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Newspapers in Times of Low Adversiting Revenues*

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Abstract

We investigate theoretically and empirically the determinants of second-degree price discrimination in two-sided markets. We build a model in which a newspaper must attract both readers and advertisers. Readers are uncertain as to their future benefit from reading, and heterogeneous in their taste for reading. Advertisers are heterogeneous in their outside option, taste for subscribers, and taste for occasional buyers. To estimate empirically the effect of the advertisers' side of the industry on price discrimination on the readers' side, we use a "quasi-natural experiment". We exploit the introduction of advertisement on French Television in 1968, which we treat as a negative shock on advertisement revenues of daily national newspapers (treated group), but not on daily local newspapers (control group). We build a new dataset on French local newspapers between 1960 and 1974 and perform a Differences-in-Differences analysis. We find robust evidence of increased price discrimination as a result of a drop in advertising revenues.
JEL: L11, M13

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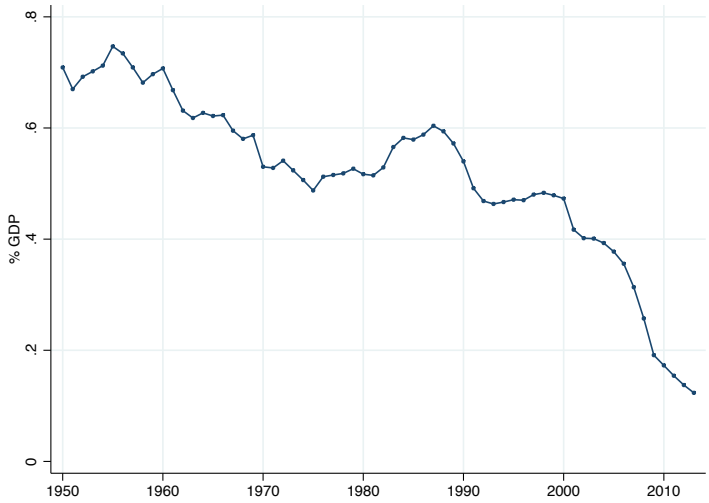
1 Introduction

The newspaper industry is a canonical example of a two-sided market: newspapers serve two distinct groups of consumers – readers and advertisers, where each group cares about the presence and characteristics of the other. The resulting network effects lead to subtle pricing policies that have received much attention recently (see for instance Rochet and Tirole (2003) and Weyl (2010)). One feature of newspapers' pricing policies is the observed price discrimination between subscribers and occasional buyers; subscribers are typically charged a lower per issue price than occasional buyers, and these price differences appear not to be explained by cost differences entirely. Furthermore, this difference in prices has recently increased and newspapers tend now to favor a more subscriber-based readership; a tendency which is often interpreted as a response to the industry's state of distress, itself in part attributed to the continuing drop in adverting revenues. In the United States for example, we indeed observe a decline in newspaper advertising revenues (as a share of GDP) since the second half of the 1950's, decline that has been sharper since the beginning of the 2000's (Figure 1[1]).



Notes: This Figure represents the evolution of newspaper advertising revenues as a share of GDP in the United States between 1950 and 2013. Data on newspaper revenues is from the Newspaper Association of America (NAA). GDP data is from the World Development Indicators (WDI).

Figure 1: Newspaper advertising revenues as a share of GDP in the United States, 1950-2103

In this paper we investigate how the reliance on advertising revenues interacts with the incentives newspapers have to adopt subscriber-based readerships. To this end, we first extend recent models of multi-sided industries to incorporate the scope for second-degree price discrimination between subscribers and occasional buyers and, second, we carry out an em-

[1]Figure C.1 in the online Appendix represents the evolution of newspaper advertising revenues in the United States over the same period in billion dollars.

pirical analysis using a new dataset on the French local newspaper industry that we build from archives data.

We build a general model of a two-sided market in which a monopolist newspaper repeatedly interacts with a continuum of readers and a continuum of advertisers. Newspapers can be purchased by readers either by subscription or at the newsstand on a day-by-day basis. Independently of the presence of advertisers, the scope for price discrimination stems from (i) the readers' uncertainty regarding their exact willingness to pay in future periods and (ii) the readers' heterogeneity in their average willingness to pay. Readers with a high average willingness to pay subscribe at a low per unit price, while others buy the newspaper at a high price whenever their willingness to pay is high.[2]

Advertisers are heterogenous in (i) their taste for subscribers, (ii) their taste for occasional readers, and (iii) their outside option (i.e., their payoff when placing ads on alternative platforms). The challenge is to disentangle how the presence of advertisers affects the prices charged to readers. We characterize the optimal pricing formulas of the newspaper, as well as the readers and advertisers' demands. These formulas are intuitive and in the spirit of Weyl (2010). When choosing its prices, aside from taking into account the various marginal costs and demand elasticities, the newspaper must cater to (i) the average taste of marginal readers – those indifferent between subscribing or buying occasionally on the one hand, and those indifferent between buying occasionally or never on the other – and (ii) the average taste of marginal advertisers for both subscribers and non subscribers, as well as their outside options.

We also aim at providing some comparative statics. We are particularly interested in the impact on the extent of price discrimination of an increase in the outside option of advertisers. In a simplified model we show that such a shock leads to an increase in the prices charged to readers. Indeed, since less surplus may be extracted from advertisers – and assuming that advertisers prefer more eyeballs to less – the newspaper will cater less to the advertisers' taste for large readerships and instead increase its margin on the readers' side (as empirically observed in Seamans and Zhu (2012)). On the other hand, whether the newspaper moves towards a more subscriber-based readership is a priori unclear as it depends also on the average profile of the newly relevant marginal advertisers (and in particular their average taste for subscribers versus non subscribers).

On the empirical side, the main empirical challenge is to isolate the "advertising revenue" effect on price discrimination. To this end, we follow an empirical strategy in the spirit of an event study. We exploit the introduction of advertisement on French Television in October 1968 by treating it as an exogenous negative shock on the advertising side of newspapers.

[2]This rationale for price discrimination was first introduced by Glazer and Hassin (1982), but in a model without advertisers.

Television is state-owned in France from 1945 to 1981. The introduction of advertisement on television was decided by law, despite strong resistances by the newspaper industry. This introduction leads to an exogenous shock that shifts exclusively the incentives to price discriminate stemming from advertising revenues. Indeed, reader heterogeneity and the various marginal costs of producing and delivering newspapers are not affected. To the best of our knowledge, we are the first to use this "quasi-natural" experiment.[3]

Our identifying assumption is that the negative shock on advertising revenues has affected national daily newspapers, but not local daily newspapers. Indeed, while national newspaper advertisement consists mostly of commercial advertisements that are relatively close substitutes to those broadcasted on television (national brands, etc), a large share of advertisements in local newspapers is instead local in nature (local commercial advertisements and classified advertisements). We document a substitution effect of advertisements from national (but not local) newspapers to television by studying the actual content of the advertisements broadcasted on television and of the advertisements published in newspapers before and after the introduction of advertisement on TV.

We thus use national newspapers as our "treated group", and local newspapers as our "control group". Using novel annual data on local and national newspapers between 1960 and 1974, we compare the pre-1968-to-post-1968 change in price discrimination by national daily newspapers to the change in price discrimination by local daily newspapers over the same period (Difference-in-Difference estimation). We find that the decrease in advertising revenues leads to an increase in the extent of price discrimination, i.e., newspapers adopt a more subscriber-based readership as a consequence to the drop in advertising revenues. Our results are robust to a range of alternative specifications and controls. In particular, they are robust to controlling for industry-specific time trends, and to allowing for flexible time-varying effects of the negative shock on advertisement revenues (Laporte and Windmeijer, 2005).

Literature review This paper first contributes to the empirical literature that examines the determinants of price discrimination. A growing number of papers investigate the role of competition. Seminal contributions include Borenstein (1991) on retail gasoline markets and Borenstein and Rose (1994) on airline tickets. More recent articles include Busse and Rysman (2005) who investigate pricing in Yellow pages advertising, Gerardi and Shapiro (2009) who reexamine air ticket price discrimination, Dai et al. (2012) who study the non-monotonicity of the effect of competition on price discrimination using data from the U.S. airline, and Seim and Viard (2011) who study nonlinear pricing in cellular telecommunication markets. All theses articles study one-sided markets, while ours aims at understanding the consequences

[3]Filistrucchi et al. (2012) considers the "reverse" experiment: they analyze the effects of the advertising ban on French public television in 2009. They find that it did not favour private TV channels at the expense of public ones. They do not investigate how it affects newspapers nor price discrimination, however.

of network effects on price discrimination.

There also exists a very recent vein of research that examines the role of consumers' bounded rationality on price discrimination via subscription (see Grubb (2012) for an insightful review). Prominent contributions to this literature are DellaVigna and Malmendier (2004) for contracts in health sport centers and Grubb (2009) for cellular phone service plans. Although we recognize that bounded rationality may play a role in consumers' decision as to subscribe or not to a newspaper, the scope for price discrimination in our model instead stems from informational considerations. In addition, our aggregated data do not allow us to investigate this issue. Finally Clerides (2004) discusses the definition of price discrimination when products are differentiated. This is of particular importance to us. Indeed, we are considering here identical newspapers but whose cost of production – through the cost of delivery – can vary depending on whether the reader is a unit buyer buying in a newsstand or a subscriber. We show that at least part of the price differences we observe cannot be explained by delivery cost differences. Our paper builds more specifically on Glazer and Hassin (1982) who first study price discrimination by a newspapers based on consumers uncertainty. We introduce the advertising side in the profit function of the newspapers and discuss how this aspect modifies prices on the reader side.

Our paper also relates to the literature on two-sided markets. Rochet and Tirole (2003) provide a widely applicable model of two-sided markets and discuss markets for advertising, credit cards, software and web portal usage. Weyl (2010) and White and Weyl (2010) further extend two-sided market models.[4] Naturally, much work on two-sided markets has focused on the media industry. Argentesi and Filistrucchi (2007) develop an analysis to estimate market power in the Italian newspaper industry, but do not consider price discrimination. Seamans and Zhu (2012) look at the impact of the entry of Craig's list on local newspapers' pricing policies and they find that this negative shock on the advertisement side of newspapers had led to an increase in subscription prices. We contribute to this recent line of research by introducing price discrimination on one side of the market. To the best of our knowledge, Liu and Serfes (2010) is the only paper investigating price discrimination in two-sided markets. However, their modeling approach does not fit well with the newspaper industry as they consider perfect price discrimination on both sides in a Hotelling framework. Our paper is the first theoretical and empirical analysis of second-degree price discrimination in a two-sided market.

The remainder of the paper is organized as follows. Section 2 develops a model of second-degree price discrimination by a platform. Section 3 introduces the new dataset we built

[4] Anderson and Coate (2000) study broadcast markets in which retailers pay for advertising to reach consumers, and where consumers dislike advertising. Rysman (2004) provides an empirical analysis of the market for yellow pages. Jin and Rysman (2013) study US sports card conventions pricing though the lens of the two-sided market theory.

for this study and provides descriptive statistics. In Section 4, we discuss the historical context of the introduction of advertisement on French Television in 1968, and document a substitution effect from national newspapers advertisements to advertisements broadcasted on television. In Section 5 we estimate the effect of the advertising side of newspapers on price discrimination on the reader side using a Differences-in-Differences analysis based on the introduction of advertisement on French Television. Section 6 concludes.

2 A Model of Second-Degree Price Discrimination by a Platform

2.1 Set-up

To model the newspaper industry we consider the repeated interaction between a newspaper, a continuum of readers of mass one (side R of the industry), and a continuum of advertisers of mass one (side A). In the following we denote S the subgroup of readers subscribing to the newspaper, and K the subgroup of occasional buyers (where K stands for "Kiosk"). The newspaper sells n issues during the length of the period of interest, which we take as given.

Newspaper The profit-maximizing newspaper chooses (i) which price p to charge occasional unit buyers, (ii) which price nh to charge subscribers to have the newspaper delivered to their home for the n issues and (iii) which price nt to charge advertisers to have their ad be placed for n issues. The marginal cost of serving unit buyers is denoted c_K, that of serving subscribers is c_N, and, finally, that of serving advertisers is c_A. We do not model the actual production of news, and thus implicitly assume that the newspaper produces content that is of interest to at least some readers.

Readers The gross payoff to reader i from reading the newspaper at date t is given by:

$$U_{i,t} = \theta_i + \epsilon_t, \tag{1}$$

where θ_i represents an individual specific taste for reading, while ϵ_t captures a common shock to all readers at date t (say elections, sport events, etc).[5] We assume that θ has support going from minus infinity to plus infinity, and is drawn according to $f^R(\theta)$. Furthermore, ϵ_t takes value x with probability $\frac{1}{2}$, and zero otherwise. Reader i, if she has not subscribed, observes the realization of ϵ *before* deciding whether to purchase the newspaper at date t. Not subscribing thus allows readers to make informed purchasing decisions.

[5] We thus disregard externalities stemming from the presence of advertisements in the newspaper. There is a line of research investigating whether readers like advertising (see e.g. Kaiser and Song (2009) who use data on German consumer magazines to analyze the extent to which consumers like advertising). The relationship between the presence of advertisements and the payoff to reader is inconclusive, however.

For a given subscription price h per issue (i.e., the actual subscription price is nh), and prior to observing the n future realizations of ϵ, reader i's expected utility from subscribing is:

$$U^S(\theta_i, h, n) = n\left(\theta_i + \frac{x}{2} - h\right). \tag{2}$$

The subscriber pays nh *upfront* to have the n issues delivered at home, and thus read all n issues (since $x > 0$ by assumption), where the expected gross benefit per issue is $\theta_i + \frac{x}{2}$.

A reader i's expected utility from occasionally buying the newspaper at the newsstand price p per issue is instead given by is:

$$U^K = \begin{cases} n\left(\theta_i + \frac{x}{2} - p\right), & \text{if} \quad \theta_i \geq p \\ \frac{n}{2}\left(\theta_i + x - p\right), & \text{if} \quad p > \theta_i \geq p - x \\ 0, & \text{if} \quad p - x > \theta_i \end{cases} \tag{3}$$

Recall first that non-subscribers make their purchasing decisions at date t knowing the realization of ϵ_t. Readers that have a very high taste for reading (that is, readers for which $\theta_i \geq p$) always buy the newspaper; their expected gross benefit per issue is thus again $\theta_i + \frac{x}{2}$. Buyers with instead an intermediary taste for reading (that is, readers for which $p > \theta_i \geq p - x$) only buy the newspaper when the shock ϵ_t is positive (i.e., when $\epsilon_t = x$). The expected number of purchases made by these readers is thus $\frac{n}{2}$; and their gross payoff when the shock is positive is equal to $\theta_i + x$. Finally, readers with a very low taste for reading never buy the newspaper.

Advertisers We assume that advertisers choose between either placing an ad in the newspaper for n periods at price nt or never placing an ad. The gross payoff to advertiser j of placing an add for n periods is taken to be $V_j = nb_j^S N^S + nb_j^K N^K$, where b_j^S captures advertiser j's taste for the average number of subscribers per period N^S, while b_j^K captures his taste for the average number of non-subscribers per period N^K. In addition, advertiser j has outside option $n\alpha v_j$. The 3-tuple (b_j^S, b_j^K, v_j) is drawn according to the joint pdf $f^A(b^S, b^K, v)$, where each parameter is drawn from support going from minus infinity to plus infinity. We assume away any price discrimination by the newspaper on the advertisers' side of the industry (i.e., all advertisers face price nt).

We thus have that advertiser j places an ad in the newspaper for n issues at unit price t if and only if:

$$V_j = nb_j^S N^S + nb_j^K N^K - nt \geq n\alpha v_j. \tag{4}$$

One can already anticipate that the advertisers' taste for large readerships may induce the newspaper to set prices "artificially" low on side R so as to attract many readers (i.e.,

more than in a world without advertisement) and in turn charge high prices to advertisers. If prices charged to readers are below the relevant marginal costs, advertisers *de facto* subsidize readers. The parameter α captures the supply of alternative platforms to advertisers. These alternative platforms could be other newspapers (therefore treated in a reduced form) or, in the spirit of this paper, the television. It is reasonable to think that the introduction of advertisement on television leads to an increase in α.

2.2 Solving the Model

We first compute the three relevant demand functions; that is, the demand for subscriptions, the average demand per issue of newspapers at the newsstand, and the demand for advertising slots.

Readers As long as $p > h$, when comparing payoffs (3) and (2), one derives that high-valuation readers subscribe and average ones instead buy occasionally.[6] In particular, the demand by subscribers is equal to:

$$N^S = \int_{2h-p}^{\infty} f^R(\theta) d\theta. \tag{5}$$

Rather intuitively, more readers are willing to subscribe to the newspaper when the subscription price nh decreases and/or the unit price p increases. The demand by unit buyers is instead given by:

$$N^K = \int_{p-x}^{2h-p} f^R(\theta) d\theta, \tag{6}$$

which is decreasing in the unit price p but increasing in the subscription price nh.

Readers with a high taste for reading would buy every issue of the newspaper at the newsstand at price p (even when $\epsilon_t = 0$) if subscribing was not possible. Since subscribing is instead possible, and since $h < p$, these readers prefer subscribing to enjoy the lower average price. Readers with an average taste for reading instead have a low-enough gross payoff when $\epsilon_t = 0$ that it is not interesting for them to have all n issues be delivered to their home; they prefer buying it only when $\epsilon_t = x$, even though the per-issue price p is higher. Here lies the scope for price discrimination. Setting $h < p$ means extracting less surplus from the readers with a rather high taste for reading (those who would have bought the newspaper at the newsstand anyway), but allows the platform to extract more surplus from the informed consumers; i.e., those who buy only when $\epsilon_t = x$. It is thus these informational differences

[6] Observe that it is weakly suboptimal for the newspaper to set $p < h$ (and having no readers subscribe) since the same outcome can be guaranteed by setting $p = h$. Furthermore, we implicitly assume that it is in fact optimal to set $p > h$. In the simplified model we provide in Subsection 2.3, we provide a condition such that this is indeed the case.

that the newspaper exploits through second-degree price discrimination. In other words, it is not the presence of advertisers that explains the existence of price discrimination in this model; though advertisers will certainly affect its extent.

Advertisers On the other side of the industry, the demand by advertisers is given by:

$$N^A(N^S, N^K, t, \alpha) = \int_{-\infty}^{\infty}\int_{-\infty}^{\infty}\int_{-\infty}^{\frac{1}{\alpha}\left(b^S N^S + b^K N^K - t\right)} f(b^S, b^K, v)dvdb^S db^K, . \tag{7}$$

Advertisers are more willing to place their ads in the newspaper as the average number of readers increases (both subscribers and non-subscribers), as the price of advertising nt decreases, and as their outside option decreases. The pricing policy of the newspaper must thus take into account these *network effects* when choosing prices on the readers' side.

The newspaper's problem Having characterized the relevant demands, the newspaper's profits are equal to:

$$\begin{aligned} \Pi &= \Pi^S + \Pi^K + \Pi^A \qquad (8) \\ &= \frac{n}{2}\left(p - c^K\right) N^K\left(h, t\right) + n\left(h - c^S\right) N^S\left(h, t\right) + n\left(t - c^A\right) N^A\left(N^S, N^K, t, \alpha\right) \end{aligned}$$

The newspaper chooses h, p, and t to maximize (8). In the following proposition let ϵ_h^S denote the elasticity of the subscribers' demand with respect to the subscription price h, ϵ_h^K that of the unit buyers' demand with respect to the unit price p, etc.

Proposition 1 *The optimal pricing policy of the newspaper is characterized by the following three pricing formulas:*

$$\frac{h - c^S}{h} = -\frac{1}{\epsilon_h^S} - \frac{1}{2}\left(p - c^k\right)\frac{\partial N^K}{\partial h}\frac{1}{N^S}\frac{1}{\epsilon_h^S} - \left(t - c^A\right)\frac{\partial N^A}{\partial h}\frac{1}{N^S}\frac{1}{\epsilon_h^S} \tag{9}$$

$$\frac{p - c^K}{p} = -\frac{1}{\epsilon_p^K} - 2\left(h - c^S\right)\frac{\partial N^S}{\partial p}\frac{1}{N^K}\frac{1}{\epsilon_p^K} - 2\left(t - c^A\right)\frac{\partial N^A}{\partial p}\frac{1}{N^K}\frac{1}{\epsilon_p^K} \tag{10}$$

$$\frac{t - c^A}{t} = -\frac{1}{\epsilon_t^A}. \tag{11}$$

Proof Differentiating (8) with respect to h yields:

$$N^S + \left(h - c^S\right)\frac{\partial N^S}{\partial h} + \frac{1}{2}\left(p - c^K\right)\frac{\partial N^K}{\partial h} + \left(t - c^A\right)\frac{\partial N^A}{\partial h} = 0, \tag{12}$$

where

$$\frac{\partial N^A}{\partial h} = \int_{-\infty}^{\infty}\int_{-\infty}^{\infty} f\left(b^S, b^K, \frac{1}{\alpha}\left(b^S N^S + b^K N^K - t\right)\right)\left(\frac{1}{\alpha}\left(b^S \frac{\partial N^S}{\partial h} + b^K \frac{\partial N^K}{\partial h}\right)\right) db^S db^K.$$

Note that this is nothing else than the average marginal change in payoff of the marginal advertisers (those exactly indifferent between placing an ad or not). One may rewrite (12) as follows:

$$h = c^S \frac{\epsilon_h^S}{1+\epsilon_h^S} - \frac{1}{2}\left(p - c^K\right)\frac{\epsilon_h^K}{1+\epsilon_h^S}\frac{N^K}{N^S} - \left(t - c^A\right)\frac{\epsilon_h^A}{1+\epsilon_h^S}\frac{N^A}{N^S}.$$

Similarly, differentiating (8) with respect to p and rearranging yields (10), while differentiating (8) with respect to t yields (11). ■

Intuition These pricing formulas are Lerner pricing formulas modified to take into account the scope for price discrimination within readers as well as the presence of advertisers. These pricing formulas, as well as the three demand functions, help us gain a good intuition for the newspaper's prices. In addition to taking into account the various marginal costs and elasticities, the newspaper chooses its prices on the readers' side taking into account (i) the average marginal change due to a change in prices charged to readers in the payoff of the marginal advertisers (those indifferent between placing an ad or not), as well as (ii) the incentives for non-subscribers to become unit buyers, and finally the incentives for non-subscribers to stop purchasing altogether. Not surprisingly, we also observe that the relative sizes of each group of consumers matters as well. Finally, note that the formula for the advertising price is nothing else but the standard Lerner pricing formula (since externalities from advertising on readers are for now disregarded).

In addition to this, these formulas also offer us insights directly linked to the empirical analysis carried out in this paper. Note first that

$$\frac{\partial N^A}{\partial h} = \int_{-\infty}^{\infty}\int_{-\infty}^{\infty} f\left(b^S, b^K, \frac{1}{\alpha}\left(b^S N^S + b^K N^K - t\right)\right)\left(\frac{1}{\alpha}\left(b^S \frac{\partial N^S}{\partial h} + b^K \frac{\partial N^K}{\partial h}\right)\right) db^S db^K$$

is equal to the average marginal change in payoff of the marginal advertisers (those exactly indifferent between placing an ad or not), scaled by the common component of their outside option. This implies that an increase in the outside option following, say, the introduction of advertisement on television, affects the *extent* of price discrimination through a *composition effect*, i.e., through a change in the average "type" of marginal advertisers. The second effect is, in a sense, less subtle: a change in the outside option of advertisers also changes the price the newspaper can charge them (it decreases it). Because of this effect, all else equal, the newspaper will distort less the prices charged to readers. Finally, the magnitude of these two

effects is affected by the relative sizes of the groups of subscribers and non-subscribers (as well as the absolute value of their own price elasticity of demand.)

2.3 A Simple Model

The main virtue of the general framework presented in the previous subsection is to identify the relevant economic factors that determine a newspaper's pricing policy. To gain further intuition, and to carry out comparative statics, we however simplify the framework presented so far in several ways. We first suppose that $\theta_i \sim U\left[0, \overline{\theta}\right]$. This implies that the revenues from subscribers become:

$$\Pi^S = nh\left(\frac{\overline{\theta} - (2h - p)}{\overline{\theta}}\right), \tag{13}$$

while those from unit purchases are instead given by:

$$\Pi^K = \frac{np}{2}\left(\frac{(2h - p) - (p - x)}{\overline{\theta}}\right) = \frac{np}{\overline{\theta}}\left(h - p + \frac{x}{2}\right). \tag{14}$$

Next we further simplify the framework by assuming that all advertisers care about is *the average number of readers per issue*, i.e., $V_j = nN^R$, where $N^R = \frac{\overline{\theta} - \left(h - \frac{x}{2}\right)}{\overline{\theta}}$.

In addition, let the newspaper engage in perfect price discrimination on the advertisers' side, i.e., let the newspaper choose advertising price nt_j for advertiser j.

Advertiser j has outside option $\alpha v_{0,j}$, where $v_{0,j} \sim U\left[0, \overline{V}\right]$, and thus places an ad if and only if:

$$nN^R - nt_j \geq n\alpha V_{0,j}. \tag{15}$$

Again, $v_{0,j}$ captures advertiser j's payoff on alternative platforms, and α captures the supply of these alternative platforms. The advertising revenue is thus equal to:

$$\Pi^A = n\int_0^V \max\left[N^R - \alpha V_{0,j}, 0\right] dj$$

$$= n\frac{(N^r)^2}{2\overline{V}\alpha}$$

The newspaper therefore chooses p and h to maximize expected payoff:

$$\Pi = \Pi^S + \Pi^K + \Pi^A = ns\left(\frac{\overline{\theta} - (2h - p)}{\overline{\theta}}\right) + np\left(\frac{h - p + \frac{x}{2}}{\overline{\theta}}\right) + n\frac{\left(N^R\right)^2}{2\overline{V}\alpha}. \tag{16}$$

The following proposition captures the newspaper's optimal prices.

Proposition 2 *The optimal pricing policy of the newspaper is such that:*

$$t_j^* = \max\left[N^R - \alpha V_{0,j}, 0\right] \tag{17}$$

$$h^* = \frac{1}{2}\frac{\left(\overline{\theta}\alpha\overline{V} - 1\right)\left(2\overline{\theta} + x\right)}{2\overline{\theta}\alpha\overline{V} - 1}, \tag{18}$$

$$p^* = h^* + \frac{x}{4} \tag{19}$$

Proof Differentiating with respect to h and p, and solving the system of two equations, yields the formulas stated in the proposition.■

Not surprisingly, we find that the price charged to occasional readers is higher than that charged to subscribers. Interestingly, in this simplified model, we find that it is always optimal for the newspaper to engage in second-degree price discrimination on the readers' side so long as $x > 0$, that is, so long as there is some uncertainty over the taste for reading that can be exploited. Indeed, recall that it is without loss of generality for the newspaper to set prices such that $p \geq h$ since the outcome without subscription can always be replicated by setting $p = h$.

Corollary 1 *An increase in the common component of the advertisers' outside options α leads to an increase in the prices on the readers' side.*

Proof Follows from differentiating the formulas for the prices stated in Proposition 2 with respect to α. ■

Intuition The intuition for this result is as follows. The presence of advertisers whose payoff increases with the average number of readers leads to the newspaper charging lower prices to readers that it would choose absent advertisers. If the benefit of doing so is high enough, readers could even be charged prices below marginal cost (they would then be effectively subsidized). The benefit of doing so to the newspapers naturally comes from the fact that the created surplus can be then extracted through the price charged to advertisers. Now, if the advertisers' outside option increases so that lower prices must be charged, it becomes less interesting for the newspaper to cater to their taste, and we thus observe a movement in the prices charged to the readers towards what they would be absent advertising: higher.

3 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.

3.1 Newspaper Industry Characteristics

The French daily newspaper industry is divided into two sub-industries: the *local* daily newspaper industry and the *national* daily newspaper industry. During our period of interest (1960-1974), there are around 100 (national and local) general information newspapers.

There are 12 national newspapers at the beginning of the period and 10 at the end.[7] 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 (2014) 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 350,000 copies a day and the one of local daily newspapers to 100,000. Copies are sold either at the newsstand to unit buyers or through subscription. The average share of unit buyers is 70%.[8] As expected, the price charged to subscribers is lower than the price paid by unit buyers at the newsstand. The average price ratio is 0.86. (Table 1 provides descriptive statistics on newspaper prices, revenues and costs as well as on circulation and newspaper content for the entire daily newspaper industry.[9])

Overall, national daily newspapers generate 67.5 million francs (€71.4 million) in total revenues each year, and local daily newspapers 19.9 million francs (€20.4 million). These revenues come from sales and from advertising. On average, between 1960 and 1974, the share of advertising revenues in total revenues is 45%. The quantity of advertisement in newspapers represents around 2 pages per newspaper issue, i.e., 11% of the content of the newspaper.

3.2 Data

We collect an annual balanced panel dataset on local and national newspapers in France between 1960 and 1974. The data is paper data that we digitize and merge from the French Ministry of Information's non-publicly available records in the National archives. Newspapers were asked by the Ministry of Information to report annually on revenues and expenses. We collect data by having direct access to their responses to these queries.

[7] *Libération* and *Paris Presse* -exit the industry respectively in 1964 and in 1970.

[8] The statistical discrepancy between the share of unit buyers and the share of subscribers – that do not sum up to 100 – stems from the fact that a number of copies is distributed for free every day.

[9] In the online Appendix, we present these descriptive statistics separately for national – Table D.1 – and local – Table D.2 – daily newspapers.

Table 1: Summary Statistics

	mean/sd
Prices	
Unit Price	0.44
	(0.20)
Subscription Price Per Issue	0.38
	(0.17)
Price Ratio	0.86
	(0.07)
Revenues and Costs	
Total Revenues	26.51
	(38.37)
Revenues from Advertising	12.90
	(22.03)
Revenues from Sales	13.57
	(18.47)
Share of Advertising	
in Total Revenues (%)	45
	(11)
Total Expenditures	25.67
	(38.04)
Profit	0.89
	(6.32)
Circulation	
Total Circulation	135,332
	(178,546)
Share Unit Buyers (%)	70
	(23)
Share Subscribers (%)	27
	(22)
Content	
Total Number of Pages per Issue	16
	(7)
Quantity of Advertising per Issue	
(in number of pages)	2
	(2)
Share of Advertising	
in Newspaper Content (%)	11
	(7)
Observations	1008

Notes: The Table gives summary statistics. Numbers in parentheses are standard deviations and the others are averages. Time period is 1960-1974. Variables are values for newspapers. Unit price and subscription price per issue are in francs. Revenues and costs are in million francs.

Local and national newspapers Our dataset includes data for 61 of the local newspapers, i.e., more than three quarters of the local daily newspapers industry in 1971. These newspapers are the only ones for which the data is available in the archives. They represent on average more than 87% of the total local daily newspaper circulation. Our sample of national newspapers include all the 10 national newspapers circulating between 1960 and 1974.

Price, cost and revenue data For the 71 newspapers described above we collect data on prices with information on unit price, subscription price, and the number of issues per year. This allows us to compute a measure of price discrimination. We also have data on revenues (from sales and from advertising), and on costs. Finally, we have data on circulation with the share of unit buyers and the share of subscribers.

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

A first source of information for advertising prices are the listed prices per advertising slot. We digitize this data from *"Tarif Media"*, an annual publication that provides information regarding advertising prices. However, a downside of using listed prices is that discounts are common in this industry. Price lists are hence a relevant measure of advertising prices as long as we assume that the potential bias between list prices and actual prices does not differ too much across newspapers and over time.

Given this caveat, we propose three other measures of advertising prices. First, we use a measure of advertising price common in the literature, which consists of the total advertising revenues divided by the newspaper circulation. Second, we compute an "average" advertising price by dividing the total advertising revenues by the average amount of advertisements in each newspaper issue, multiplied by the number of issues. Third, we combine the two previous approaches and define the advertising price as the total advertising revenues divided by the average amount of advertisement per issue, multiplied by the number of issues and normalized by the newspaper circulation.

We collect data on the amount of advertisement per issue directly from the paper version of the newspapers available in the French National Library. For each year and each newspaper, we select two issues (Monday and Thursday of the third week of March[10]). We measure the quantity of advertisement on each page. We thus have information on the total amount of advertisements in the newspaper, and the share of the newspaper that is devoted to advertising.

[10]The choice of the third week of March was dictated by the fact that this is the week used by the INSEE to run all its surveys.

Finally, for a subset of newspapers, we also collect information on the type of advertisements in the newspapers and obtain information on the category of each advertisement (e.g. alimentation, automobile, household electrical goods,...) as well as on the brand advertising in the newspaper.

4 Background on the Introduction of Advertisement on French Television

The model we built in the previous section provided us with a general framework with which to think about the determinants of pricing policies by newspapers, including the extent of price discrimination. In this section, we study empirically how price discrimination varies with advertising revenues. The empirical strategy we follow is in the spirit of an event study. We exploit the introduction of advertisement on French Television in October 1968 as an exogenous negative shock on the advertising side of newspapers. To the best of our knowledge, we are the first to use this quasi-natural experiment.

In this section, we first present some historical background on the introduction of advertising on French Television in 1968, and then document a substitution effect from advertisements in national newspapers to advertisement on television.

4.1 French Television in 1968

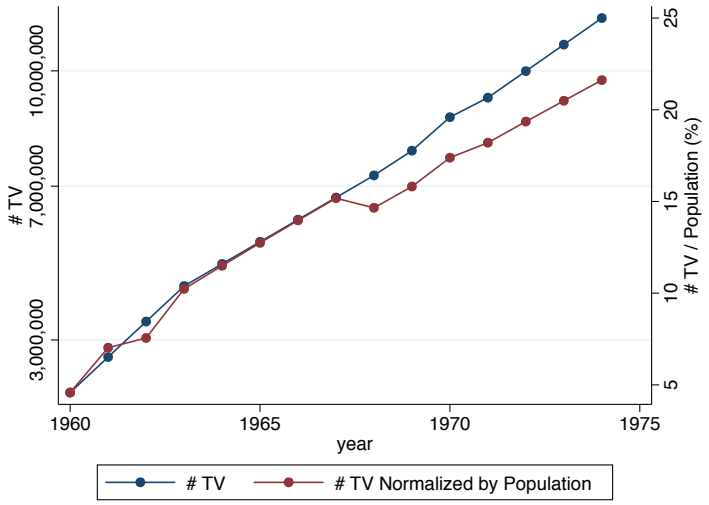
French Television is state-owned from 1945 to 1981.[11] A national agency – the *"Office de Radiodiffusion-Télévision Française"* (ORTF) – is in charge of providing radio and television content.[12] Only one channel (*"La première chaîne"* – the "First Channel") is available until 1963. A second TV channel (*"La deuxième chaîne*" – the "Second Channel") is introduced in 1964 and a third one (*"La troisième chaîne"* – the "Third Channel") in 1972. TV penetration is increasing at the time, as shown in Figure 2. In 1970, nearly 70% of the French households own a television (Parasie, 2010).

Channels are financed mostly through a fee (*redevance*) until 1968. By law, *commercial* or *brand* advertising is forbidden, with the exception of "collective advertising". Collective ads promote products, say fruits, without mention of a brand.[13] They were not very important

[11] During this period all TV channels are privately-owned in the US, while in the UK two TV channels are state-owned (BBC 1 and BBC 2) and one is private (ITV).

[12] The first national agency, the *"Radiodiffusion Française"* (RDF), is created in 1945. It is eventually renamed *"Radiodiffusion-Télévision Française"* (RTF) in 1949 and replaced by the ORTF in 1964.

[13] These are allowed since the 1950's and are also referred to as "compensatory advertising" (*"publicité compensée"*), where the term"compensatory" captures the fact that the ORTF would receive a compensation in exchange for the broadcast (Duchet, 2005). Not only advertisers have to constitute associations, but an advertising campaign also needs the approval of the supervisory Ministry (e.g., the Ministry of Agriculture for oranges).



Notes: This Figure represents the evolution of television penetration in France between 1960-1974. Data on television equipment is from studies conducted for the advertising market (PROSCOP) and data on population is from the French national institue for statistics (INSEE).

Figure 2: TV Penetration in France, 1960-1974

however. In 1959 for example, the time devoted to collective advertising is only of five hours and ten minutes per year (Parasie, 2010).

The transition to color on the Second Channel and the need to produce an increasing number of programs means that the ORTF experiences severe financial difficulties – it is *"on the edge of the abyss"* (Bellanger, 1969).[14] Secretly decided by the French Government in March 1965, the introduction of advertising on television is made public on October 20th 1967, thereby provoking a strong controversy both in Parliament and within the Newspaper Industry. The then Prime Minister George Pompidou argues that the ORTF has no choice but to find new sources of revenues to develop the Second Channel and eventually create a third one. He also argues that the introduction of advertising on television will *"revitalize the production by giving to our firms the possibility to develop their domestic market, essential support to any exporter activity."* (address in Parliament on April 24 1968).[15]

4.2 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 that it would lead to a decrease in the quality of television content. More importantly – and consistently with the identification

[14] Beginning on October 1st 1967, the Second Channel broadcasts twelve hours a week of programs in color.

[15] Commercial advertising is allowed much earlier in almost all other developed countries: it is allowed in 1941 in the US, in 1955 in the UK, in 1956 in Germany, and in 1957 in Italy and Spain (Parasie, 2010).

strategy we use in this paper –, very much present is the idea that the reform would lead to a decrease in newspaper advertising revenue.[16] In fact, already in 1964, the Minister of Information of the time, Alain Peyrefitte, was aware of this issue and claimed that the introduction of advertising on television would be worth considering only if the press could survive it (Bellanger, 1969).

Newspapers were similarly against the reform as they anticipate a decrease in their advertising revenues. And indeed, as underlined by Bellanger (1969), *"in terms of* national *advertising (...) in a limited market, any drain leads to a decrease in the advertising revenues which the press lives off"*. The Federation and the Confederation of the French Press estimated in a report that the press would lose between 40 and 50% of its advertising revenues, i.e., between 20 and 40% of total revenues depending on the newspaper.

4.3 A substitution effect

Despite these strong resistances from the newspaper industry and the opposition, the first commercial advertisement is broadcasted on French Television in October 1968. The time devoted to advertising is of 2 minutes per day in 1968 – only on the First Channel –, 4 in 1969, 8 in 1970 (i.e. 2,720 minutes per year) – year in which advertising is introduced on the Second Channel, and more than 12 in 1971 (Bellanger, 1969). Advertising revenues generated by the ORTF increase by 69 million francs (77 (constant 2009) million euros[17]) between 1967 and 1968 and by 197 million francs (€201 million) between 1968 and 1969. In 1971, advertising revenues represent 22% of the ORTF total revenues (Bellanger, 1969). Did this increase lead to a symmetric decrease in newspaper advertising revenues?

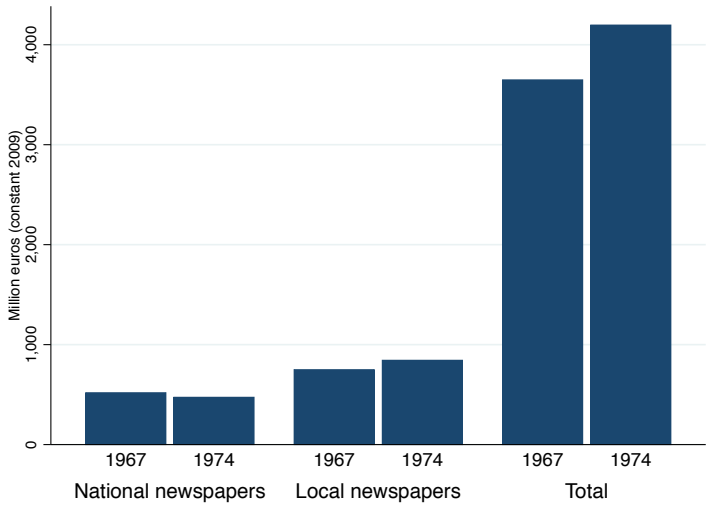
In order to provide a sense of the effect of the introduction of advertisement on television on the advertising revenues of local and national daily newspapers, we first provide aggregate evidence at the industry level.[18] Total advertising revenues of national daily newspapers decrease by 21 million francs (€45 million) between 1967 and 1968, and then stabilize around 500 million francs. While the advertising market is expanding in France between 1967 and 1974, national newspapers advertising revenues are actually decreasing. On the contrary, local newspaper advertising revenues increase during the same period (Figure 3).

The introduction of advertisement on television in 1968 can thus be considered as a sig-

[16] The Federation of the Democratic and Socialist Left argues that the government wishes to introduce advertising on television so as to weaken newspapers, the only independent media (Parasie, 2010). In an address to the Parliament on April 24 1968, Jacques Chambaz (from the Communist Party) claims that *"the introduction of commercial advertisement on television is but a new way to deal a blow to the broadsheet newspapers that you consider not docile and flexible enough."*

[17] In the remainder of the paper, to save on space, we simply use the terminology "euros" when refering to "constant 2009 euros".

[18] In Section 5, we provide econometric evidence of this shock, computing differences-in-differences estimates to show that this shock affects negatively the advertising revenues of the national daily newspapers, but not those of the local daily newspapers.



Notes: The Figure shows for 1967 and 1974 the value of advertising revenues in France by media outlets (local and national daily newspapers, and total) in million euros (constant 2009). Data is from the *"Institut de Recherches et d'Etudes Publicitaires"* (IREP), a French research institute devoted to the study of advertising.

Figure 3: Advertising Revenues, 1967-1974, by Media Outlets

nificant negative shock on the advertisers' side of the *national* newspaper industry. Why did it only affect national newspapers? Because the nature of advertising varies between national and local newspapers. In particular, advertisements in national newspapers are mostly commercial advertisements that are relatively close substitutes to those broadcasted on television, while a large share of advertisements in local newspapers are local in nature (local commercial advertisements and classified advertisements).

5 Empirical Analysis

5.1 Estimation Strategy

We use our panel data to compute differences-in-differences (DD) estimates of the effect of the introduction of advertising on television. The negative shock on newspaper advertising revenues following this introduction (our treament) only affects national newspapers (treated group) but not local newspapers (control group). We thus compare the pre-1968-to-post-1968 change in prices of national daily newspapers to the change in prices of local daily newspapers over the same period.

Let $D_{\text{national news}}$ be an indicator variable for national newspapers and D_{after} be a time dummy that switches on for observations post 1968 (i.e., after the introduction of advertisement on television). Our analysis is based on the following regression equation:

$$\begin{aligned}\text{log price ratio}_{n,t} = &\alpha + \beta_1 D_{\text{after}} + \beta_2 D_{\text{national news}} + \beta_3 \left(D_{\text{after}} * D_{\text{national news}}\right) \\ &+ X'_{n,t}\delta + \lambda_n + \gamma_t + \epsilon_{n,t}\end{aligned} \tag{20}$$

where n indexes newspapers and t indexes years ($t = 1960, ...1974$). λ_n is a newspaper fixed effect, γ_t is a year fixed effect, and $\epsilon_{n,t}$ is a newspaper-year shock. $X'_{n,t}$ is a vector of newspaper-level controls; it includes circulation and operating costs. Standard errors are clustered at the newspaper level.

The dependent variable, log price ratio$_{n,t}$, is the log of the price ratio of newspaper n in year t defined as the subscription price per issue divided by the unit price. We assume that the difference in prices charged to unit buyers and subscribers is entirely due to price discrimination and use the price ratio as our measure of price discrimination (Clerides, 2004). Obviously, part of the difference between the prices charged to unit buyers and subscribers may be driven by differences in costs, in particular costs of delivery. However, our assumption is valid in the DD setting as long as the introduction of advertisement on television did not affect costs of delivery.[19]

Due to the inclusion of newspapers and year fixed effects, the coefficient β_3 – our coefficient of interest – measures the annual price ratio effect for national newspapers of the introduction of advertisement on television compared to the general evolution of the price ratio for local newspapers. The key identifying assumption here is that price trends would be the same for both categories of newspapers (local and national) in the absence of treatment. The treatment induces a deviation from this common trend. Figure 4 provides strong visual evidence of treatment and control newspapers with a common underlying trend, and a treatment effect that induces a sharp deviation from this trend. However, as an alternative check on the DD identification strategy, we add an industry-specific time trend to the list of controls. In other words we estimate:

$$\begin{aligned}\text{log price}_{n,t} = &\alpha + \beta_1 D_{\text{after}} + \beta_2 D_{\text{national news}} + \beta_3 \left(D_{\text{after}} * D_{\text{national news}}\right) \\ &+ \mu_{1\text{national}} t + X'_{n,t}\delta + \lambda_n + \gamma_t + \epsilon_{n,t}\end{aligned} \tag{21}$$

where $\mu_{1\text{national}}$ 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.

Finally, the unbiasedness of the DD estimates requires the strict exogeneity of the introduction of advertisement on television. As we underline above, French Television is state-owned from 1945 to 1981. There is thus no interaction between television owners and newspaper

[19] Future work will aim at isolating the part of the difference in prices which reflects differences in costs (non-discriminatory price differences) using relevant observed cost shifters (delivery costs are unobserved).

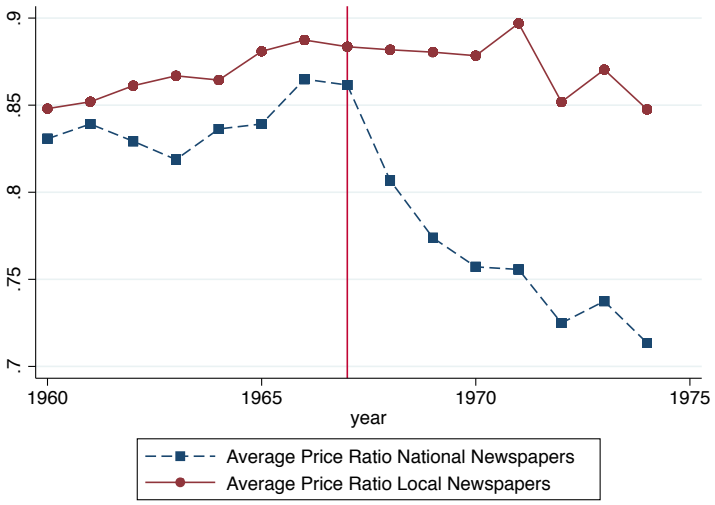


Figure 4: Descriptive Evidence: Changes in Price Discrimination.

owners, be they national or local. The introduction of advertising on television was decided unilaterally by the French government to answer the concerns of the ORTF. It is exogenous to the newspaper industry.

5.2 Results

5.2.1 Benchmark Estimates

Table 2 reports estimates of equations (20) and (21). It appears clearly in column 1 (baseline estimation without controls and time trends) that there is a statistically significant decrease in the price ratio – our measure of price discrimination – of national newspapers compared to local newspapers following the introduction of advertisement on television. Moreover, this negative effect is robust to controlling for a national newspapers industry-specific time trend which is reassuring as to the validity of our DD identification strategy (column 2). This result is also robust to the introduction of newspaper-level controls (column 3).

5.2.2 Timing of the Effect

This before-after event study approach enables us to control for time-invariant newspaper-specific effects and general time trends. As an additional robustness check, we allow for flexible time-varying effects of the negative shock on advertising revenues (Laporte and Windmeijer, 2005). To quantify the dynamics effects of the event and control for lags and leads, we define ("pulse") variables for two, non-overlapping, three-years spaced periods around the event and a dummy variable isolating the long-run effect of the shock (see e.g. (Papaioannou and Siourounis, 2008)).

Table 2: The Effect of the Decrease in Advertising Revenues on the Price Ratio: Baseline Estimation

	Price Ratio		
	(1)	(2)	(3)
National x Post-1968	-0.12***	-0.07***	-0.07***
	(0.02)	(0.02)	(0.02)
Year FE	Yes	Yes	Yes
News FE	Yes	Yes	Yes
Industry-Specific Trend	No	Yes	Yes
News Controls	No	No	Yes
R-sq	0.14	0.14	0.20
Observations	968	968	955
Clusters (news)	71	71	71

Notes: * p<0.10, ** p<0.05, *** p<0.01. Standard errors in parentheses are clustered by newspaper. Time period is 1960-74. Models are estimated using OLS estimations. Newspaper controls are newspaper circulation and expenditures. Variables are described in more details in the text.

Our specification is:

$$\begin{aligned} \text{log price ratio}_{n,t} = &\alpha + \delta_1 d^1_{n,t} + \delta_2 d^2_{n,t} + \delta_3 d^3_{n,t} \\ &+ X'_{n,t}\Delta + \lambda_n + \gamma_t + \epsilon_{n,t} \end{aligned} \tag{22}$$

where $d^1_{n,t} = 1$ in 1966, 1967 and 1968 for national newspapers (pre introduction of advertising on television); $d^2_{n,t} = 1$ in 1969, 1970 and 1971 for national newspapers (at the time of the introduction and in the following years); and $d^3_{n,t} = 1$ in 1972 and all subsequent post-introduction years (until 1974). Each indicator variable equals zero in all other years than those specified and for local newspapers. Thus the base period is the years before 1966.

Table 3 presents the results. In column 1 we report the results without controls, and in column 2 we introduce newspaper-level controls. We find no statistically significant effect (with a point estimate close to zero) for the pulse variable $d^1_{n,t} = 1$. This is reassuring as to the validity of our DD strategy. Moreover, as expected given the results of Table 2, we obtain a negative and statistically significant at the 1% level δ_2: there is a statistically significant decrease in the price ratio – i.e., in the extent of price discrimination – of national newspapers compared to local newspapers following the introduction of advertising on television. This effect is long lasting: the δ_3 is statistically significant and the point estimates is higher than for the short-run effect (column 1) and increases when we introduce controls (column 2).

Finally in Table 4, we investigate the effect of the introduction of advertising, using the same empirical strategy, separately for unit prices and subscription prices. It appears that the decrease in the price ratio is entirely driven by a decrease in the subscription price,

Table 3: The Effect of the Decrease in Advertising Revenues on the Price Ratio: Timing of the Effect

	Price Ratio	
	(1)	(2)
Pre Introduction of Advertisement on TV		
(1966-1968)	-0.02	-0.02
	(0.02)	(0.02)
Short-Run Introduction of Advertisement on TV		
(1969-1971)	-0.12***	-0.12***
	(0.01)	(0.02)
Long-Run Introduction of Advertisement on TV		
(1972, onwards)	-0.13***	-0.15***
	(0.02)	(0.02)
Year FE	Yes	Yes
News FE	Yes	Yes
News Controls	No	Yes
R-sq	0.14	0.19
Observations	968	955
Clusters (news)	71	71

Notes: * p<0.10, ** p<0.05, *** p<0.01. Standard errors in parentheses are clustered by newspaper. Time period is 1960-74. Models are estimated using OLS estimations. Newspaper controls are newspaper circulation and expenditures. Variables are described in more details in the text.

Table 4: The Effect of the Decrease in Advertising Revenues on Different Prices: Timing of the Effect

	Unit Price	Subscription Price	Advertising Price
	(1)	(2)	(3)
Pre Introduction of Advertisement on TV (1966-1968)	-0.02	-0.04	-0.17
	(0.03)	(0.03)	(0.22)
Short-Run Introduction of Advertisement on TV (1969-1971)	0.02	-0.10***	-0.52**
	(0.03)	(0.02)	(0.23)
Long-Run Introduction of Advertisement on TV (1972, onwards)	-0.01	-0.15***	-0.58**
	(0.04)	(0.03)	(0.26)
Year FE	Yes	Yes	Yes
News FE	Yes	Yes	Yes
News Controls	Yes	Yes	Yes
R-sq	0.93	0.90	0.21
Observations	955	955	590
Clusters (news)	71	71	48

Notes: * p<0.10, ** p<0.05, *** p<0.01. Standard errors in parentheses are clustered by newspaper. Time period is 1960-74. Models are estimated using OLS estimations. Newspaper controls are newspaper circulation and expenditures. Variables are described in more details in the text.

while there is no statistically significant change in the unit price charged to unit buyers at the newsstand. Moreover, we find a statistically significant decrease in the advertising price charged by national newspapers compared to local newspapers following the introduction of advertising on television. This effect is long lasting: the δ_3 is statistically significant and the point estimates is higher than for the short-run effect when advertising price is the outcome variable of interest.

6 Conclusion

We have built a model in which a profit-maximizing newspaper must attract both readers and advertisers. Particular attention has been paid to the incentives the newspaper has to engage in second-degree price discrimination between subscribers and occasional buyers, and how these incentives interact with the advertisers' side of the industry, and in particular the reliance on advertising revenues.

In our model, there is scope for second degree price-discrimination because of the readers' uncertainty regarding their utility from reading in future periods. The newspaper sets its prices such that readers with a high average taste for reading subscribe at a relatively low

unit cost, while readers with an intermediate average taste for reading only buy occasionally – but at a high price – when their utility from reading on that day is high. One general tendency that emerges is that, as long as advertisers prefer large readerships to smaller one, prices charged to readers tend to be lower than absent the advertisers' side of the industry. Following a general increase in the outside option of newspapers we therefore find that prices tend to go up. As for the extent of price discrimination, the interaction with the advertisers' side is more subtle since then elasticities, group sizes, as well as the average taste of marginal advertisers (those indifferent between placing an ad or not) are all relevant. According to the empirical evidence we obtain using French daily newspapers between 1960 and 1974, price discrimination increases when advertising revenues decline.

This empirical finding has implications for the 21st century newspaper industry. In particular it sheds light on the observed current tendency for newspapers to favor subscriber-based readerships through low subscription prices (and high newsstand prices). What our paper suggests is that when newspapers are less capable of generating revenues from advertising, all else equal, they tend to adjust their pricing policies on the readers' side so as to increase the share of subscribers. As advertising revenues continue declining, we should thus expect this tendency to reinforce itself in the coming years.

Moreover, our results also shed light on a new phenomenon characterizing the newspaper industry: the tendency of a number of newspapers in the United States to charge *more* for a digital subscription than for a print subscription, despite that it is much more costly to deliver a print than a digital subscription. The *Greensboro News & Record* is thereby charging $187.12 for a 7-day, 52-week print subscription but $215.40 for a digital one. Similarly, the *Orange County Register* is offering digital access for $3.99 a week, or digital plus Sunday print for $2.99 a week, and the *New York Times*' Sunday print gives all-digital access at a price thats usually cheaper than all-digital access itself.[20] What is driving this new pricing strategy? According to our results, this could be explained by the fact that a digital reader may be worth less than a print reader (see e.g. Noam, 2009)[21]. To the extent that newspapers may be less capable of generating advertising revenues from a digital-only subscription than from a print one, they may tend to adjust their pricing policies to increase the share of print readers. Whether it is indeed the case will be the topic of future research.

[20] http://www.niemanlab.org/2014/07/when-a-digital-subscription-costs-more-than-a-print-one/

[21] *"A print reader generates more than 20 times times as much in revenues than an online reader."* (p.440)

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