.44	25.00	12.55	1.88	5.45	3.07

newspaper's ad revenue and 95 % of print advertising. Classifieds, which used to generate a sizable fraction of the print ad revenues were reduced to inconsequential levels (about 1 %), mostly due to the advent of alternatives such as Craigslist (Santhanam and Rosenstiel 2012)).

## 2.1 Cross-sectional patterns

### 2.1.1 Differences across advertising options

We present a comparison of the five different types of advertising at the newspaper in Table 1. ROP had the largest number of advertisers, followed by online. On the other hand, an average advertiser spent more on pre-prints (\$300,000 over seven years), followed by ROP (\$230,000 over seven years). Advertisers spent significantly less online (\$30,000 over seven years). An average advertiser advertised in 22.71 out of the 84 months. Among individual advertising types, ROP had the highest frequency of 18.12. There are no discernible differences in frequency across the other types of advertising. Overall, these results suggest that print advertising, especially ROP and pre-prints, generated more revenues per advertiser than online advertising as a result of (a) high frequency of advertising and (b) high average conditional expenditure per advertising occasion.

### 2.1.2 Differences by advertiser type

We next explore differences in ad expenditures across advertisers by considering three bases of classification: (a) local vs. national advertising, (b) size of the advertiser, and (c) advertising exclusively in print or online version of the newspaper (henceforth, exclusive advertisers) or both (henceforth, hybrid advertisers). We recognize that an advertiser's decision to use any one/both media for advertising represents an endogenous choice. Therefore, we document differences across these types of advertisers without making a causal inference regarding how the exclusive/hybrid

*dichotomy affects advertising expenditures.*<sup>7</sup> In Table 2, we break down the number of advertisers and the corresponding ad revenue based on this classification. Below, we discuss these in detail.

### **Local vs. National Advertising**<sup>8</sup>

There are significantly more local (1,733) than national advertisers (520). Local advertisers also generate significantly more ad revenues than national advertisers. Overall, local advertisers constitute 77 % of accounts and are responsible for 69 % of the advertising revenue. However, an average local advertiser spent less on advertising than a national advertiser (\$275,000 for local advertiser vs. \$401,000 for national). This pattern of larger number of local advertisers, but lower expenditure per advertiser persists across advertising options except the Sunday magazine. We argue that national advertisers can reach only a fraction of their potential customer base by advertising in the local newspaper. Therefore, the local newspaper is likely to be more relevant and attractive medium for local rather than national advertisers. Together, these might explain why there are significantly more local advertisers in the data. However, national advertisers, by virtue of their larger geographic reach might also have larger media budgets, which is possibly the reason behind their higher average advertising expenditure.

**Small vs. Large Advertisers** We divide advertisers into four quartiles based on their total ad spend during the seven years of our data. Therefore, we have equal number of these advertisers when we consider the total invoice amount. Table 2 suggests that the highest quartile advertisers account for 93 % of the total revenue. The corresponding figures for ROP and pre-prints are 93 % and 97 %, respectively. Classifieds, Sunday magazine, and online advertising have more democratic contributions; the highest quartile advertisers account for 67 %, 79 %, and 81 % of their respective ad revenues, respectively.

**Hybrid vs. Exclusive Advertisers** We distinguish between advertisers that use the print or online versions of the newspaper exclusively from those using both versions of the newspaper. In our data, 883 advertisers (roughly 40 % of all advertisers) advertised in both the print and online versions of the newspaper at some point during the seven years. Henceforth, we refer to them as hybrid advertisers. Of the remaining advertisers, 1170 exclusively used the print version of the newspaper while 200 advertised only in the online version.

<sup>7</sup>We define an advertiser as exclusive if they only advertised in either the print or the online version of the newspaper during the entire period of our analysis. Therefore, the classification is purely cross-sectional and hence, constant over time. In subsequent analyses, we consider within-advertiser changes, which nets out any differences between these two types of advertisers.

<sup>8</sup>We define an advertiser as local if (a) the advertiser does not have a significant presence outside the local market, or (b) the advertiser uses the medium to communicate information specific to the local market. Under the second condition, we classify an advertiser with presence beyond the local market (e.g., AMC theaters) as local if the ads are likely to contain information specific to the local market (e.g., showtimes for movies).



**Table 2** Composition of advertising by advertiser type

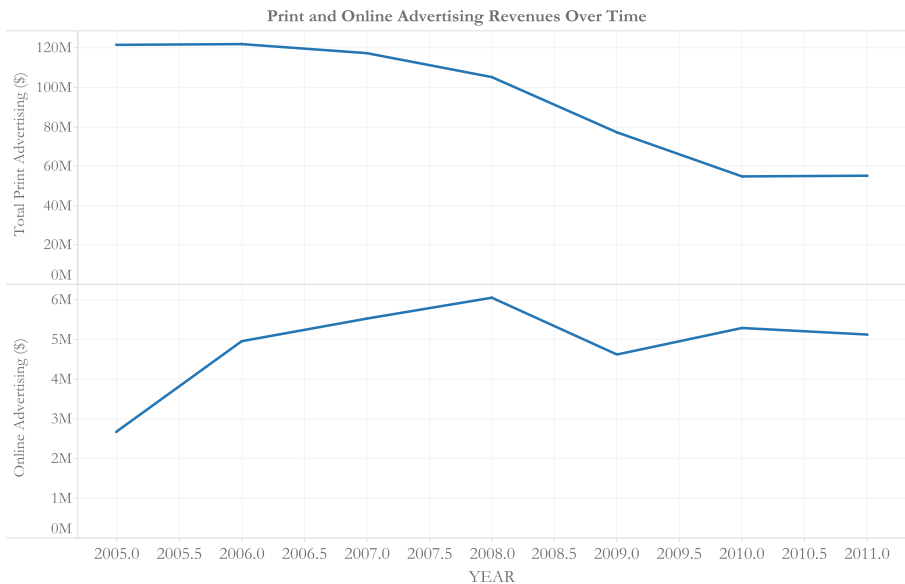
	Total Invoice		ROP		Pre-prints		Classifieds		Magazine		Online	
	# Advertisers	Ad Revenues (Millions of \$)	# Advertisers	Ad Revenues (Millions of \$)	# Advertisers	Ad Revenues (Millions of \$)	# Advertisers	Ad Revenues (Millions of \$)	# Advertisers	Ad Revenues (Millions of \$)	# Advertisers	Ad Revenues (Millions of \$)
Local vs. National	520	210.7	431	142.3	139	54.9	25	0.7	50	2.7	227	10.2
	1733	477.2	1312	254	601	167	254	4.7	428	27.3	856	24.1
Size	563	2	333	0.99	141	0.28	58	0.1	45	0.11	234	0.52
	563	9.8	416	5.29	158	1.38	77	0.37	112	1.06	238	1.69
	563	37.28	473	22.19	163	4.37	67	1.3	152	5.22	252	4.21
	564	638.78	521	367.84	278	215.9	77	3.62	169	23.58	359	27.85
Print-Only vs. Hybrid Advertisers	883	454.42	737	292.12	299	112.89	247	5.17	236	20.96	883	23.28
	200	11.00	NA	NA	NA	NA	NA	NA	NA	NA	200	11.00
	1170	222.46	1006	104.19	441	109.04	32	0.22	242	9.01	NA	NA

Table 2 points to some important differences between hybrid and the two types of exclusive advertisers. First, the three types of advertisers differ significantly in terms of their total ad expenditure. An average hybrid advertiser spent \$515,000 in advertising during the seven years of our data. On the other hand, an average print-only advertiser spent only \$190,000. Exclusively online advertisers were even smaller and generated only \$55,000 per advertiser over seven years. Second, the pattern that exclusive advertisers spent significantly less than hybrid advertisers holds for all types of print advertising, except classifieds. For example, an average hybrid advertiser spent \$396,000 on ROP between 2005 and 2011, while a print-only advertiser spent only \$104,000. On the other hand, a hybrid online advertiser spent significantly less (\$21,000) than an exclusive online advertiser (\$55,000).

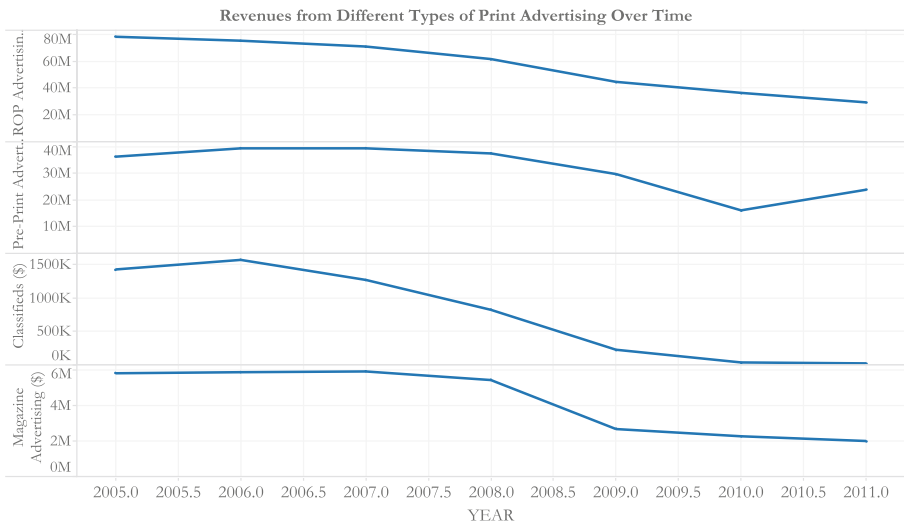
## 2.2 Temporal patterns

In Fig. 1, we present the temporal trend in overall print and online advertising. Print advertising decreased over time while online newspaper advertising increased steadily, barring a temporary decline during the recession of 2009. Further, Fig. 2 shows that all types of print advertising declined during this period. The decline was steepest for classifieds advertising, although the magnitude of loss was significantly higher for ROP advertising.

We present a comparison of the ad revenues in different types of advertising in 2005 vs. 2011 in Table 3. These data suggest that the newspaper's ad revenues decreased by 51 % between 2005 and 2011. While print advertising declined by 55 %, online ad revenues increased by 91 % during this period. These rates of decline are



**Fig. 1** Print and online advertising revenues over time



**Fig. 2** Revenues from different types of print advertising over time

consistent with those experienced by the U.S. newspaper industry; during the same period, the overall U.S. newspaper ad revenues declined by 52 %, print decreased by 56%, while online increased by 60 %.<sup>9</sup> Overall, for a \$1 increase in online ad revenues, the newspaper lost \$27 in print advertising.<sup>10</sup> While ROP was the single largest contributor and accounted for \$20 out of the \$27 decline in print advertising (i.e., 74 % of the total decline in print advertising), pre-prints were the second largest and accounted for \$5 of the \$27. Therefore, losses in ROP and pre-prints were responsible for 93 % of the total loss in print advertising.

### 2.2.1 Change in advertising by type of advertiser

In Table 4, we document how different types of advertisers contributed to the change in ad revenues between 2005 and 2011. Approximately 60 % of the loss in ROP and the gain in online ad revenues can be traced back to local advertising. Based on Table 2, we note that local advertisers accounted for 64 % of the total ROP ad revenues. Therefore, the higher contribution of local advertising to the change in ad revenues is commensurate with their contribution to ROP advertising. This pattern holds for all types of advertising, suggesting that local advertisers did not differ significantly from national advertisers in terms of the percentage change in ad revenues. Also, consistent with their higher contribution to overall ad revenues, large advertisers, especially those in the highest quartile, contributed to over 90 % of the decline in ROP, pre-prints, and online advertising. However, online advertisers gained

<sup>9</sup>We obtained the data from the Newspaper Association of America ([www.naa.org](http://www.naa.org)).

<sup>10</sup>As mentioned earlier, the U.S. newspaper industry lost \$22 for every dollar it gained in online advertising during this period. Therefore, the loss experienced by the focal newspaper is consistent with those experienced by a broad basket of newspapers in the U.S.

**Table 3** Changes in advertising revenue between 2005 and 2011

	Ad revenue in 2005 (millions of \$)	Ad revenue in 2011 (millions of \$)	Difference between 2005 & 2011 (millions of \$)	% change between 2005 & 2011	\$ change in ad revenue with a \$1 increase in online advertising
Total invoice	124.32	60.33	-63.99	-51 %	-26.17
Total print	121.64	55.20	-66.44	-55 %	-27.17
Pre-prints	36.21	23.84	-12.37	-34 %	-5.06
ROP	78.18	29.34	-48.84	-62 %	-19.98
Classifieds	1.43	0.02	-1.41	-98 %	-0.57
Magazine	5.81	2.00	-3.82	-66 %	-1.56
Online	2.68	5.13	2.45	91 %	NA

significantly more from advertisers in the fourth quartile; these advertisers accounted for 81 % of online ad revenues and 93 % of the gain in online advertising between 2005 and 2011.

We now turn to comparing exclusive vs. hybrid advertisers. In Table 4, we see that hybrid advertisers were responsible for 66 % of the decline in ROP advertising, but accounted for 74 % (based on Table 2) of the corresponding ad revenues. The same pattern holds, albeit to varying degree, across all types of print advertising. Furthermore, the ad revenues from exclusively online-only advertisers declined between 2005 and 2011. Therefore, the increase in online advertising came solely from hybrid advertisers. This pattern suggests that hybrid advertisers (a) reduced their print ad expenditures less than exclusive print advertisers and (b) increased their online ad expenditures more than exclusive online advertisers. *At this point, we need to recognize that hybrid and exclusive advertisers may not be strictly comparable, partly because advertisers endogenously chose to be in either group. Therefore, we cannot assess if this pattern is a function of advertiser characteristics or due to advertisers perceiving synergies between print and online advertising. Subsequently, we try to parse out the two alternative explanations by considering within-advertiser changes in ad expenditures in the two media, which would net out the cross-sectional differences between advertisers. A second caveat with drawing inferences regarding complementarity based on these preliminary patterns is that they are based on aggregated data. Hence, we cannot infer how individual advertisers modified their advertising in one medium based on how much they spent in the other.* In the next section, we perform our analyses using disaggregate advertiser-level data in order to account for these concerns.

### 3 Empirical analysis

We now present empirical evidence of how individual advertisers change their online and print advertising expenditures within the newspaper over time. Given that ROP

**Table 4** Decomposition of the loss in ROP advertising by type of advertiser

	ROP		Pre-Prints		Classifieds		Magazine		Online	
	Loss (Millions of \$)	Contribution to the Total Change	Loss (Millions of \$)	Contribution to the Total Change	Loss (Millions of \$)	Contribution to the Total Change	Loss (Millions of \$)	Contribution to the Total Change	Loss (Millions of \$)	Contribution to the Total Change
Local vs. National	-29	59%	-8.07	65%	-1.34	95%	-3.53	92%	1.53	62%
	-19.84	41%	-4.30	35%	-0.07	5%	-0.29	8%	0.92	38%
Size	-0.18	0%	0.00	0%	-0.04	3%	-0.02	0%	0.01	0%
	-0.81	2%	-0.28	2%	-0.16	11%	-0.26	7%	0.05	2%
	-3.17	6%	-0.26	2%	-0.33	23%	-0.99	26%	0.11	5%
	-44.69	92%	-11.83	96%	-0.88	62%	-2.55	67%	2.28	93%
Exclusive vs. Hybrid Advertisers	-32.24	66%	-4.9738	40%	-1.3078	93%	-1.9648	51%	2.84	116%
	-16.61	34%	-7.3994	60%	-0.0979	7%	-1.8503	49%	N/A	N/A
	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	-0.40	-16%

accounted for 74 % of the decline in print advertising, we use ROP as a proxy for print advertising. We use annual, advertiser-level spending data in these analyses. Past research (e.g., Clarke (1976) and Assmus et al. (1984)) has documented that advertising has long-term effects, lasting several months. If advertisers internalize these long-term effects, they can resort to specialized strategies such as pulsing (e.g., Dube et al. (2005)). By aggregating to the annual level, we reduce the risk of misspecification due to ignoring the long-term effects of advertising.

As discussed in the introduction, the common empirical strategy in the intermedia substitution literature (e.g., Bresnahan (1984), Seldon and C. Jung (1993), Seldon et al. (2000), and Silk et al. (2002)) is to rely on cross-price effects to identify the nature of the perceived relationship between two media. However, price per impression is an endogenous decision made by the newspaper in response to changes in the reader and advertising sides of the market. Therefore, our ability to infer the relationship between two media options hinges on the quality of the instruments used to correct for this endogeneity.

In view of this concern, we adopt a descriptive approach that relies on how advertisers change their print and online advertising expenditures within a newspaper over time. Given that advertisers' decisions to choose print and/or online options are endogenous, we need to be cautious while inferring complementary/substituting relationships between the two media based on the correlation in the corresponding ad expenditures.

First, we present some model-free evidence that accounts for cross-sectional heterogeneity in preference for advertising in the two media by considering within-advertiser deviations in ad expenditures in these media over time. Subsequently, we present descriptive regressions that account for both cross-sectional heterogeneity and some possible correlated unobservables using a rich set of controls.

### 3.1 Model-free evidence

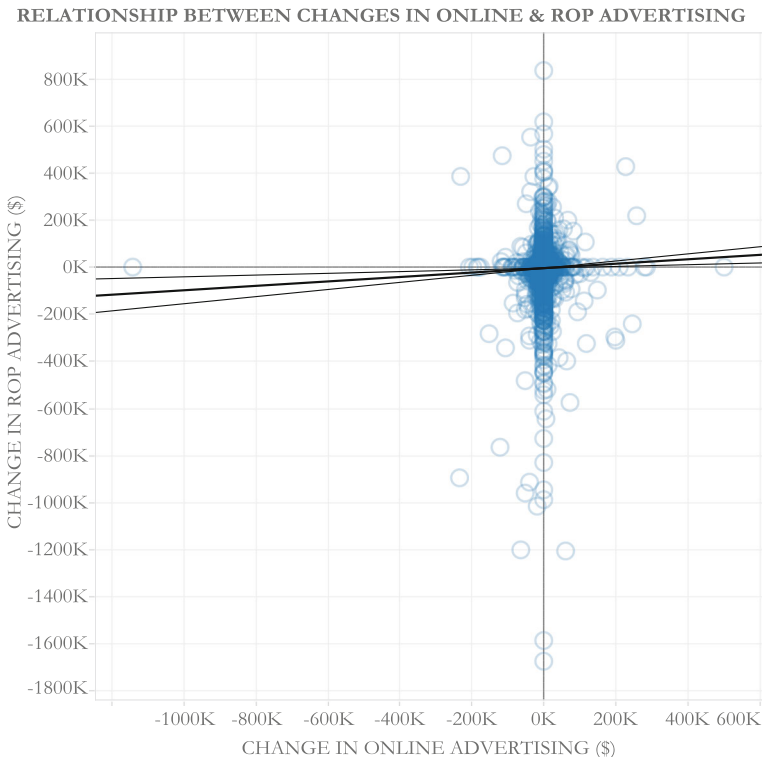
The data in Table 2 suggest that, out of the 1743 advertisers that used ROP advertising, 1006 were exclusive print advertisers. These exclusive advertisers contributed to 34 % of the decline in ROP advertising between 2005 and 2011. We argue that this decline is not a consequence of advertising shifting their ad expenditures from print to the online version of the newspaper. Therefore, our earlier conjecture that the overall change in the advertising landscape (such as the growth in targeted search advertising), drove some of the decline in print advertising.

Next, we consider how advertisers change their ROP and online ad spend from year to year. *Note that the year-on-year changes account for cross-sectional differences in advertisers' intrinsic preference to choose a medium.* In Fig. 3, we present a scatter plot of the year-on-year changes in ROP versus online advertising. The figure suggests that there is a positive, statistically significant relationship between changes in online and ROP ad spend. A priori, if advertisers are shifting their ad expenditures from print to online newspaper advertising, we would expect their changes in print

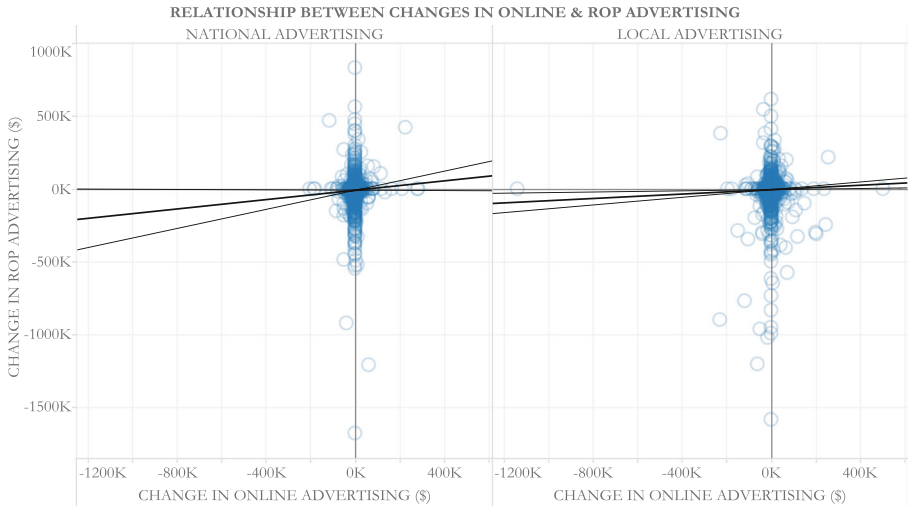
and online newspaper advertising to be negatively related. Therefore, the data patterns in Fig. 3 are in variance with our a priori expectation. Furthermore, the pattern in Fig. 3 suggests that the relationship between the two changes in ad expenditures is weak, i.e., changes in online expenditure can only explain 1 % of the change on ROP spending.

We further explore if the above relationship differs across local and national advertisers. The patterns in Fig. 4 suggest that the same positive relationship between changes in online and ROP expenditures persists. Nevertheless, the relationship is stronger and more statistically significant for local advertisers. Therefore, changes in online advertising expenditure is a better predictor of the corresponding changes in ROP ad expenditures for local, rather than national advertisers.

The positive association between changes in online and ROP ad expenditures runs counter to the notion that advertisers are shifting their print ad expenditures to the online version of the newspaper. Since ROP ad expenditures consistently declined during the period of our analysis, it is conceivable that the positive relationship is driven by decreasing ROP ad expenditures when advertisers decreased their spending in the online version of the newspaper. In order to verify this intuition, we explore if there is an asymmetric relationship between online and ROP ad expenditures based

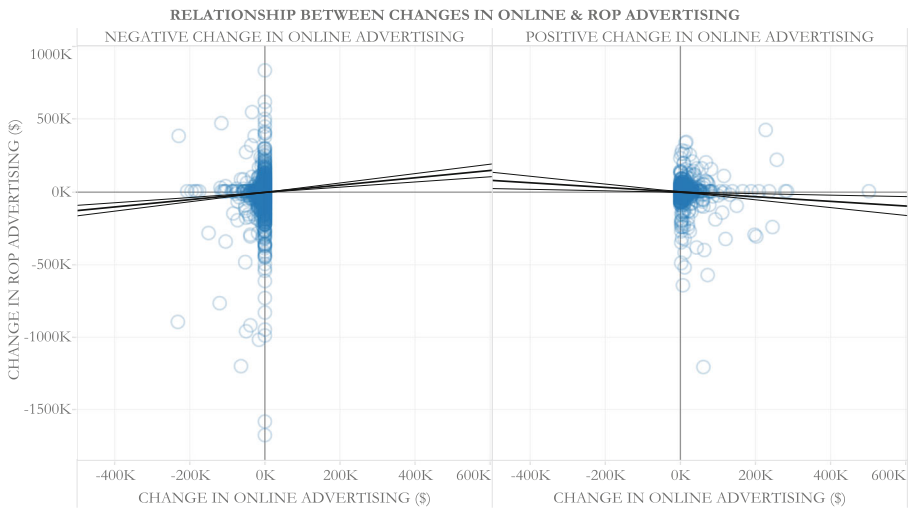


**Fig. 3** Relationship between changes in online & ROP advertising



**Fig. 4** Relationship between changes in online & ROP advertising. National advertising. Local advertising

on whether advertisers increased vs. decreased their spending online. We present the corresponding scatter plots in Fig. 5. These results suggest that when online ad expenditure decreased, so did ROP ad expenditure, i.e., there appears a positive relationship. On the other hand, when online ad expenditure increased, it was associated with a decrease in ROP ad expenditure. Both these relationships are statistically significant, although the negative relationship is smaller in magnitude than the positive



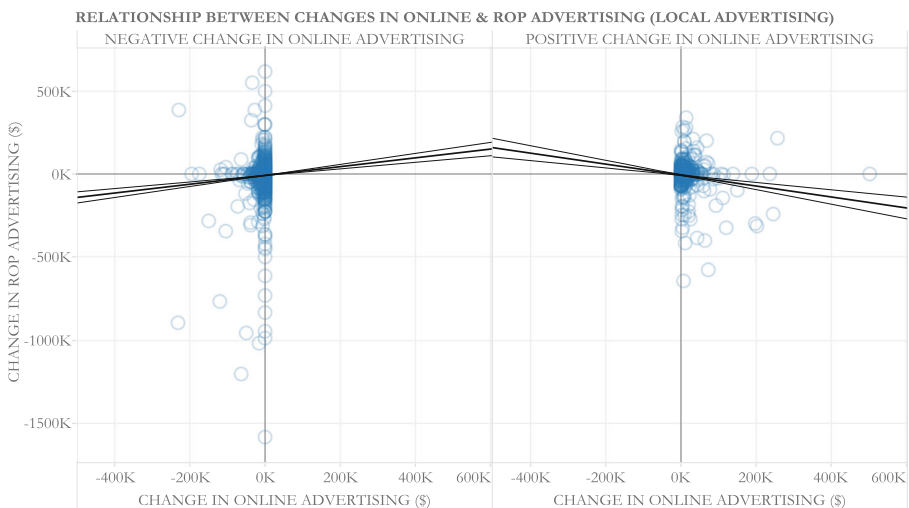
**Fig. 5** Relationship between changes in online & ROP advertising. Negative change in online advertising. Positive change in online advertising



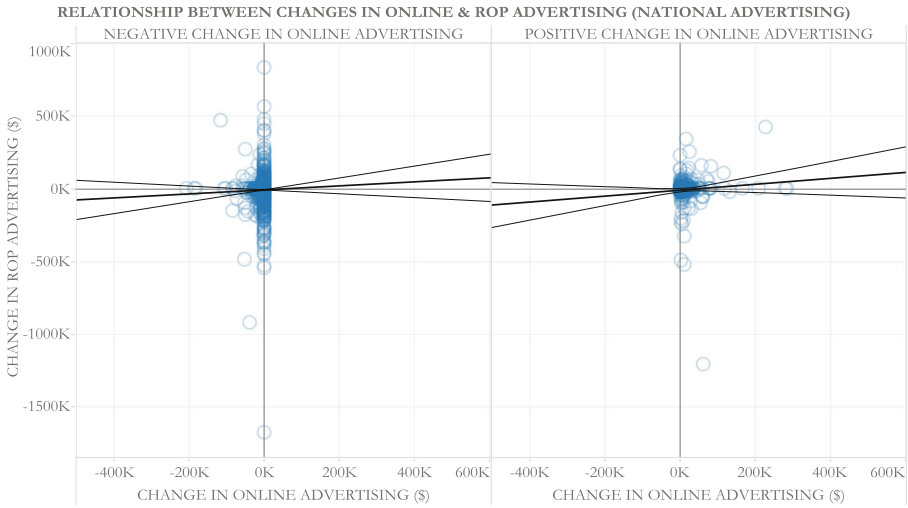
effect. Therefore, the overall positive association between the two deviations was driven by advertisers decreasing their ROP ad spend when they spent less on the online version of the newspaper.

These patterns suggest that when advertisers increased their online ad expenditures with the newspaper, there was a tendency to decrease print advertising, a pattern that is potentially consistent with substitution and cannibalization. However, given a substituting relationship, the joint decrease in both online and print ad expenditures might be a consequence of (a) decrease in the overall ad budget, and/or (b) advertisers taking their ad budgets away from the newspaper, possibly in response to changes in outside media options. Subsequently, we present evidence that (b) is the plausible reason behind the joint decrease in print and online advertising.

We then investigate if the above asymmetric response to positive versus negative changes in online advertising persists for both local and national advertisers. We present the corresponding data in Figs. 6 and 7. These figures suggest that local advertisers exhibit the asymmetric response in ROP spend to positive versus negative changes in online advertising. However, there is no such significant relationship, either positive or negative, for national advertisers. In Figs. 8 and 9, we explore how the differential effects vary from year to year. The results in Fig. 8 reinforce the notion that for local advertisers, an increase in advertising expenditure in the online version of the newspaper is associated with a decrease in ROP advertising, consistently across all years. This negative effect, consistent with potential substitution and cannibalization, is also statistically significant for most years. Similarly, a decrease in online ad spend is associated with a concomitant decrease in ROP spend for all years, except 2010-11. On the other hand, the relationship between changes in online and ROP ad spend is statistically insignificant for most part, when we consider national advertisers.

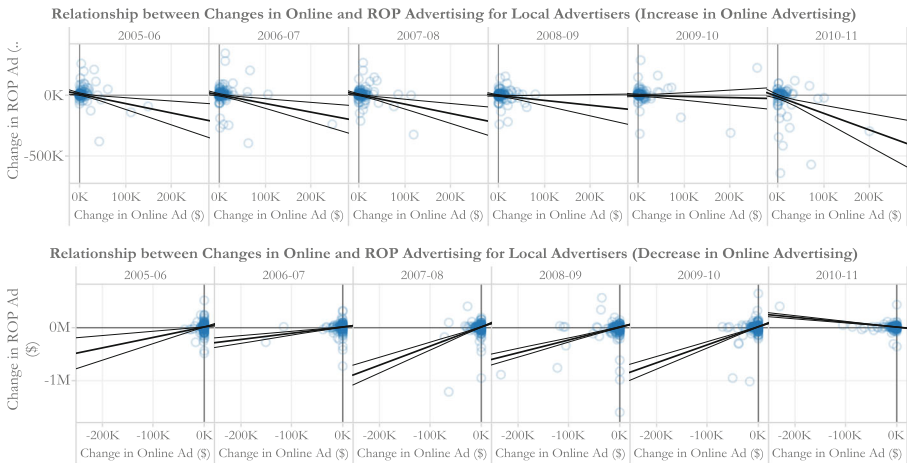


**Fig. 6** Relationship between changes in online & ROP advertising (local advertising)

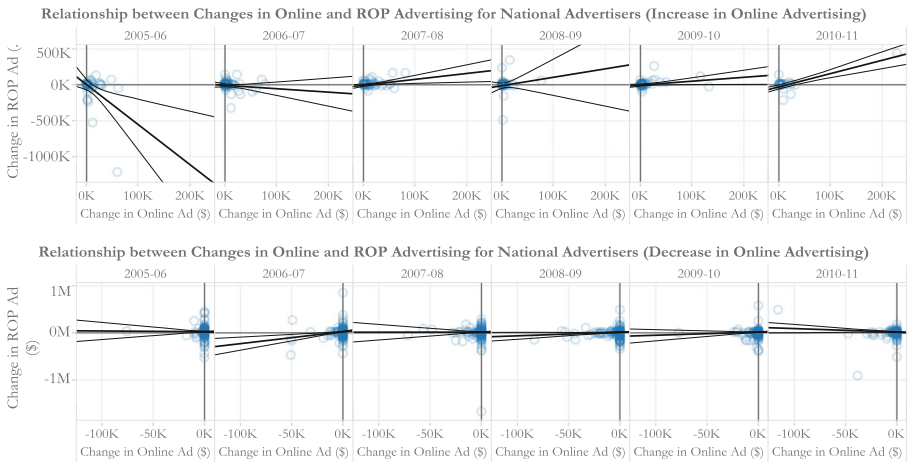


**Fig. 7** Relationship between changes in online & ROP advertising (national advertising)

Overall, the model-free evidence suggests that, advertisers tend to decrease their print ad expenditures both when they increase and decrease their advertising in the online version of the newspaper. This pattern manifests in the form of positive (negative) correlation when online spending decreases (increases), with the negative relationship being salient for local, rather than national advertisers. Given this overall



**Fig. 8** Relationship between changes in online & ROP advertising for local advertisers (increase in online advertising). Relationship between changes in online & ROP advertising for local advertisers (decrease in online advertising)



**Fig. 9** Relationship between changes in online & ROP advertising for national advertisers (increase in online advertising). Relationship between changes in online & ROP advertising for national advertisers (decrease in online advertising)

tendency on the part of advertisers to decrease print advertising, the negative relationship between ROP and online ad spending does not conclusively inform us about whether advertisers perceive the two media as substitutes. However, we can use the change in ROP advertising when there is no change in online ad spending to construct a baseline for the general tendency among advertisers to decrease their ROP spending. If advertisers exhibit a greater tendency to decrease their ROP ad spending when they increase their online spending compared to this baseline, it might be suggestive of a substituting relationship.

Following up on this intuition, in Table 5, we summarize the extent to which advertisers reduced their ROP spending year-on-year under three scenarios: (a) when they decreased online spending, (b) when online spending remained unchanged year-on-year, and (c) when online spending increased. In addition to presenting these patterns for all advertisers, we break them down by different types of advertisers. Since we consider year-on-year changes within advertisers, this analysis automatically accounts for cross-sectional differences across advertisers. These results in Table 5 imply that advertisers decreased their ROP spending under all three scenarios. However, there is a higher propensity to decrease ROP spending when advertisers increase their online spending (51 % of observations across all advertisers) compared to the scenario when online spending either remains unchanged (36 % of observations across all advertisers) or even decreases (43 % of observations across all advertisers). These differences are statistically significant at the 1 % level. The same pattern holds when we consider different types of advertisers. Similarly, when we consider the magnitude of the change, advertisers decreased their ROP spending under all three

**Table 5** Change in ROP ad expenditure vs. change in online ad expenditure over time

	When online advertising decreased			No change in online advertising			When online advertising increased			% of the decrease in ROP that occurred when online ad spend increases
	# Obs.	% Obs. when ROP decreased	Change in ROP per observation (thousands of \$)	# Obs.	% Obs. when ROP decreased	Change in ROP per observation (thousands of \$)	# Obs.	% Obs. when ROP decreased	Change in ROP per observation (thousands of \$)	
All advertisers	1265	43 %	-4.94	8111	36 %	-3.41	1082	51 %	-13.80	31 %
Local advertisers	1001	42 %	-4.23	6023	35 %	-2.42	848	51 %	-12.04	35 %
National advertisers	264	45 %	-7.62	2088	38 %	-6.28	234	53 %	-20.18	24 %
First quartile advertisers	58	34 %	-0.09	1883	30 %	-0.08	57	39 %	-0.29	9 %
Second quartile advertisers	217	37 %	0.13	2082	34 %	-0.31	197	43 %	-0.97	24 %
Third quartile advertisers	335	40 %	0.30	2216	37 %	-1.07	287	49 %	-3.12	28 %
Fourth quartile advertisers	655	47 %	-9.73	1930	44 %	-12.68	541	57 %	-25.57	31 %

scenarios. However, the magnitude of the decrease was significantly larger when they increased their online spending (\$13,800 per observation) compared to the scenario when online spending either remained unchanged (\$3,410 per observation) or decreased (\$4,940 per observation). Once again, the same pattern holds for all types of advertisers.

Together, these results suggest (but do not provide formal evidence) that advertisers might perceive online and print versions of the newspaper as substitutes. However, the results also reveal that only 31 % of the decrease in ROP ad expenditures occurred when advertisers increased their online ad spend, i.e., a scenario that is consistent with cannibalization. The remaining 69 % of the decrease in print advertising occurred when online advertising expenditure remained unaltered or even decreased.

### 3.2 Descriptive analysis with additional controls

While the above model-free analyses control for cross-sectional heterogeneity among advertisers in terms of their intrinsic propensity to advertise in each medium, they do not control for factors other than the potential complementary/substituting relationship that potentially induced dynamics in print and online newspaper advertising. Notably, the period of our analysis covered the great recession of 2008-09, which possibly placed a downward pressure on the total media budgets of advertisers. As a result, advertisers are likely to have reduced their ad expenditures in both print and online newspaper advertising. In addition, our data cover an especially tumultuous time in the newspaper industry wherein readership of the print newspaper eroded dramatically. This possibly rendered print newspaper advertising less attractive compared to other media advertising options. At the same time, there was a surge in online advertising, enabled by improvements in targeting, and the growth of search advertising giants such as Google. Although newspapers have tried to employ behavioral targeting for ads placed on their website, targeted advertising is not very common; as of 2011, targeted display ads contributed less than 5 % of the digital ad revenues at newspapers (Rosenstiel et al. 2012)). Therefore, advertisers interested in placing targeted ads are likely to have shifted their ad budgets away from the newspaper. Hence, in addition to the potential relationship between print and online newspaper advertising, there are two broad classes of factors that could have induced correlation between the ad expenditures in these two media: (i) change in the total media budget and (ii) common time-varying factors, such as the growing attractiveness of media options outside the newspaper, that could have driven both online and print advertising within the newspaper. As a result, we need to include strong controls to account for these correlated unobservables so that the residual correlation between print and online newspaper advertising can be construed as an indicator of the potential relationship between the two media.

In our analysis, we first control for the correlated temporal shocks that affected print and online advertising expenditures for all advertisers (e.g., the great recession led to lower print and online ad spending for all advertisers) by using flexible controls in the form of year fixed effects. However, it is difficult to control for advertiser-specific correlated factors driving both print and online ad spending (e.g., the recession forced some advertisers to cut their media budgets more deeply than

others). We attempt to control for these advertiser-specific temporal unobservables by estimating different year-period fixed effects for advertisers that share similar observed characteristics (i.e. interactions between year-period fixed effects and advertiser characteristics). The rationale is that advertisers that share a common set of observable characteristics, possibly experienced similar changes in their ability to commit resources to advertising and/or threat from alternative media options outside the newspaper. To the extent that we include a rich set of observable characteristics, this analysis should yield relatively homogeneous “sub-groups” of advertisers that share common time fixed effects that approximate the advertiser-specific correlated unobservables. Once we adequately control for heterogeneity and correlated unobservables, the residual correlation between online and print newspaper advertising should be indicative of the perceived relationship between the two media. The intuition is that we can arrive at the actual substitution effect by considering the extent to which advertisers that increase their online ad spend decrease their print ad spend differentially compared to advertisers that do not change their online ad expenditures.

In this section, we try to isolate how changes in online ad spending are associated with changes in ROP expenditures. Subsequently, we discuss what these descriptive results tell us regarding the nature of the relationship between print and online newspaper advertising. To this end, we specify the temporal trajectory of ROP spend as follows:

$$y_{i1t} = \alpha_i + \delta_t + \gamma_t Z_i + \beta y_{i2t} + u_{it}, \quad (1)$$

where,  $y_{i1t}$  ( $y_{i2t}$ ) is the ROP (online) ad expenditure by advertiser  $i$  in year  $t$ ,  $t = 1, 2, \dots, 7$ ,  $\alpha_i$  is the advertiser-specific fixed effect,  $\delta_t$  is the year-specific fixed effect,  $Z_i$  is a vector of advertiser characteristics,  $\gamma_t$  is the corresponding coefficient that varies over time in a flexible manner, and  $u_{it}$  is the error term. The advertiser-specific fixed effects account for the cross-sectional differences across advertisers in terms of how much they value ad exposures in the print version of the newspaper. The year fixed effects control for the overall trend in ROP advertising over time, i.e., correlated factors that are common across advertisers. The term  $\gamma_t Z_i$  is essentially the interaction of the year fixed effects with advertiser characteristics. It captures how advertisers with observed characteristics,  $Z_i$ , experience changes in ROP ad spend beyond what is captured by the year-specific fixed effect (i.e., correlated factors that are shared by advertisers with these observed characteristics).<sup>11</sup> The idea is that if advertisers that share common characteristics (such as belonging to the same industry) change their print ad expenditures in a systematic way due to exogenous factors, the characteristic-specific time trends will account for them. The parameter  $\beta$  is the main measure of interest and captures how advertisers adjust their ROP ad expenditure when they change their online ad spending, after accounting for advertiser fixed effects and potential correlated unobservables. If advertisers view the two media options as substitutes, we would expect  $\beta$  to be negative.

<sup>11</sup>We also tried a specification where we interacted the advertiser characteristics with year fixed effects instead of the time trend. The substantive insights were similar.

In our empirical specification, we use four kinds of advertiser characteristics: (a) hybrid vs. exclusive print advertisers, (b) advertiser size defined in terms of the quartile to which an advertiser belongs based on their overall expenditure at the newspaper, (c) local vs. national advertisers, and (d) the industry/category to which the advertiser belongs. We use eight categories of advertisers: (i) manufacturing, (ii) transportation and public utilities, (iii) wholesale trade, (iv) retail trade, (v) finance, insurance, and real estate, (vi) services, (vii) public administration, and a composite category, which we call “others.”

In order to avoid the estimation of advertiser-specific fixed effects, we use the first difference estimator to recover the remaining model parameters. Formally, we rewrite Eq. 1 as

$$\begin{aligned}
 \Delta y_{it} &= \Delta \delta_t + \Delta \gamma_t Z_i + \beta \Delta y_{i2t} + \Delta u_{it}, \\
 \Delta y_{i1t} &= y_{i1t} - y_{i1t-1}, \\
 \Delta y_{i2t} &= y_{i2t} - y_{i2t-1}, \\
 \Delta \delta_t &= \delta_t - \delta_{t-1}, \\
 \Delta \gamma_t &= \gamma_t - \gamma_{t-1}, \\
 \Delta u_{it} &= u_{it} - u_{it-1}.
 \end{aligned}
 \tag{2}$$

Once again, we estimate both a pooled model and separate models for the data grouped by advertiser size. We present these results in Table 6.<sup>12</sup> These results suggest that, across all model specifications, there is a positive tradeoff between online and ROP ad expenditure; on average, a unit change in online ad expenditure is associated with a 0.31 unit change in print ad expenditure. This positive relationship is consistent with the model-free evidence presented earlier. Comparing the results across advertisers of different sizes, we find that larger advertisers tend to have tradeoffs of higher magnitude.

Leading from the results of model-free analyses, we further investigate if there is asymmetry in the tradeoff between ROP and online ad expenditures at the newspaper based on whether online spending increased vs. decreased. To this end, we allow the parameter  $\beta$  to vary based on the sign of  $\Delta y_{i2t}$  by rewriting Eq. 2 as

$$\Delta y_{it} = \Delta \delta_t + \Delta \gamma_t Z_i + \beta^+ \Delta y_{i2t} I(\Delta y_{i2t} > 0) + \beta^- \Delta y_{i2t} I(\Delta y_{i2t} < 0) + \Delta u_{it}, \tag{3}$$

where  $I(\Delta y_{i2t} > 0)$ , and  $I(\Delta y_{i2t} < 0)$ , are indicator variables that take the value of 1 if the statements within the parentheses are true and 0 otherwise. Therefore,  $\Delta \delta_t$  captures the common year-on-year change in print advertising, while the parameters  $\beta^+$  and  $\beta^-$  capture the extent to which a positive or negative dollar change in online spending is related to change in print spending.

The results from this analysis, presented in Table 7, suggest that, overall, positive changes in online ad expenditure are indeed associated with a decline in ROP expenditure. On the other hand, when advertisers reduced their online advertising within

<sup>12</sup>The R-squares that we report are for the first difference estimators and need to be interpreted as the extent to which the variation in the within-advertiser changes in print ad spending over time is explained by the independent variables. In fact, if we estimate the advertiser fixed effects without using the first difference estimator, R-squares are consistently higher than 0.9 for all the models that we report in the paper. Therefore, the low R-squares in the first difference estimators reported in the paper cannot be attributed to the inability of the advertiser fixed effects to capture the cross-sectional variation across advertisers.

**Table 6** Relationship between change in online ad spend and ROP ad spend

	FULL SAMPLE		FIRST & SECOND QUARTILE ADVERTISERS (N=749)		THIRD QUARTILE ADVERTISERS (N=473)		FOURTH QUARTILE ADVERTISERS (N=521)	
	ESTIMATE	STD ERROR	ESTIMATE	STD ERROR	ESTIMATE	STD ERROR	ESTIMATE	STD ERROR
YEAR FIXED EFFECTS	✓		✓		✓		✓	
YEAR FIXED EFFECTS x SECOND QUARTILE	✓							
YEAR FIXED EFFECTS x THIRD QUARTILE	✓							
YEAR FIXED EFFECTS x FOURTH QUARTILE	✓							
YEAR FIXED EFFECTS x PRINT-ONLY	✓		✓		✓		✓	
YEAR FIXED EFFECTS x LOCAL	✓		✓		✓		✓	
YEAR FIXED EFFECTS x MANUFACTURING	✓		✓		✓		✓	
YEAR FIXED EFFECTS x TRANSPORTATION & PUBLIC UTILITIES	✓		✓		✓		✓	
YEAR FIXED EFFECTS x WHOLESAL/ TRADE	✓		✓		✓		✓	
YEAR FIXED EFFECTS x RETAIL TRADE	✓		✓		✓		✓	
YEAR FIXED EFFECTS x FINANCE, INSURANCE, & REAL ESTATE	✓		✓		✓		✓	
YEAR FIXED EFFECTS x SERVICES	✓		✓		✓		✓	
YEAR FIXED EFFECTS x PUBLIC ADMINISTRATION	✓		✓		✓		✓	
(ONLINE AD)	0.29	0.06	0.10	0.04	0.23	0.08	0.29	0.11
R-SQUARED	0.03		0.03		0.02		0.03	



**Table 7** Asymmetric relationship effect of increase/decrease in online spend

	FULL-SAMPLE		FIRST & SECOND QUARTILE ADVERTISERS (N=749)		THIRD QUARTILE ADVERTISERS (N=473)		FOURTH QUARTILE ADVERTISERS (N=521)	
	ESTIMATE	STD ERROR	ESTIMATE	STD ERROR	ESTIMATE	STD ERROR	ESTIMATE	STD ERROR
YEAR FIXED EFFECTS	✓		✓		✓		✓	
YEAR FIXED EFFECTS x SECOND QUARTILE	✓							
YEAR FIXED EFFECTS x THIRD QUARTILE	✓							
YEAR FIXED EFFECTS x FOURTH QUARTILE	✓							
YEAR FIXED EFFECTS x PRINT-ONLY	✓		✓		✓		✓	
YEAR FIXED EFFECTS x LOCAL	✓		✓		✓		✓	
YEAR FIXED EFFECTS x MANUFACTURING	✓		✓		✓		✓	
YEAR FIXED EFFECTS x TRANSPORTATION & PUBLIC UTILITIES	✓		✓		✓		✓	
YEAR FIXED EFFECTS x WHOLESALE TRADE	✓		✓		✓		✓	
YEAR FIXED EFFECTS x RETAIL TRADE	✓		✓		✓		✓	
YEAR FIXED EFFECTS x FINANCE, INSURANCE, & REAL ESTATE	✓		✓		✓		✓	
YEAR FIXED EFFECTS x SERVICES	✓		✓		✓		✓	
YEAR FIXED EFFECTS x PUBLIC ADMINISTRATION	✓		✓		✓		✓	
(ONLINE AD) x POSITIVE	-0.22	0.08	0.05	0.06	0.21	0.12	-0.22	0.14
(ONLINE AD) x NEGATIVE	1.06	0.10	0.15	0.06	0.24	0.11	1.08	0.18
R-SQUARED	0.04		0.03		0.02		0.04	

the newspaper, they also reduced their print display advertising expenditures, i.e., in ROP. This result is consistent with the model-free evidence discussed earlier. On average, when advertisers increased their online ad expenditure by \$1, their ROP ad expenditure decreased by \$0.22. The results in Table 8 also suggest that the negative relationship holds only for large advertisers, i.e., those in the highest quartile. However, the positive effect, i.e., decreasing both online and ROP expenditure, persists for advertisers of all sizes.<sup>13</sup>

In the spirit of our model-free evidence, we estimate separate values of  $\beta^+$  and  $\beta^-$  for local and national advertisers. The results in Table 8 imply that, consistent with the model-free evidence, there is no statistically significant relationship between changes in ROP and online ad spend for national advertisers. On the other hand, local advertisers exhibit the asymmetric effect described in the model-free section. Moreover, the negative effect exists only for large advertisers; small advertisers tended to increase their ROP ad expenditure when they increased their online ad expenditure and vice versa. *Nevertheless, given that the advertisers in the fourth quartile contributed to 92 % of the decline in ROP advertising between 2005 and 2011, the negative effect (i.e., when advertisers increase their online ad expenditure) dominates when we consider the pooled regression.* When we consider the estimates from the pooled data, a \$1 increase in online ad spend is associated with a \$0.48 decrease in ROP advertising. On the other hand, when advertisers decrease their online advertising by \$1, they also reduce their ROP advertising by \$1.27.

Overall, the results reinforce the model-free evidence documented earlier: (a) advertisers decrease their ROP spending both when they increase their online spending and when they do not, (b) there is evidence of a negative relationship between online and ROP ad spending for large local advertisers, and (c) factors outside the newspaper also drove the decline in print advertising.

### 3.3 Relationship between print and online newspaper advertising

We now assess whether the above descriptive evidence can help us answer whether (a) advertisers perceive print and online versions of the newspaper as complements or as substitutes and (b) if the two media are viewed as substitutes, was online newspaper advertising cannibalizing print advertising. In essence, the question calls for a causal interpretation regarding the extent to which growth in online newspaper advertising was responsible for the decline in print advertising. As discussed earlier, making this causal inference based on correlational evidence requires some cautious interpretation of the results.

As discussed earlier, the raw correlation between print and online ad expenditures subsumes (a) the true complementary/substituting relationship between the two media, as perceived by advertisers as well as confounds due to (b) cross-sectional differences in advertisers' intrinsic propensity to choose a medium, (c) correlated temporal shocks in the preference for print and online advertising that are common to

<sup>13</sup>We also estimated a model with indicators for positive and negative changes in online ad spending in addition to their interactions with the magnitude of the change (as in Eq. 3). The substantive results remained unchanged. The results can be obtained from the authors upon request.

**Table 8** Asymmetric relationship effect of increase/decrease in online spend: local vs. national advertisers

	FULL SAMPLE		FIRST & SECOND QUARTILE ADVERTISERS (N=749)		THIRD QUARTILE ADVERTISERS (N=473)		FOURTH QUARTILE ADVERTISERS (N=521)	
	ESTIMATE	STD ERROR	ESTIMATE	STD ERROR	ESTIMATE	STD ERROR	ESTIMATE	STD ERROR
YEAR FIXED EFFECTS	✓		✓		✓		✓	
YEAR FIXED EFFECTS x SECOND QUARTILE	✓							
YEAR FIXED EFFECTS x THIRD QUARTILE	✓							
YEAR FIXED EFFECTS x FOURTH QUARTILE	✓							
YEAR FIXED EFFECTS x PRINT-ONLY	✓		✓		✓		✓	
YEAR FIXED EFFECTS x LOCAL	✓		✓		✓		✓	
YEAR FIXED EFFECTS x MANUFACTURING	✓		✓		✓		✓	
YEAR FIXED EFFECTS x TRANSPORTATION & PUBLIC UTILITIES	✓		✓		✓		✓	
YEAR FIXED EFFECTS x WHOLESALE TRADE	✓		✓		✓		✓	
YEAR FIXED EFFECTS x RETAIL TRADE	✓		✓		✓		✓	
YEAR FIXED EFFECTS x FINANCE, INSURANCE, & REAL ESTATE	✓		✓		✓		✓	
YEAR FIXED EFFECTS x SERVICES	✓		✓		✓		✓	
YEAR FIXED EFFECTS x PUBLIC ADMINISTRATION	✓		✓		✓		✓	
(ONLINE AD) x POSITIVE x NATIONAL	0.49	0.45	-0.19	0.10	-0.67	0.23	0.62	0.47
(ONLINE AD) x NEGATIVE x NATIONAL	0.28	0.20	0.14	0.10	-0.08	0.15	0.25	0.40
(ONLINE AD) x POSITIVE x LOCAL	-0.48	0.09	0.18	0.07	0.51	0.14	-0.52	0.17
(ONLINE AD) x NEGATIVE x LOCAL	1.27	0.11	0.16	0.08	0.57	0.15	1.27	0.20
R-SQUARED	0.04		0.03		0.03		0.04	

all advertisers and (d) advertiser-specific correlated unobservables driving both print and online ad spending that drove advertising in both media. In our empirical analyses, we have accounted for confound (b) by considering first differences and for (c) using year fixed effects. To the extent that we have partially accounted for advertiser-specific correlated unobservables (i.e., confound (d)) using a rich set of controls, we can interpret the negative relationship between online and ROP spending as a sign that advertisers view the two media as substitutes. This substitution effect can be a result of (i) advertisers perceiving sub-additive benefits from reaching the same audience via two media options and/or (ii) the budget constraint implies that an advertiser cannot increase their online ad expenditure without decreasing how much they spend on ROP advertising.

However, we recognize that the existence of other correlated unobservables that are not captured by our controls cannot be ruled out. As discussed earlier, there are two common sources of correlated unobservables: (i) environmental factors such as the recession that reduce the overall media budget, and (ii) common driver of the preference for print and online newspaper advertising, possibly driven by the growing attractiveness of outside newspaper advertising options. Specifically, the growing attractiveness of media options outside the newspaper such as search advertising (i.e., (ii)), possibly because of their increased ability to target ads, drove advertisers away from both media options within the newspaper. Although newspapers have tried to employ behavioral targeting for ads placed on their website, targeted advertising is not very common; as of 2011, targeted display ads contributed less than 5 % of the digital ad revenues at newspapers (Rosenstiel et al. 2012)). Therefore, advertisers interested in placing targeted ads are likely to have shifted their ad budgets outside the newspaper.

Holding all else constant, changes in the total media budget within an advertiser are likely to have driven print and online advertising in the same direction, thereby inducing a positive correlation. A similar argument can be made regarding the second source of correlated unobservables. As media options outside the newspaper, such as search advertising, become more popular, they are likely to have adversely affected the preference for both media options within the newspaper, although the extent of this adverse effect is likely to be different. Therefore, the omission of these positively correlated unobservables is likely to bias our conclusion about the tradeoffs between the two forms of advertising towards complementarity. *Thus, it is conceivable that the strength of the substitution effect would likely be higher if we had controlled for all correlated unobservable in our analyses.*<sup>14</sup> Thus, we believe our measure of cannibalization is likely to be a lower-bound. Subsequently, we discuss which of

---

<sup>14</sup>In fact, when we used less flexible controls for the temporal dynamics in the form of a linear time trend, we recovered a smaller negative coefficient for the tradeoff between ad expenditures. Specifically, the coefficient when online ad expenditure increased was  $-0.47$  when we used a linear time trend, as opposed to  $-0.48$  with the time fixed effects. For large local advertisers, the coefficients were  $-0.5$  with linear time trend versus  $-0.52$  with year fixed effects.

**Table 9** Change in ROP advertising that can be linked to increase in online ad spending

	All advertisers	All local advertisers	Local advertisers in the fourth quartile
Net year-on-year change in ROP spending (millions of \$)	-48.84	-29.00	-26.26
Total positive year-on-year change in online spending (millions of \$)	16.18	10.69	8.01
Total decline in ROP spending that is related to the increase in online spending (millions of \$)	-3.40	-5.02	-4.00
% of decline in ROP spending that is due to cannibalization	7 %	17 %	15 %

these two sources of correlated unobservables we outline earlier is possibly prevalent in our context.<sup>15</sup>

Based on this premise, we compute the cannibalization by considering the total change in ROP ad spending that was related to increase in online spending. We perform this computation for three classes of advertisers: (a) all advertisers, where a \$1 increase in online spending was associated with a \$0.22 decrease in ROP spending (based on Table 7), (b) all local advertisers, where a \$1 increase in online spending was associated with a \$0.48 decrease in ROP spending (based on Table 8), and (c) local advertisers that belong to the fourth quartile, where a \$1 increase in online spending was associated with a \$0.52 decrease in ROP spending (based on Table 8). First, for each class of advertisers, we compute the net year-on-year change in ROP spending and the corresponding total positive change in online spending between 2005 and 2011. Next, based on the estimates in Tables 7 and 8, we compute the change in ROP spending that can be linked to the increase in online spending. We report these results in Table 9. Overall, these results suggest that 7 %-17 % of the decline in ROP advertising can be linked to cannibalization.

### 3.3.1 Sources of potential correlated unobservables

As discussed above, there are two possible unobserved factors that could have induced correlation between print and online newspaper advertising, i.e., change in media budgets and common drivers of the preference for print and online newspaper advertising. Given the descriptive nature of our analyses and the lack of data

<sup>15</sup>The presence of a substituting relationship does not imply cannibalization of print advertising by online newspaper advertising. If the negative tradeoff was triggered by an exogenous decline in the perceived effectiveness of print advertising per dollar, under a substituting relationship, advertisers could have responded by lowering their ROP spending and increasing online spending. Such a scenario is not consistent with cannibalization of print advertising by the more attractive online newspaper advertising. On the other hand, if the decline in ROP spending was triggered by the increasing attractiveness of online newspaper advertising, cannibalization is likely to be a concern. Therefore, while the negative relationship might be consistent with advertisers perceiving the two media options as substitutes, our analysis does not permit us to take a stance on the direction of the effect.

**Table 10** Comparison of advertisers with total ad budget information

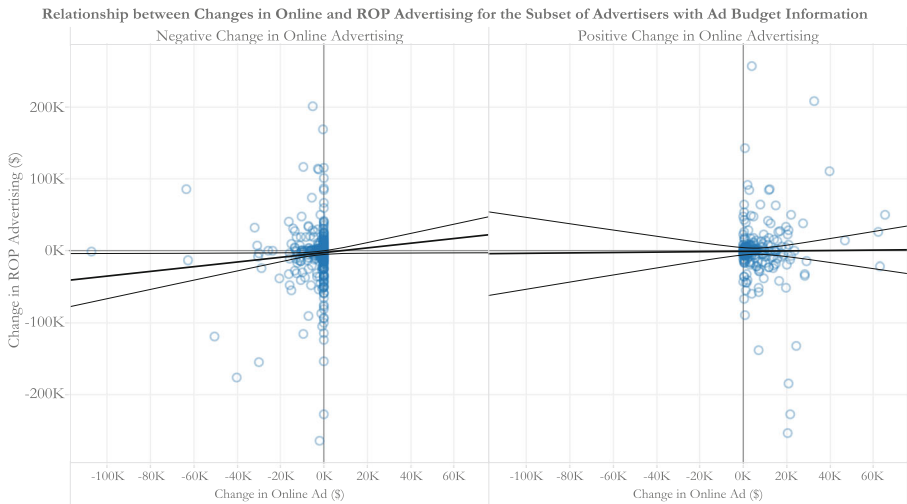
	All Local & Hybrid Advertisers (N=566)		Sample of Local & Hybrid Advertisers with Ad Budget Information (N=162)	
	ROP	Online	ROP	Online
Total Spend (Millions of \$)	199.71	15.68	24.05	3.95
Average Spend per Advertiser (Millions of \$)	0.35	0.03	0.15	0.02
Total Change in Spend Between 2005 and 2011 (Millions of \$)	-58.46	10.21	-7.75	2.65
% Change in Spend Between 2005 and 2011	-29%	65%	-32%	67%

on the total ad budget, we cannot parse out the exact impact of each source of correlated unobservables on our conclusions. As further analysis in order to assess whether decrease in the total ad budget played a role in the concomitant decrease in both online and ROP spending, we assembled a sub-sample of advertisers for whom we could obtain ad budget information over time from the AdSpender database. We restrict our analysis to local advertisers that advertised in both online and print versions of the newspaper because cannibalization is unlikely to be a concern for exclusive advertisers under either definition.<sup>16</sup> We focus on local advertisers because local and national advertisers are likely to consider different options when deciding on their advertising expenditures. Especially, national advertisers might be advertising in print newspapers operating nationally or in other local markets, which would make it difficult to answer our research question regarding the effect of growing attractiveness of online newspaper advertising on print advertising revenues. Including only advertisers for whom we could obtain data on outside media spending from Adspender, we have a sample of 162 local firms.

In Table 10, we compare the sample of advertisers with ad budget information with all local, hybrid advertisers. These data suggest that this sample accounts for 29 % of hybrid local advertisers and 25 % (12 %) of the corresponding online (ROP) spending. Therefore, the average advertiser in the sub-sample is representative of all hybrid local advertisers in terms of their online spending at the focal newspaper, but skewed towards smaller ROP advertisers. When we consider the change in ad spending between 2005 and 2011, the sample is fairly representative of the population of large local advertisers.

In the spirit of the model-free evidence, we consider the relationship between year-on-year changes in online and ROP spending for the advertisers with budget

<sup>16</sup>For advertisers that exclusively used the print medium, we can categorically say that the growing attractiveness of online newspaper advertising did not have an effect on their ROP ad expenditure. On the other hand, we acknowledge that the growing attractiveness of online newspaper advertising might have precluded them from ever using print advertising during the seven years of our data. However, since our analyses were based on advertisers that used ROP advertising at least once, evaluating the credibility of this concern is beyond the scope of this study.



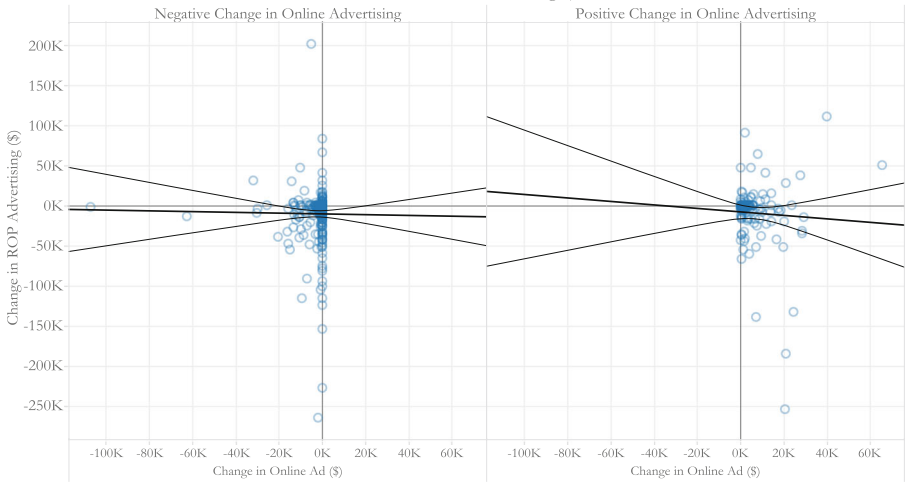
**Fig. 10** Relationship between changes in online and ROP advertising for the subset of advertiser with ad budget information

information.<sup>17</sup> In Fig. 10, we present the scatterplot for advertisers that decreased vs. increased their online ad spending. Similar to the full sample of advertisers, we find a significant positive relationship when advertisers decreased their online spending. However, there is no statistically significant relationship when we consider advertisers that increased their online spending. Next, we explore whether the concomitant decrease in online and ROP spending occurred when advertisers decreased their overall ad budget. In Fig. 11 and (12), we present the scatterplots for instances when advertisers decreased (did not decrease) their total ad budget. These plots suggest that the concomitant decrease in online and ROP spending occurred when advertisers did not decrease their online spending. On the other hand, there is no significant relationship when advertisers decreased their online spending. Therefore, the concomitant decrease in ROP and online ad spending does not appear to have been a result of decrease in media budgets. Rather, to the extent that we believe that the sample is representative of the population of local hybrid advertisers, these results suggest that the concomitant decrease in both online and ROP spending occurred because these advertisers were diverting their media budgets outside the newspaper.

We performed the descriptive regression analysis discussed earlier, albeit with the sub-sample of advertisers for whom we have information on the annual media budget. Recall that the total media budget was one of the potential factors that drove both print and online advertising simultaneously. We control for this by including this information in our analysis in two different ways. The first approach was similar

<sup>17</sup>Note that these analyses are based on the online spending at the focal newspaper and are comparable to the analyses presented in Section 3.1.

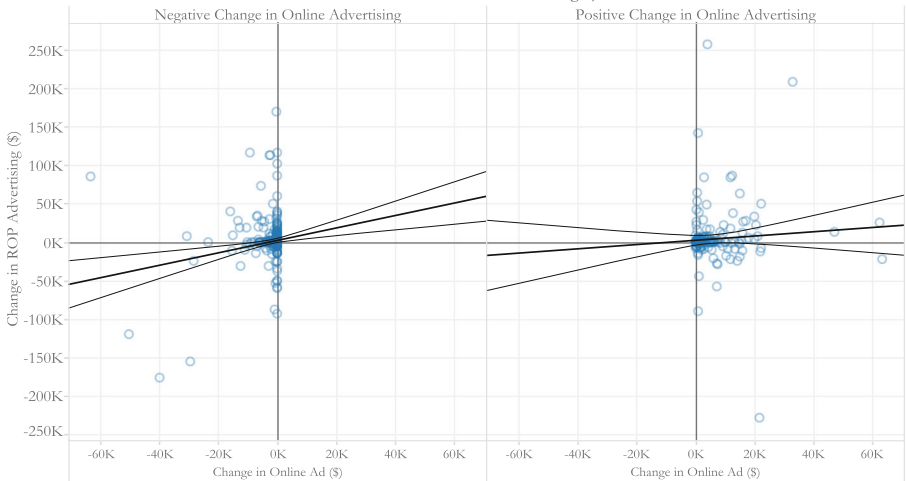
Relationship between Changes in Online and ROP Advertising for the Subset of Advertisers with Ad Budget Information (Advertisers that Decreased their Ad Budget)



**Fig. 11** Relationship between changes in online and ROP advertising for the subset of advertisers with ad budget information (advertisers that decreased their ad budget)

to the previous analyses (i.e., based on ROP and online newspaper ad expenditures), but included the year-year change in the total media as a covariate in Eqs. 2 and 3. In the second approach, we used changes in share of ROP and online newspaper ad

Relationship between Changes in Online and ROP Advertising for the Subset of Advertisers with Ad Budget Information (Advertisers that did not Decrease their Ad Budget)



**Fig. 12** Relationship between changes in online and ROP advertising for the subset of advertisers with ad budget information (advertisers that did not decrease their ad budget)



**Table 11** Dependent variable: change in ROP share

	ESTIMATE	STD ERROR	ESTIMATE	STD ERROR
YEAR FIXED EFFECTS		✓		✓
YEAR FIXED EFFECTS x MANUFACTURING		✓		✓
YEAR FIXED EFFECTS x TRANSPORTATION & PUBLIC UTILITIES		✓		✓
YEAR FIXED EFFECTS x WHOLESALE TRADE		✓		✓
YEAR FIXED EFFECTS x RETAIL TRADE		✓		✓
YEAR FIXED EFFECTS x FINANCE, INSURANCE, & REAL ESTATE		✓		✓
YEAR FIXED EFFECTS x SERVICES		✓		✓
YEAR FIXED EFFECTS x PUBLIC ADMINISTRATION		✓		✓
CHANGE IN ONLINE SHARE	0.10	0.08		
POSITIVE CHANGE IN ONLINE SHARE			0.11	0.10
NEGATIVE CHANGE IN ONLINE SHARE			0.09	0.09
R-SQUARED	0.03		0.03	

expenditures (as a fraction of the total media budget during each period) as the dependent and independent variables, respectively. In both approaches, as in the earlier analyses, we used year fixed effects and the corresponding interactions with advertiser characteristics as controls. We present the results from these analyses in Tables 11 and 12. Overall, the relationship between changes in print and online newspaper ad expenditures is not significant in all specifications. Given that these analyses were based on a small subset of advertisers, it is conceivable that the sample size was insufficient to generate more conclusive results.

**Table 12** Dependent variable: change in ROP expenditure

	ESTIMATE	STD ERROR	ESTIMATE	STD ERROR
YEAR FIXED EFFECTS		✓		✓
YEAR FIXED EFFECTS x MANUFACTURING		✓		✓
YEAR FIXED EFFECTS x TRANSPORTATION & PUBLIC UTILITIES		✓		✓
YEAR FIXED EFFECTS x WHOLESALE TRADE		✓		✓
YEAR FIXED EFFECTS x RETAIL TRADE		✓		✓
YEAR FIXED EFFECTS x FINANCE, INSURANCE, & REAL ESTATE		✓		✓
YEAR FIXED EFFECTS x SERVICES		✓		✓
YEAR FIXED EFFECTS x PUBLIC ADMINISTRATION		✓		✓
CHANGE IN TOTAL MEDIA BUDGET	0.00	0.00	0.00	0.00
CHANGE IN ONLINE SHARE	0.17	0.13		
POSITIVE CHANGE IN ONLINE SHARE			0.15	0.19
NEGATIVE CHANGE IN ONLINE SHARE			0.19	0.19
R-SQUARED	0.03		0.03	

## 4 Conclusion

A pressing but unresolved concern in the newspaper industry is whether online newspaper advertising is averting or accelerating losses in print newspaper advertising, which ties back to the issue of whether advertisers view print and online newspaper advertising to be complements or substitutes. Most arguments forwarded in either direction are based on the anecdotal or correlational evidence that that simply place the increase in online advertising next to a decrease in print advertising revenues. In an interview, a top-level manager in the advertising department of the newspaper we worked with revealed that newspapers have “resigned themselves to the fact” that online newspaper advertising is cannibalizing print newspaper advertising.

In this paper, we systematically investigate the relationship between print and online newspaper advertising by leveraging unique data on advertisers’ over time spending on print/online ads within a newspaper. We are careful to control for alternative drivers of cross-sectional and temporal variation in print advertising revenues—heterogeneity in advertiser’s intrinsic propensity to choose print advertising media, trends in online and print advertising, and some sources of correlated unobservables (e.g., common economic shocks) that could drive changes in both print and online newspaper advertising revenue.

Our results generate three main substantive takeaways for the newspaper industry. Our first finding is that 7-17 % of the loss in print advertising can be traced back to cannibalization due to growing online newspaper advertising. Therefore, we argue that cannibalization should be a consideration in the marketing decisions of the paper. Our finding of a negative tradeoff between online and print advertising within the newspaper, notwithstanding this untapped positive correlation, is likely to be strong and credible indicator of a substituting relationship.

Second, a significant fraction of the decline of print newspaper advertising revenue co-occurs with decline in online newspaper advertising revenue, suggesting that advertisers are substituting away to media options outside the newspaper. This result implies that newspapers ought to work to arrest this trend of print advertising losing to emerging online media options such as search advertising. One viable option would be to change the sales force strategy by (1) directing sales force efforts to print advertisers that have taken their media dollars elsewhere, (2) educating the sales force about the advantages of online newspaper advertising to win back media dollars lost to display and search advertising, and (3) altering commission structures that disproportionately reward only print sales such that salespeople are incentivized to sell more print and online bundles. A notable example is the Scripps chain of newspapers, which has altered sales force commission structures to reward the sales of print and online bundles, as well as online-only sales, in an effort to restrict the flight of advertisers to display and search advertising outside the newspaper (Steel and Ovide 2008)). Moreover, the newspaper should embrace the online newspaper and identify avenues to generate additional advertising revenue. For example, several newspapers are trying to make online advertising more attractive by exploiting its ability to track and target customers. In similar vein, online ad platforms, such as QuadrantOne, deliver accurate measurements of online newspaper advertising

effectiveness to advertisers.<sup>18</sup> Early reports suggest that newspapers that have implemented this new technology have experienced some growth in their online advertising revenues.

Third, our descriptive analyses across a number of advertiser types (i.e. local vs. national, advertiser size and advertiser business categories) shows that the cannibalization concern is possibly most valid for large local advertisers. Therefore, efforts needed to prevent cannibalization (such as price bundling and tailored selling strategies) should be more intensely focused on large, local advertisers.

We conclude by stating some limitations in our work, which serve as opportunities to further this nascent research stream. First, further research using data from a broader sample of newspapers would help in generalizing these findings. Second, there are three sets of agents who make interdependent decisions in the context of our application: advertisers, news consumers, and the newspaper platform. We have focused our attention on advertiser revenue alone, while accounting for the possible factors confounding the relationship between print and online advertising. If researchers have access to individual-level data on readership, extending the study to understand the overall effect of the growth in online newspaper on the print version, including the effect on the readership side, might be a worthwhile extension. While our research considers the direct cannibalization effect of online newspaper advertising, the online newspaper also cannibalizes print advertising indirectly by drawing readers away from the print newspaper, characterizing how readers substitute between the print and online versions of the newspaper will help us understand the indirect cannibalization effect of the online newspaper. In instances where researchers do not have access to individual-level readership data, they could explore identifying substitution on the reader side of the market based on the decisions of the newspaper and the advertisers. Such an inference could draw upon past research (e.g., Thomadsen (2005)) wherein one can impose some structure on the data generating process, possibly based on assumption that these agents are behaving in an optimal manner in response to inter-media substitution patterns on the reader side. Fourth, to the extent that we leave some correlated unobservables uncaptured, our documented substitution effect may be biased downward.

**Acknowledgments** The authors thank Dan Ackerberg, Anocha Aribarg, Pradeep Chintagunta, Fred Feinberg, Rajdeep Grewal, Wes Hartmann, Pranav Jindal, Aradhna Krishna, Gary Lilien, Puneet Manchanda, Murali Mantrala, Kanishka Misra, Yesim Orhun, Joseph Pancras, seminar participants at the Iowa State University, Syracuse University, University of Michigan, University of Virginia, University of Wisconsin, and the participants at the 2012 Marketing Science Conference, 2014 UTD FORMS conference and 2014 ISBM Academic Conference for their comments and suggestions. The first author would like to thank Smeal College of Business for summer funding that enabled this project. The second author would like to thank the 3M Corporation for financial support. The authors are solely responsible for all errors and omissions. The authors also thank the Reynolds Journalism Institute at the University of Missouri for enabling them to obtain the data. The standard disclaimer applies.

---

<sup>18</sup><http://www.mediapost.com/publications/article/178958/quadrantone-unveils-targeting-tools-for-newspaper.html>

## References

- Assmus, G., Farley, J., & Lehmann, D. (1984). How advertising affects sales: Meta-analysis of econometric results. *Journal of Marketing Research*, 21(1), 65–74.
- Bresnahan, T. (1984). The demand for advertising by medium: Implications for the economies of scale in advertising. In P. Ippolito, & D. Scheffman (Eds.), *Empirical approaches to consumer protection economics*. Washington: Federal Trade Commission.
- Chang, Y., & Thorson, E. (2004). Television web advertising synergies. *Journal of Advertising*, 33, 75–84.
- Clarke, D. (1976). Econometric measurement of the duration of advertising effect on sales. *Journal of Marketing Research*, 13(4), 345–357.
- Dube, J.-P., Hitsch, G., & Manchanda, P. (2005). An empirical model of advertising dynamics. *Quantitative Marketing and Economics*, 3, 107–144.
- Edmonds, R., Guskin, E., Rosenstiel, T., & Mitchell, A. (2012). Newspapers: Building digital revenues proves painfully slow. State of the News Media Report 2012, Project for Excellence in Journalism (<http://stateofthedia.org/2012/newspapers-building-digital-revenues-proves-painfully-slow/>).
- Gentzkow, M. (2006). Valuing new goods in a model with complementarity: Online newspapers. *American Economic Review*, 97, 713–744.
- Goldfarb, A., & Tucker, C. (2011a). Advertising bans and the substitutability of online and offline advertising. *Journal of Marketing Research*, 48, 207–228.
- Goldfarb, A., & Tucker, C. (2011b). Search engine advertising: Channel substitution when pricing ads to context. *Management Science*, 57(3), 458–470.
- Havlena, W., Cardarelli, R., & De Montigny, M. (2007). Quantifying the isolated and synergistic effects of exposure frequency for TV, print, and internet advertising. *Journal of Advertising Research*, 47, 215–222.
- Jagpal, H. (1981). Measuring joint advertising effects in multiproduct firms. *Journal of Advertising Research*, 21(1), 659–69.
- Naik, P., & Raman, K. (2003). Understanding the impact of synergy in multimedia communications. *Journal of Marketing Research*, 40(4), 375–388.
- Olmstead, K., Sasseen, J., Mitchell, A., & Rosenstiel, T. (2012). Digital: News Gains Audience but Loses Ground in Chase for Revenue. Project for Excellence in Journalism (<http://stateofthedia.org/2012/digital-news-gains-audience-but-loses-more-ground-in-chase-for-revenue/>).
- Rosenstiel, T., Jurkowitz, M., & Ji, H. (2012). The Search for a New Business Model. Project for Excellence in Journalism.
- Rossi, P. (2014). Even the rich can make themselves poor: A critical examination of the use of IV methods in marketing. *Marketing Science*, 33(5), 655–672.
- Santhanam, L.H., & Rosenstiel, T. (2012). Why U.S. Newspapers Suffer More than Others. State of the News Media Report 2011, Project for Excellence in Journalism (<http://stateofthedia.org/2011/mobile-survey/international-newspaper-economics/>).
- Seldon, B.J., Jewell, R.T., & O'Brien, D.M. (2000). Media substitution and economies of scale in advertising. *International Journal of Industrial Organization*, 18, 1153–1180.
- Seldon, B.J., & C. Jung (1993). Derived demand for advertising messages and substitutability among the media. *The Quarterly Review of Economics and Finance*, 33, 71–86.
- Silk, A.J., Klein, L.R., & Berndt, E.R. (2002). Intermedia substitutability and market demand by national advertisers. *Review of Industrial Organization*, 20, 323–348.
- Steel, E., & Ovide, S. (2008). Newspapers Think Locally for Online Ads. The Wall Street Journal (<http://online.wsj.com/article/SB121746776033899393.html>).
- Thomadsen, R. (2005). The Effect of Ownership Structure on Prices in Geographically Differentiated Industries, RAND Journal of Economics.
- Zentner, A. (2012). Internet adoption and advertising expenditures on traditional media: An empirical analysis using a panel of countries. *Journal of Economics and Management Strategy*, 21, 913–926.

Copyright of Quantitative Marketing & Economics is the property of Springer Science & Business Media B.V. and its content may not be copied or emailed to multiple sites or posted to a listserv without the copyright holder's express written permission. However, users may print, download, or email articles for individual use.