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Prices and Network Effects in Two-Sided Markets: the Belgian Newspaper Industry

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Abstract

This paper investigates the two-sided nature of the newspaper industry. We explicitly take into account cross network effects that exist between advertisers and newspaper readers. On one side, advertisers' demand for publicity space depends on the number of newspaper readers and their characteristics. On the other side, readers' demand can be, positively or negatively, influenced by the number of advertisements. In addition, editors may own several newspapers and hence a variety of cross-market effects that result from changes in market prices exist. To estimate demand parameters for both sides of the market, a specific structural model is needed that takes into account those effects. We estimate network effects and price elasticities for Belgian newspaper publishers to assess market power and the degree of competition in the market, which experienced a large consolidation wave over the last decades. This allows us to evaluate a recent merger in the Belgian newspaper industry.

Keywords: two-sided markets, newspapers, demand estimation

JEL Codes: L11, L82, C23

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1 Introduction

Over the last decades, there has been a large consolidation wave in media industries all over the world which has led to the emergence of large cross-media companies. This trend towards media ownership concentrations has raised concerns about potential harmful effects on the dissimulation of accurate information to the population. There are two possible detrimental effects of concentration in media markets, namely a reduction in opinion diversity and the potential for an exercise of market power by media companies (Chandra and Collard-Wexler 2008). We study the second effect as we assess the impact of the existence of multi-product firms in the Belgian newspaper market and contrast it with a market structure where each newspaper is published by an independent media company. Moreover, we evaluate the effects of the recent acquisition of two newspapers by already existing publishers. Concerning the first effect, we refer interested readers to Picard (1998).

Media markets differ from traditional markets in that they sell a joint product to two different categories of buyers, namely advertisers and consumers. Media companies need advertisers to make the publication of media content profitable while firms use media outlets to advertise their products. As such, this paper adds to the growing body of economic literature on two-sided markets. These are defined as markets where a platform connects two distinct types of economic agents. The value of the good to one type of economic agents depends on the number of agents of the other group that consume the good (Caillaud and Julien 2003, Rochet and Tirole 2003 and Armstrong 2006). In these markets not only price level but also price structure matters and often one side will subsidize the other side which pays a price below marginal cost. The choice of this price structure is key to the success of a platform (Rochet and Tirole 2003). Rochet and Tirole (2006) provide a survey of the literature about two-sided markets. The newspaper industry connects advertisers and readers with each other. The network effect from readers to advertisers is unambiguous since the more readers, the higher the valuation of the advertising space in a newspaper is. The network effect going from advertisers to readers is less clear-cut. On the one hand, it could be that more advertisements lead to a higher value of the newspaper to consumers. This is true if newspaper readers also want to be informed about promotions and special offers by firms, or simply want to get guidance in their choice. Kaiser and Wright (2006) find that for the German magazine industry, readers' willingness to pay for an increase in advertisements is positive and not significantly different from their willingness to pay for extra content. On the other hand, it could also be the case that consumers view advertising as a nuisance and value the amount of advertising negatively. An obvious example is the television industry for which Wilbur (2008) finds consumers to be strongly advertising averse. For a survey about media markets from the perspective of two-sided markets, see Anderson and Gabszewicz (2006).

Other recent empirical papers about the newspaper industry include Gentzkow (2007) who studies the impact of online newspapers on the demand for print newspapers. George and Waldfogel (2006) show how the spread and growth of the *New York Times* has influenced demand and positioning of local newspapers. Chandra (2008) finds that advertisers' willingness to pay is higher, the more homogeneous the readership is. Closer to our work is Argentesi and Filistrucchi (2008) who look at market power in the Italian newspaper industry and determine whether the observed price-cost margins can best be explained by (tacit) collusion or by competition.

This paper provides an empirical framework for multiproduct publishers where advertisers are allowed to place advertisements in multiple newspapers simultaneously. It shows how the recent consolidation wave in the Belgian newspaper industry has affected market power of newspaper publishers and looks at the impact of the most recent merger in the Belgian newspaper market. From a methodological point of view, we contribute to the two-sided market literature by allowing for the ownership of multiple platforms by a single decision maker. A brief overview of the Belgian newspaper market is provided in Section 2 and Section 3 shows the empirical model for both demand for advertising space and readers' demand for newspapers. The data used for the analysis is described in Section 4 and Section 5 presents empirical results. Finally, Section 6 concludes.

2 The Belgian Newspaper Market

Similar to other countries, Belgium has witnessed a large consolidation wave in the newspaper market over the last decades. According to De Bens and Raeymaekers (2007, p. 74), 34 independent newspaper publishers operated in Belgium in the year 1950. This number dropped to 17 in 1980 and nowadays only 5 independent publishers¹ are active in the market as can be seen from Figure 1. Following this trend, two Belgian newspapers, *De Tijd* and *L'Echo* were recently acquired by two already existing publishers, namely *De Persgroep* and *Rossel*. The two largest publishers together, namely *De Persgroep* and *VUM* have a market share² of around 60% in the readers market and 50% in the advertising market.³ Table 1 shows daily newspaper titles in Belgium. The newspaper market can be divided in Dutch language versus French language newspapers. One newspaper, *Grenz-Echo*, is published in German and has a limited distribution in the German speaking part of Belgium next to the German border. The market can be further divided into *quality* versus *popular* newspapers⁴.

¹Namely *De Persgroep*, *Groupe Rossel*, *Concentra*, *I.P.M.* and *VUM*.

²In the newspaper market without *Metro*, which is distributed for free.

³For the Dutch speaking part of Belgium alone, this fraction is even higher, namely almost 80% in both reader and advertising market.

⁴In *quality* newspapers the emphasis is more on international and political news while *popular* newspapers spend more attention to human interest, criminal news and entertainment (De Bens 2007). Note that the term *quality* here does not refer to vertical product differentiation. Differentiation between *popular* and *quality* newspapers is more of the horizontal type.

In total there exist three Dutch and three French *quality* newspapers. Furthermore five *popular* periodicals are published in Dutch and three in French. In 2000, *Metro* entered the market. This newspaper is distributed for free and is published in both Dutch and French.

Figure 2 shows the evolution of total daily sales in the Belgian newspaper market. On average, sales have been fallen since 1994 and this trend is especially pronounced in the French speaking part of Belgium. In the Dutch speaking part, newspapers were able to keep their readership fairly stable in the nineties, but witnessed a slight drop afterwards. This general downward trend is not true for all Belgian newspapers. For example *De Morgen* and *Het Laatste Nieuws* managed to increase their readership substantially while *Le Soir* lost more than 30% of its readers between 1994 and 2005.

Figures 3 and 4 show the evolution of the price of one single newspaper copy. The figures also show the consumer price index (CPI), normalized to the average price of a single copy in the beginning of the sample period. Before the mid nineties, the cover price was fixed at the national level. Even after price liberalization, price increases occur mostly simultaneously accross all newspapers. Note that this behavior is also consistent with "collusive" price setting. In general, *quality* newspapers have a higher cover price than *popular* newspapers⁵ and among the quality newspapers, the two business newspapers *De Tijd* and *L'Echo* have the highest price. It is clear that before 2000, price increases in cover prices more or less match inflation (as measured by the CPI). Afterwards, nominal newspaper prices rise faster than the CPI.

We show a comparison between advertising and newspaper sales revenues in Figure 5. It can be seen that in recent years, nominal revenue from advertisements increased substantially while nominal sales revenue⁶ remains fairly constant. As a result advertising revenue is higher than sales revenue at the end of the sample period⁷. Note that there exists considerable monthly variation in sales and especially advertising revenue. We observe for each advertiser the value of advertising spent in each single newspaper which allows us to get an idea of the degree of multihoming as defined by Rochet & Tirole (2003). In principle, an advertiser multihomes if he uses more than one newspaper to communicate its advertising campaign to the consumers. Due to data limitations we assume that an advertiser multihomes when he buys in one month publicity space in more than one newspaper. This is equivalent with assuming that a firm launches at most one advertising campaign per month. Table 2 shows the amount of multihoming following this definition. Around 53.5% of the firms singlehome, i.e. buy advertising space in no more than one newspaper in one single

⁵This is especially true for Dutch language newspapers. In the French language newspaper market, only the business newspaper *L'Echo* is priced higher over the whole sample period.

⁶Revenue from subscriptions and daily distribution through newspaper shops.

⁷One need to be careful in interpreting advertising revenues. These are computed using list prices and do not take into account possible rebates. Consequently, they are likely to be on overestimate of advertising revenue. This issue will be further discussed in the data description section and in the econometric analysis.

month which means that almost half of the advertisers multihome. Almost 20% advertise in two newspapers. Around 5% of the advertisers place their ads in more than 10 newspapers. This makes that the majority of advertising campaigns that appeared in one newspaper was also published in an other newspaper. Table 3 shows that for example for *Het Volk* less than 1% of its advertisements are unique ads⁸. In contrast, more than 40% of ads in the business newspaper *De Tijd*, are unique. In general, *quality* newspapers and especially financial newspapers attract more unique advertisements than their *popular* counterparts.

3 Empirical Model

This section presents the econometric model. It takes into account both sides of the markets, namely readers and advertisers and the interaction between them. A newspaper publisher gains revenue from both readers and advertisers. In its pricing strategy, he takes into account the fact that advertisers value the readership of the newspaper. First we model advertising demand, next we present newspaper demand by consumers and third we derive the pricing decisions of newspaper publishers.

3.1 Advertising Demand

This subsection models the advertising decision of the firm. In recent economic literature about product differentiation, discrete choice models are often applied. However, given the numbers on multihoming shown in the previous section, a discrete choice model for advertising demand would not be appropriate. Therefore we rely on a representative advertiser model, similar to the one used by Rysman⁹ (2004). Intuitively, a firm derives a certain value of placing an advertisement in a newspaper. This value depends on how much its profits will increase in response to the advertising campaign in the newspaper. Consequently, it is likely to be a function of the number of newspaper readers, the characteristics thereof and the probability that the consumer reads and remembers the advertisement. When the value of placing an ad in a certain newspaper exceeds the cost of placing the same ad, it is optimal for the firm to place the advertisement. When there is no overlap in the readership of newspapers¹⁰, there should be no tradeoff in the decision to buy advertising space in different newspapers. As a result, demand for advertising in one newspaper is independent from ad prices and characteristics of other newspapers and the firm chooses separately the advertising amount in each individual newspaper, based on a comparison of costs of

⁸Note that in fact we do not observe advertisements but advertising spending per newspaper/advertiser combination. To be correct, the statement should be: "less than 1% of the advertisers that bought advertising space in *Het Volk*, did not advertise in an other newspaper in the same month".

⁹Rysman (2004) applies this model to describe advertising demand in the Yellow Pages market.

¹⁰This is equivalent the assumption that a consumer reads only one newspaper a day. We keep this assumption in our model of readers' demand.

the advertising space and expected revenue from advertising in each individual newspaper. Consequently, a newspaper may advertise in different newspapers simultaneously, which is what we observe as shown in the previous section. Armstrong (2006) defines markets where one side singlehomes (readers) and the other side multihomes (advertisers) as competitive bottlenecks. He shows that there are too few ads in equilibrium from a social point of view because newspaper publishers act as monopolists on the advertisers market.

Formalizing the above discussion, suppose there are N advertisers. The representative advertiser chooses a_j , the amount of advertising¹¹ in newspaper j , $j = 1 \dots J$. Furthermore, we assume advertisers act as price takers. Profit to the advertiser from advertising Π is a function of the amount of advertising, profit per informed consumer and the number of newspaper readers¹²:

$$\Pi = f(a_1, R_1, p_1^A, \tilde{\pi}_1, \dots, a_J, R_J, p_J^A, \tilde{\pi}_J)$$

whith R_j the number of readers, p_j^A the advertising price and $\tilde{\pi}_j$ the profit per consumer that reads the newspaper. Under the assumptions that readers singlehome and there are constant profits per reader who notices the advertisement, the profit function of the advertiser is separable in a_j . If these assumptions are satisfied, there is no reason why the choice to advertise in one newspaper should be influenced by the choice to advertise in another newspaper. From the demand side, if consumers singlehome they can only be reached by advertising in the specific newspaper they read. As a result, the advertiser's decision about the amount of advertising in newspaper j is affected only by the amount of readers, their characteristics and the price of an ad in that particular newspaper. The assumption of constant profits per consumer says that serving many consumers because of an advertisement in newspaper j does not affect the benefit of serving extra consumers through an advertisement in newspaper k (Rysman 2004). The profit function of an advertiser can therefore be written as:

$$\Pi = (\tilde{\pi}_1 G(a_1, R_1) - p_1^A a_1^{\alpha_2}) + \dots + (\tilde{\pi}_J G(a_J, R_J) - p_J^A a_J^{\alpha_2})$$

$G(a_j, R_j)$ measures the number of readers that notice and remember the advertisement which is a function of advertising quantity purchased by the advertiser and the readership of newspaper j . We assume that $G(.,.)$ takes the Cobb-Douglas functional form, namely $G(a_j, R_j) = (a_j)^{\alpha_1} R_j^{\beta}$. We expect α_1 to lie between 0 and 1, so there are decreasing returns to larger advertisements. The parameter α_2 captures the shape of the price schedule for ads of different sizes. α_2 should be larger than zero, reflecting size discounting if α_2 is smaller than 1 or a price premia for larger advertisements if α_2 is larger than 1. When the advertising price increases linearly in size, α_2 is equal to 1 (Busse and Rysman 2005).

¹¹Throughout the paper, the quantity of advertising is expressed as the number of black&white pages.

¹²Time subscripts are omitted for expositional reasons.

However α_2 should be larger than α_1 , otherwise a profit maximising firm would choose an infinite amount of advertising. β is expected to be positive, capturing potential network effects. The advertiser chooses a_j to maximize profits from advertising in newspaper j :

$$\begin{aligned} \max_{a_j} \quad & \tilde{\pi}_j R_j^\beta a_j^{\alpha_1} - p_j^A a_j^{\alpha_2} \\ \implies \quad & a_j = \left(\frac{\alpha_2 p_j^A}{\alpha_1 \tilde{\pi}_j R_j^\beta} \right)^{\frac{1}{\alpha_1 - \alpha_2}} \end{aligned}$$

Hence the total amount of advertising demand for newspaper j is given by $q_j^A = N * a_j$ with N the number of advertisers in the market:

$$q_j^A = \left(\frac{\alpha_2 p_j^A}{\alpha_1 \pi_j R_j^\beta} \right)^{\frac{1}{\alpha_1 - \alpha_2}}$$

where $\pi_j = \tilde{\pi}_j N^{(\alpha_2 - \alpha_1)}$. Assume that $\ln(\pi_j)$ can be written as a linear function of some observable characteristics $x_{1j}, \dots, x_{Kj}$ of the readership of newspaper j and an unobservable term η_j . Consequently, the above can be written as:

$$\ln(q_j^A) = \frac{1}{\alpha_1 - \alpha_2} \ln(p_j^A) + \frac{\beta}{\alpha_2 - \alpha_1} \ln(R_j) + X_j \gamma + \eta_j \quad (1)$$

Equation 1 allows the estimation of demand parameters using data on advertising prices and quantities at the newspaper level. Note that the equation does not include prices or characteristics of other newspapers. As discussed above, the decision to advertise in one newspaper is independent of the decision to advertise in any other newspaper. Since it is likely that when advertising demand is high for unobservable reasons (for example an unobserved shift in reader characteristics) the newspaper will set a higher advertising price, advertising price is likely to be correlated with η_j . Consequently we need proper instruments to get consistent estimates for the price coefficient. This identification issue is further addressed in Section 5.1.

3.2 Readers' demand

Given that consumers are expected to buy only one newspaper every day, i.e. they single-home, and the common division between *popular* and *quality* newspapers is maintained, we make use of a nested logit to model consumer utility. The indirect utility consumer i derives from newspaper j depends on both product and consumer characteristics. As such, utility can be written as¹³:

¹³Again, time subscripts are omitted.

$$u_{ij} = \delta_j + \nu_{ij}$$

where δ_j represents the mean utility of consuming newspaper j which is common to all consumers and ν_{ij} is the deviation from this mean and is specific to each individual consumer. A consumer chooses the newspaper which gives them the highest utility and buys one unit of it. Mean utility can be expressed as a function of the newspapers' observable characteristics X_j^N , its cover price p_j^N and a taste parameter ξ_j , which is unobservable:

$$\delta_j = X_j\beta + \alpha \ln(p_j^N) + \xi_j$$

We included in several specifications the number of advertisements as newspaper characteristic. However, the coefficient was always estimated to be zero implying newspaper demand is independent of advertisements. As noted in the introduction, from a theoretical perspective one could expect newspaper demand to be influenced positively or negatively by the number of ads in a newspaper copy. If consumers value advertisements negatively our result does not come as a surprise since advertisements can be skipped relatively easily and the nuisance from advertisement is mitigated. Our finding also rejects the hypothesis that consumers value advertisements positively. This is in contrast with Kaiser and Wright (2006) who show readers value advertisers positively in the German magazine market. However, they study more specialized magazines such that advertising is expected to be of greater benefit to these readers¹⁴. Given our results, we assume for the rest of the analysis that consumers do not value advertisements positively nor negatively.

The nested logit model puts more structure on the consumer specific part of utility. It allows consumer utility to be correlated across products belonging to the same group. In response to for example a price increase of newspaper j , a consumer is more likely to substitute away to newspapers in the same group than to other, more different products outside the group. However, within one nest the well known *Independence from Irrelevant Alternatives* (IIA) property is present which implies that in response to a price increase of newspaper j , the choice probabilities of other newspapers in the same group go up by the same percentage. Assuming the market can be divided into G groups, the consumer specific deviation from the mean utility ν_{ij} can be written as follows:

$$\nu_{ij} = \varepsilon_{ig} + (1 - \sigma)\varepsilon_{ij}$$

Where ε_{ig} captures consumer i 's preference for group g . If ε_{ij} and ε_{ig} have the standard nested logit distribution such that ε_{ig} , ε_{ij} and ν_{ij} have the extreme value distribution, the individual choice probability, P_{ij} , can be written as (Verboven 1996):

¹⁴If the number of newspaper pages is fixed and a publisher chooses between filling the newspaper with news content or advertisements, the interpretation of the coefficient changes. Finding no impact of advertising on consumer utility indicates that consumers value advertisements in the same way as content, which is consistent with the finding of Kaiser and Wright (2006).

$$\begin{aligned}
P_{ij} &= P_i(g)P_i(u_{ij} > u_{ik} \quad \forall k \neq j \mid k, j \in g) \\
&= P_{ig}P_{ij|g} \\
&= \frac{\exp(\delta_j/(1-\sigma)) \exp(I_g)}{\exp(I_g/(1-\sigma)) \exp(I)}
\end{aligned}$$

where $P_{ij|g}$ is the probability of choosing newspaper j given a newspaper from group g has been chosen and P_{ig} is the probability of choosing a newspaper belonging to group g . I and I_g are the inclusive values defined by:

$$\begin{aligned}
I_g &= (1-\sigma) \ln \left(\sum_{j \in g} \exp(\delta_j/(1-\sigma)) \right) \\
I &= \ln \left(\sum_{g=0}^G \exp(I_g) \right)
\end{aligned}$$

The σ parameter must satisfy the following condition to be consistent with random utility maximization: $0 \leq \sigma \leq 1$. The higher σ , the more consumer preferences are correlated across newspapers belonging to the same group. When σ is equal to zero, the model collapses to the simple logit model. Under the nested logit model assumptions, individual choice probabilities equal the newspaper market shares and the demand parameters can be estimated from a linear regression of log market shares on newspaper characteristics and log group market shares (Berry 1994, Verboven 1996):

$$\ln s_j - \ln s_0 = X_j^N \beta + \alpha \ln(p_j^N) + \sigma \ln s_{j|h,g} + \xi_j \quad (2)$$

Where s_j is the market share of newspaper j , s_0 represents the market share of the outside good and $s_{j|h,g}$ is market share of newspaper j in group g . Equation 2 shows how the logarithm of the market share of newspaper j can be written as a linear function of mean utility of the newspaper and the logarithm of its group market share, which allows us to estimate β , α , and σ using linear estimation techniques. Note that $s_{j|h,g}$ is endogeneous by definition and needs to be instrumented. Moreover, the cover price is also likely to be endogeneous and correlated with the newspaper specific unobservable ξ_j . These identification issues will be addressed in Section 5.2

3.3 Equilibrium

There exist K different newspaper publishers each of whom produces a subset Ψ_k of the $j = 1 \dots J$ different newspapers. Each newspaper is sold by only one publisher, such that the subsets Ψ_k are mutually exclusive. We assume there is a constant marginal cost associated

with printing of a newspaper j copy c_j^N and with placing an ad in newspaper j namely c_j^A . Under the assumption that newspaper demand is independent of advertising quantity but advertising demand depends on the number of readers, total profits Π_k for publisher k can be written as follows:

$$\Pi_k = \sum_{j \in \Psi_k} (p_j^N - c_j^N) q_j^N(\mathbf{p}^N) + \sum_{j \in \Psi_k} (p_j^A - c_j^A) q_j^A(\mathbf{p}^A, \mathbf{q}^N) - C_k \quad (3)$$

where C_k are fixed costs of publishing n_k different newspapers for publisher k . It can be seen that the quantity of newspapers sold depends on the price vector $\mathbf{p}^N = (p_1^N, \dots, p_j^N \dots p_J^N)$ which includes not only the price of newspaper j , but also prices of all other newspapers in the market owned by the same or different publishers. Readers' demand is independent of advertising. Advertising quantity q_j^A is not only a function of the price vector $\mathbf{p}^A = (p_1^A, \dots, p_j^A, \dots, p_J^A)$, but also of the number of readers of all newspapers $\mathbf{q}^N = (q_1^N, \dots, q_j^N, \dots, q_J^N)$. The assumption that advertising demand for newspaper j is independent of prices and characteristics of other newspapers is implemented at the end of this section. First, we derive the most general expressions for profit maximizing prices. We assume there exists a Bertrand-Nash equilibrium with positive prices. Solving the publishers' profit-maximization problem generates the first-order conditions. There are two FOC's for each individual newspaper j owned by publisher k , one for the readers' side and one for the advertising side:

Advertising Price:

$$\frac{\partial \Pi_k}{\partial p_j^A} = q_j^A + \sum_{r \in \Psi_k} (p_r^A - c_r^A) \frac{\partial q_r^A}{\partial p_j^A} = 0 \quad (4)$$

Cover Price:

$$\frac{\partial \Pi_k}{\partial p_j^N} = q_j^N + \sum_{r \in \Psi_k} (p_r^N - c_r^N) \frac{\partial q_r^N}{\partial p_j^N} + \underbrace{\sum_{r \in \Psi_k} \sum_{i \in J} (p_r^A - c_r^A) \frac{\partial q_r^A}{\partial q_i^N} \frac{\partial q_i^N}{\partial p_j^N}}_{\text{Network Effects}} = 0 \quad (5)$$

The FOC for the advertising price is the standard formula for multiproduct firms in a oligopolistic setting since readers' demand is independent of the number of advertisements. The FOC for the cover price however, incorporates the network effect, represented by the last term in in Equation 5. When the publisher increases the cover price of newspaper j , it will lose readers and as a result advertising demand for newspaper j will be lower. Moreover, because part of the foregone sales go to other newspapers than newspaper j , demand for advertising increases for those newspapers vis-à-vis newspaper j . These effects

cause markups for the cover price to be lower compared to a standard differentiated product setting. Part of this effect however is mitigated because there are multiproduct publishers present. When publisher k increases the cover price of newspaper j , demand for advertising will be lower, but demand for advertising in other newspapers in its portfolio increases, softening the downward pressure on markups realised in the readers' market. In matrix notation, one can write the vector of markups in the advertising market as follows:

$$\begin{aligned} \mathbf{q}^A + \Lambda \odot (\mathbf{D}_p^A \mathbf{q}^A)' (\mathbf{p}^A - \mathbf{c}^A) &= \mathbf{0} \\ \Leftrightarrow (\mathbf{p}^A - \mathbf{c}^A) &= - [\Lambda \odot (\mathbf{D}_{p^A} \mathbf{q}^A)]^{-1} \mathbf{q}^A \end{aligned} \quad (6)$$

where Λ is the $J \times J$ ownership matrix of which the element at column r and row j is equal to 1 if there is a publisher who owns both newspapers j and r and 0 otherwise. The $J \times 1$ vector of markups is given by $\mathbf{p}^A - \mathbf{c}^A$ and $\mathbf{q}^A$ is a $J \times 1$ vector of advertising quantities. The operator $\odot$ denotes the element-by-element matrix multiplier (Hadamard product) and $\mathbf{D}_{p^A} \mathbf{q}^A$ is the $J \times J$ Jacobian matrix of the vector function $\mathbf{q}^A(\mathbf{p}^A)$, i.e. $\mathbf{D}_{p^A} \mathbf{q}^A \equiv \frac{\partial(q_1^A, \dots, q_J^A)}{\partial(p_1^A, \dots, p_J^A)}$.

The expression for cover markups can be written in a similar way. Let $\mathbf{D}_{\mathbf{p}^N} \mathbf{q}^N \equiv \frac{\partial(q_1^N, \dots, q_J^N)}{\partial(p_1^N, \dots, p_J^N)}$ be the $J \times J$ Jacobian matrix of first derivatives of $\mathbf{q}^N(\cdot)$ with respect to $\mathbf{p}^N$ and likewise $\mathbf{D}_{\mathbf{q}^N} \mathbf{q}^A \equiv \frac{\partial(q_1^A, \dots, q_J^A)}{\partial(q_1^N, \dots, q_J^N)}$. The J first-order conditions for newspaper markups are given by:

$$\begin{aligned} \mathbf{q}^N + \left(\Lambda \odot (\mathbf{D}_{\mathbf{p}^N} \mathbf{q}^N)' \right) (\mathbf{p}^N - \mathbf{c}^N) + \left(\Lambda \odot (\mathbf{D}_{\mathbf{q}^N} \mathbf{q}^A \mathbf{D}_{\mathbf{p}^N} \mathbf{q}^N)' \right) (\mathbf{p}^A - \mathbf{c}^A) &= \mathbf{0} \\ \Leftrightarrow (\mathbf{p}^N - \mathbf{c}^N) &= - \left(\Lambda \odot (\mathbf{D}_{\mathbf{p}^N} \mathbf{q}^N)' \right)^{-1} \left(\mathbf{q}^N + \left(\Lambda \odot (\mathbf{D}_{\mathbf{q}^N} \mathbf{q}^A \mathbf{D}_{\mathbf{p}^N} \mathbf{q}^N)' \right) (\mathbf{p}^A - \mathbf{c}^A) \right) \end{aligned} \quad (7)$$

Equations 6 and 7 show first-order conditions for both advertising and cover prices which have to be fulfilled for each newspaper $j = 1, \dots, J$ in equilibrium. The assumption that demand for advertising in newspaper j is independent of characteristics and prices of other newspapers implies that the matrix $\mathbf{D}_{\mathbf{q}^N} \mathbf{q}^A$ has all off-diagonal elements equal to zero. The network effects in equation 5 are restricted to the impact of price changes on own advertising demand through the impact of its own readership.

4 Data Description

This section provides a brief description of the data used in the empirical section of the paper. The dataset used, includes all nationwide available daily newspapers in Belgium. Sales figures of Belgian newspapers are provided by the association of Belgian newspaper publishers (BVDU)¹⁵. The dataset includes monthly figures of total average daily newspaper sales for the period January 1994 to June 2005. Free distribution of newspapers is included in the data, which accounts for about 2% of total distribution. Cover prices are also provided by the BVDU. Characteristics of the newspaper readership are collected by CIM, an agency that gathers and publishes data about all different media outlets in order to inform firms about the different possibilities for their advertising campaigns. They conduct a survey every year among 10,000 consumers about their usage of different media outlets. Data about the professional status, sex, education, place of living, composition of the family, ... are collected and aggregate summaries of these reader characteristics are published on the website of CIM and in a number of periodicals, such as *MediaBook* and *MediaPlan* who provide data about the Belgian media market. Moreover, we observe from CIM surveys how the newspaper readers are spread out over the different provinces¹⁶ in Belgium. Combining the share of each province in total readership of each newspaper with total newspaper sales, yields an estimate of province specific newspaper sales. Together with population data per province from the Belgian Statistical Office, we are able to construct market shares for each individual newspaper per province. We also retrieved consumer price indices from the Belgian Statistical Office to deflate the price data.

Data for the advertising side of the market are provided by Aegis Media. The database shows on a monthly basis the individual companies that have bought advertising space in each newspaper separately together with their monthly spending on advertising in that particular newspaper. The agency that gathers these data, computes ad spending per company by using the appropriate list price for each advertisement. We aggregated advertising spending by all companies up to total monthly advertising revenue for each newspaper. The time span of the dataset is January 2001 to June 2005. We obtained advertising prices from the website of *Scripta* and *Full Page*, which are the main companies that commercialize and sell publicity space in Belgian newspapers. Because some of the years were missing in this dataset, we complemented it with advertising prices provided by *MediaBook* and BVDU. Unfortunately, we only observe list prices while rebates are likely to be granted for larger advertisers or for example during the summer period. However, as long as these do not differ too much across newspapers, this is not a serious problem for our empirical analysis. We can pick up variations over time or periods with various time dummies. We combine the data about advertising spending with the list prices to obtain an estimate of advertising

¹⁵Data for the most recent years is electronically available at <http://www.cim.be>

¹⁶Belgium is divided into ten provinces. Population in each province varies between 200,000 in the smallest province and 1,400,000 in the largest province.

quantity¹⁷. The list price we use to infer advertising quantity is the price of a one page tall black and white advertisement. Prices of different ad sizes are a fraction of this price and this fraction is similar across newspapers. Also data about newspaper formats come from *MediaBook*. There are three different newspaper formats in our sample, namely (1) *Broadsheet*, (2) *Belgian* and (3) *Tabloid*¹⁸. A number of newspapers shifted to a smaller newspaper size over the sample period.

In Table 4, the mean, standard deviation, minimum and maximum of the main variables are shown. It can be seen that the largest Belgian newspaper (*Het Laatste Nieuws*) sold more than 300,000 copies per day in one month. The smallest newspaper (*Grenz-Echo*) sold only around 10,000 daily copies. The nominal cover price ranged from €0.62 to €1.35. In general, *quality* newspapers have a higher cover price and lower sales than their *popular* counterparts. Making abstraction of rebates, average monthly revenue from advertisements amounts up to around 2 million euros. Although newspaper sales for *quality* titles are lower than for *popular* titles, advertising revenue is approximately the same for both types of newspapers. The former charge higher advertising prices per reader than the latter and advertising quantity is comparable between *popular* and *quality* newspapers. As a result, the advertising revenue per copy sold is much higher for *quality* newspapers than for *popular* newspapers which can be explained by differences in reader characteristics. Despite their higher cover prices, *quality* newspapers gain a higher share of their total revenue from advertising, namely 60% compared to 48% for *popular* newspapers¹⁹.

Table 5 and Table 6 show the market shares²⁰ of Dutch language and French language newspapers respectively in each province. It can be seen that there is considerable variation across provinces in the market shares. Especially, newspapers have a strong position in the province they originally started their activities. Note that all newspapers under consideration are national newspapers. They are sold in each province belonging to their language group.

¹⁷Note that the list prices are correct to infer advertising quantity from advertising revenue, since the same prices are used to compute the published revenues.

¹⁸Broadsheet measures 540X385 millimeters (8 columns) , Belgian format is slightly smaller namely 490X336 mm (7 columns). Tabloid is the smallest format with 385X250 mm (5 columns).

¹⁹This figure probably overestimates the real share of advertising revenue in total revenue, since rebates for advertisers are not taken into account.

²⁰Here market share of newspaper j is defined as total sales of newspaper j in the province divided by total sales of all newspapers in the same province.

5 Results

5.1 Advertising Demand

We estimate the following equation to receive estimates for the advertising demand parameters.

$$\ln(q_{jt}^A) = \hat{\alpha} \ln(p_{jt}^A) + \hat{\beta} \ln(R_{jt}) + X_j \gamma + \eta_t + \Delta \eta_{jt} \quad (8)$$

A_{jt} is the average number of one page black and white advertisement equivalents that have been placed in an edition of newspaper j in month t . R_{jt} is the average number of daily sales²¹ in month t , p_{jt}^A is the deflated price of a one page black and white advertisement in month t and X_j is a vector of readership characteristics. The own price elasticity of demand is $\hat{\alpha} = \frac{1}{\alpha_1 - \alpha_2}$ and is expected to be negative ($\alpha_2 > \alpha_1$) and $\hat{\beta} = \frac{\beta}{\alpha_2 - \alpha_1}$ captures the network effect.

Identification

As noted above, the advertising price is likely to be endogeneous, since an increase in advertising demand for unobservable reasons is expected to have an impact on the advertising price too. As instrument we use the size of the newspaper, which is as we argue below correlated with the advertising price but does not influence advertising demand directly. At the beginning of our sample period, most newspapers were published in *Broadsheet* format. Some of them switched to *Belgian* format, others switched to *Tabloid* format. Changes to narrower newspaper formats are decided at least one year in advance since they require large investments in printing facilities. Furthermore, format changes can be seen as cost shifters for ad placements. First, pages are smaller and thus printing costs per advertising page are lower, and second, format changes typically coincide with investments in newer and more efficient printing rolls. More compact formats are assumed to have no other impact on advertising quantity than through advertising prices,²² making it together with the above arguments a valid instrument for advertising prices. One could also be concerned about the endogeneity of the number of newspaper readers. Following a positive shock on advertising demand, an extra consumer generates more profits from advertisements for the publisher. As a result, it will be optimal for the publisher to attract more newspaper readers and a positive bias on the coefficient for the number of readers is expected. Therefore, we treat the number of readers as endogeneous in one specification and add the number of readers lagged one year as additional excluded instrument.

²¹So, also the number of copies that are distributed for free are included.

²²*Gazet van Antwerpen* was published simultaneously on *Broadsheet* and *Tabloid* format in the period before the definite switch to tabloid. This allowed the measurement of the influence of different formats on the impact of an advertisement on consumers. The results were that not the absolute size, but rather the relative size to total newspaper size mattered for consumer responsiveness (MediaMarketing 2004). Consequently we do not expect the newspaper format to have a direct impact on advertising quantity. This is confirmed in a simple OLS regression of Equation 8 where also newspaper size is included. The coefficients on newspaper formats were not significant at the 10% level.

Estimation Results

We use Generalized Method of Moments (GMM) to estimate advertising demand in equation 8, applying four different specifications. The first (GMM1) uses a quality dummy and a Dutch language dummy to capture the main reader characteristics. The quality dummy is equal to 1 when the newspaper is considered as a *quality* newspaper, the Dutch dummy is equal to one if the newspaper is published in Dutch (cf. Table 1). The second specification (GMM2) replicates the estimation but now allows the readership to be endogeneous. The third column (GMM3) reports results including data from the CIM survey about Belgian newspaper readers²³. We include the percentage of readers that belong to the two highest socio-economic groups (High Soc. Group %), the percentage of readers that have at least one child younger than 15 years old (With children %), the percentage of male readers (Male %) and the percentage of readers that consider themselves as responsible for the daily purchases (Purchases Resp. %). The last specification is a GMM estimation with newspaper fixed effects (GMM FE). Standard errors are robust against heteroskedasticity and clustered at the newspaper level allowing errors to be correlated over time for the same newspaper but not across newspapers. We insert dummies for each year/month combination in each specification²⁴.

Although, there are no real first stage regressions in GMM, we report OLS regressions of advertising prices on the (excluded as well as included) instruments to assess their appropriateness. Results are shown in Table 7. Column (1) reports first stage results for the baseline specification. The estimates of the reduced form regression when the readership is allowed to be endogeneous are shown in column (2) and (3) with advertising price and newspaper readership as dependent variable respectively. Column (4) displays parameter estimates when reader characteristics are included and finally a specification with newspaper fixed effects is reported in column (5). The instruments excluded from equation 1, are newspaper size in all specifications and the logarithm of the number of readers lagged one year in the second specification. Results are in line with expectations. The larger the size of the newspaper, the higher the advertising price and the contemporaneous readership is highly correlated with lagged readership. Also, the included instruments show the expected partial correlations with the advertising price. The more readers a newspaper has, the higher the advertising price. *Quality* newspapers charge higher prices and Dutch language newspapers charge lower prices, given the other control variables. Newspapers with more readers from higher socio-economic groups, male readers and readers who are responsible for the daily purchases charge higher advertising prices. The Shea partial R^2 statistics are satisfactory, namely around 0.6 (reported in Table 8) in all specifications, showing that large part of

²³We do not have information about reader characteristics of *Grenz-Echo*, so the newspaper is dropped from the sample in this specification.

²⁴These dummies pick up seasonal and year effects. For example the mentioned problem of misreporting in 2001, is picked up by the dummies (as long as there is no systematic difference in reporting across newspapers).

the variation in the endogenous variable(s) can be explained by the excluded exogenous variable(s)²⁵. This is true for both the readership and advertising price. It is also reflected in the F -statistic of joint significance of the excluded instruments, which is higher than 10 in all specifications²⁶.

Table 8 shows the results of estimating Equation 8. Assuming advertising price is exogenous, results from an Ordinary Least Squares regression of Equation 8 are reported in column (1). The coefficient on advertising price is negative, highly significant and equal to -1.30 despite an expected upward endogeneity bias. Column (2) (GMM1) corrects for this endogeneity problem and the coefficient on advertising price goes in the right direction, i.e. increases in absolute value. However, the difference is not that large. The number of readers have a significantly positive impact on the advertising quantity, pointing to a strong network effect. The more readers a newspaper has, the higher the demand for advertising space it faces. Controlling for the possible endogeneity of the number of readers, slightly changes the coefficient as can be seen from column (3). Results from the GMM1 specification point to a price elasticity of demand of about -1.54 . The network elasticity is estimated to be 1.38, implying that β is close to one, which means there exist constant returns to extra readers for advertisers. Advertising demand is higher for quality newspapers and somewhat lower for Dutch language newspapers. In column (4), reader characteristics²⁷ are included in the regression. It can be seen that especially the percentage of readers from the highest socio-economic groups has a significant and positive impact on advertising quantity. Also the percentage of responsables for daily purchases has a positive impact that is significant at the 5% level. Advertising demand drops as the relative number of male readers increases. This result is not significant however. Whether or not readers have children does not seem to have an impact on advertising demand. The results from the fixed effects estimates (column 5) are more or less similar, although the demand elasticity is estimated to be somewhat smaller.

5.2 Readers' demand

We use Equation 2 to retrieve information about readers' demand parameters. As described in Section 4, we complemented data about total newspaper sales with CIM surveys to obtain an estimate of newspaper sales per province. Unfortunately, data from the CIM surveys are

²⁵This is a partial R^2 measure that takes into account the intercorrelations among instruments (Shea 1997). When there is only one endogenous regressor, the measure is equal to "normal" partial R^2 statistics.

²⁶As a rule of thumb, Staiger and Stock (1997) suggest you do not have to worry about weak instruments if the F -statistic is above 10 in the case of a single endogenous regressor.

²⁷These characteristics are time invariant and are taken from the 2003 survey. We do not expect these characteristics to vary substantially over the sample period.

only available on a yearly basis while sales data are on a monthly base²⁸. Consequently we have to assume the difference in readership across provinces between two years changes gradually over the 12 months and we use a linear interpolation to compute newspaper sales for every month in each different province. As a robustness check, we ran the regression with data on a yearly basis and the results remained the same.

The groups in the nested logit model are defined as *quality* newspapers versus *popular* newspapers. As noted before, this is the division which is normally made for the Belgian newspaper market (De Bens and Raeymakers 2007). Total market size is taken to be the population older than 15 years in each province²⁹. Consequently the outside good is given by the population above 15 years who do not buy a newspaper. The implicit assumption is that each person older than 15 years old has a demand for news. Newspaper cover prices are deflated using the harmonized consumer price index. As newspaper characteristics we include the newspaper size and the “origin” of the newspaper. This is a dummy equal to one when the newspaper is originally from that particular province. French language newspapers are typically not bought by Dutch speaking inhabitants so we exclude those newspapers from the choice set in the Dutch speaking (Flemish) provinces. The same applies to French language newspapers. The exception is the Brussels region which is bilingual. We lack detailed data on the Dutch and French speaking inhabitants of this region and hence can not define the outside good. Consequently, we opt to leave Brussels out of our analysis. The equation to be estimated is the following

$$\ln s_{jlt} - \ln s_{0lt} = \alpha \ln p_{jt}^N + \beta_1 \text{size}_{jt} + \beta_2 \text{origin}_{jl} + \gamma_1 \text{trend} + \gamma_2 \text{trend} * \text{dutch} + \xi_{jlt} \quad (9)$$

where subscripts j and t represent newspaper and time respectively and subscript l indicates the province. We capture part of the unobserved characteristics ξ_{jlt} by dummy variables. More precise we can write $\xi_{jlt} = \xi_j + \xi_l + \xi_m + \Delta \xi_{jlt}$ where ξ_m are seasonal differences in mean utility levels. We can pick up ξ_j , ξ_l and ξ_m by newspaper, province and month dummies respectively.

Identification

Since the cover price of a newspaper is likely to be endogeneous, we need to find valid instruments for it to receive unbiased estimates for α . It is now common in the literature to use as instruments functions of rivals’ observed product characteristics (cf. Berry et al 1995). Unfortunately, we lack time varying data on newspaper characteristics. Therefore we

²⁸The German language newspaper *Grenz-Echo* is excluded from the analysis since the CIM surveys do not report information on it. Moreover, this newspaper is only available in one province and is not expected to be a substitute for French language newspapers.

²⁹Again, this data is only available at the yearly level. Again we assume a gradual change and compute a linear interpolation over the different months.

opt to use prices of newspapers in other geographical markets as instruments (Nevo 2001 and Hausman et al. 1994). The underlying assumption is that demand shocks are not correlated across markets while cost shocks are. To be precise, we use as instruments for Dutch language *quality* newspapers, the average price of French language *quality* newspapers and the average price of all French language newspapers. Similarly, we instrument the price French language newspapers with the average price of Dutch language newspapers in the same group and the overall average cover price of Dutch language newspapers³⁰. Consequently, we only obtain group/time specific instruments instead of newspaper/time specific instruments. Given that prices of newspapers within the same group tend to move together as shown in figures 3 and 4, this seems to be an appropriate strategy. Moreover, these instruments are more likely to satisfy the requirement that they are not correlated with unobserved demand shocks. It is plausible that newspapers in the same group but with a different language, have similar cost structures and as such will be valid instruments, while demand shocks are less likely to be correlated across the two markets after controlling for a time trend and newspaper, month and province fixed effects. As noted before, $\ln s_{j|g}$ is endogeneous by definition. As instrument we use a dummy indicating whether there is a rival newspaper present which was originally established in that province and has a strong regional focus³¹.

Estimation Results

Table 9 shows the results of the estimation of equation 9 by the Generalized Method of Moments (GMM). Column (1) displays the estimates of the logit model without controlling for the endogeneity of the cover price. This provides for a marginally significant positive coefficient for the price variable. Controlling for endogeneity of the price variable in column (2) generates better results as the price coefficient becomes significantly negative in accordance with economic theory. Column (3) duplicates column (2) but now without newspaper dummies. As can be seen, only the coefficient on the size of the newspaper changes and becomes significantly negative, pointing to a preference of consumers for smaller newspapers. Turning to the nested logit model in columns (4) and (5), it is obvious that there is a statistical significant correlation of preferences across newspapers of the same group. The coefficient on $\ln s_{j|g}$, which measures the correlation of preferences across newspapers in the same group, is estimated to be .423 without the inclusion of newspaper dummies (column 4) and .743 with newspaper fixed effects (column 5). This indicates that consumers will switch more easily between newspapers of the same group than between newspapers of different groups. Note that also the hypothesis that $\sigma = 1$ can be rejected at standard significance levels, i.e. newspapers within one group are not perfect substitutes. The coefficient on the cover price

³⁰Note that these instruments are different from the instruments used in Hausman et al. (1994) and Nevo (2001) since they use the price of the same goods in other geographical markets. This is not feasible in our study because newspapers are only sold at one price over all provinces.

³¹For example *Gazet van Antwerpen* was founded in Antwerp and large parts of its content are devoted to news from the province of Antwerp.

is negative and significant at the 10% level. Not surprisingly, consumers prefer newspapers that were originally founded in the same province they reside in, as shown by the positive coefficient on the Origin variable. When newspaper dummies are included, the size of the newspaper does not seem to matter to consumers as can be seen from column (5).

The Hansen test statistics never rejects the validity of the instruments used. The Shea partial R^2 reports the fraction of variance of the endogeneous variable that is explained by the excluded instruments. In our preferred specification of column (5), the partial R^2 is higher than 0.10 for both the endogeneous variables, pointing to a substantial correlation between the endogeneous and (excluded) exogeneous variables. This is confirmed by the F -statistic that tests whether the coefficients on the excluded instruments are equal to zero. The F -test rejects the null at any conventional significance level for both endogeneous variables.

The results reported in Table 9 allow us to compute own and cross price elasticities for all newspapers. The expressions for price elasticities in the nested logit model are:

$$\frac{\partial s_{klt}}{\partial p_{jt}} \frac{p_{jt}}{s_{klt}} = \begin{cases} \alpha p_{jt} \left(\frac{1}{1-\sigma} - \frac{\sigma}{1-\sigma} s_{jlt|g} - s_{jlt} \right) & \text{if } j = k \\ -\alpha p_{jt} \left(\frac{\sigma}{1-\sigma} s_{jlt|g} + s_{jlt} \right) & \text{if } j \neq k, \text{ but } k \text{ and } j \text{ in same group} \\ -\alpha p_{jt} s_{jlt} & \text{if } j \neq k, \text{ and } k \text{ and } j \text{ in different group} \end{cases}$$

From these formulas, it can be immediately seen that elasticity of demand of newspaper k with respect to the price of newspaper j is the same for each newspaper k in the same group. This is a consequence of the assumption that the consumer specific random shock ε_{ijt} has an i.i.d. structure. Table 10 reports the price elasticities of demand for newspaper readers using the above formulas³². The own price elasticities range from -1.25 to -3.05 and are at first sight relatively low in absolute value since they would imply high markups. However, recall that also the advertising market needs to be taken into account in the analysis. Because of the high estimate for the correlation of preferences across newspapers in the same group, the cross price elasticities between newspapers of the same group are found to be substantial while the cross price elasticities between newspapers of different groups are very low.

5.3 Markups

Table 11 shows average markups on both the readers and advertising side computed using the estimation results presented in the previous sections and the expression for the markups

³²Price elasticities are computed for each newspaper in each province in the year 2004. Subsequently, a weighted average of these elasticities has been taken, using as weights the population in the province, to get an estimate of the total price elasticities for each newspaper across all provinces. Those are the figures reported in Table 10.

given by equations 6 and 7. The figures presented are computed under the assumption of multi-product profit maximizing publishers³³. The reported markups are weighted averages of all newspaper markups with sales as weights and are measured in euro. It can be seen that newspaper publishers make negative profits at the readers' side and this is true for both *quality* and *popular* newspapers. The reason is that advertisers have a high preference for the presence of readers and advertisers are cross-subsidizing newspaper readers. Ignoring advertising, publishers make on average a loss of € .38 at each copy sold. Since elasticity of demand at the readers side and advertising markups per reader are larger for *quality* newspapers, markups at the readers' side are lower (more negative) than markups of *popular* newspapers. The last three columns of Table 11 show the profits made per newspaper copy sold. It can be seen that the negative markups at the readers' side are more than compensated by revenues from the advertising side such that the average newspaper gains € .23 per newspaper copy sold. Total markups are slightly higher for *popular* newspaper compared to *quality* newspapers. To compute confidence intervals we follow a parametric bootstrap procedure. We draw 1000 parameter values for α and σ from a multivariate normal distribution with the estimated mean and covariance matrix. Likewise we draw 1000 observations for the parameters of the advertising demand equation. For these parameter values, we compute markups. The reported confidence intervals are at the 90% significance level. It can be seen that due to the relatively large standard deviation of the price coefficient at the readers' side, the confidence interval for markups at the readers side is quite large.

Redefining the ownership matrix in equation 7 allows us to compute the impact of multi-product pricing on newspaper markups. The outcome of this exercise is reported in Table 12. The first column shows the markups on the readers' side when each single newspaper would be published by an independent company. Markups under multi-product pricing are reported in the second column and the third column displays markups after the acquisition of *De Tijd* and *L'Echo* by the *Rossel* and *De Persgroep*. Multi-product pricing increases markups slightly, mainly driven by the rise in markups of *popular* newspapers. The reason is that each publisher owns maximum one *quality* newspaper and cross-price elasticities between newspapers from different groups are small. However, the acquisition of *De Tijd* and *L'Echo* causes the markups on the readers' side for *quality* newspapers to increase from -.85 to -.76. Note that mergers between different newspapers have no impact on pricing in the advertising market. Newspaper publishers already act as monopolist on the advertising side because consumers singlehome.

³³Without taking into account the acquisition of *De Tijd* and *L'Echo*.

6 Conclusions

Newspaper markets are notable examples of two-sided markets. Advertisers' demand depends on the number readers a newspaper has. This paper builds up an empirical framework for both demand for publicity space in newspapers and demand for newspapers by consumers. We explicitly allow publishers to own more than one newspaper. Moreover, the fact that advertisers multihome is incorporated in the model. Using estimated demand parameters for both advertisers' and consumers' demand, together with the supply function of a profit maximizing newspaper publisher that takes both revenues from advertising and consumers into account, we find negative markups on the readers' side. The fact that one side (advertising) cross-subsidizes the other side (readers) with prices lower than marginal costs is a characteristic that can be found in many other two-sided markets.

Because consumers singlehome, newspapers act as monopolists in the advertising market. Consequently, there is no change in advertising markups following higher concentration in the newspaper market. Things are different on the readers' side, however there is only a limited impact of the large consolidation wave on cover prices. We find that due to the existence of multiproduct companies, prices are around 4% higher for *popular* newspapers while there is almost no impact on *quality* newspapers, mainly because there is no publisher who owns more than one *quality* newspaper. The acquisition of two *quality* newspapers by two already existing publishers are expected to increase the price of *quality* newspapers by around 10% on average. Our results indicate that the impact of the consolidation of newspaper publishers has a limited impact on prices in both the advertising and readers' side.

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7 Tables and figures

Figure 1: Newspaper Publishers in 2005

Figure 2: Total Daily Sales Belgian Newspapers

Figure 3: Cover price Dutch language newspapers

Figure 4: Cover price French language newspapers

Figure 5: Advertising and sales revenue for all newspapers

Table 1: Belgian Newspapers

	Quality	Popular	Free
Dutch	De Morgen (DM)	Het Laatste Nieuws (HLN)	Metro NL (METN)
	De Standaard (DS)	Het Nieuwsblad (NB)	
	De Tijd (FET)	Het Volk (HV)	
		Gazet van Antwerpen (GVA)	
		Belang van Limburg (BVL)	
French	Le Soir (LS)	Sud Presse (SUD) ³⁴	Metro FR (METF)
	La Libre Belgique (LLB)	Vers l'Avenir (VA)	
	L'Echo (LECH)	La Dernière Heure (DH)	
German		Grenz-Echo (GRE)	

Table 2: Number of advertisements per newspaper

Nr. of newspapers	Frequency	Percentage
1	19662	53.5%
2	7015	19.1%
3 to 5	5781	15.7%
6 to 10	2527	6.9%
More than 10	1796	4.9%
Total	36781	100%

³⁴Sud Presse was founded in 1999, following the merger between La Nouvelle Gazette and La Meuse

Table 3: Multi per newspaper

Newspaper	Percentage
Het Volk	99.4%
Het Nieuwsblad	97.1%
Metro FR	94.7%
Grenz-Echo	91.5%
Sud Presse	90.9%
Metro NL	89.1%
Belang van Limburg	87.3%
Gazet van Antwerpen	87.1%
Vers l'Avenir	84.5%
La Dernière Heure	84.4%
Het Laatste Nieuws	80.4%
De Standaard	79.4%
De Morgen	76.8%
Le Soir	72.7%
La Libre Belgique	72.5%
L'Echo	69.8%
De Tijd	57.6%

Table 4: Summary Statistics

	Mean	S.D.	Min.	Max.
Readers				
Copies Sold (daily)				
Quality	61953	34253	17502	177968
Non-Quality	124868	74082	10067	303941
Total	100325	68889	10067	303941
Price per copy (€)				
Quality	.90	.18	.62	1.35
Non-Quality	.76	.09	.62	1.00
Total	.81	.15	.62	1.35
Advertising				
Revenue (monthly X1000 €)				
Quality	2212	1402	40.6	5869
Non-Quality	2407	1762	118	8199
Total	2329	1630	41	8199
Quantity (nr. pages per copy)				
Quality	6.95	3.73	.24	18.9
Non-Quality	6.61	2.97	1.56	15.8
Total	6.75	3.30	.24	18.9
Price (€)				
Quality	12874	4588	6738	22000
Non-Quality	13794	6826	2200	30000
Total	13426	6045	2200	30000
Price per 1000 Copies Sold (€)				
Quality	248	90	128	494
Non-Quality	124	41	64	252
Total	174	89	64	494
Revenue per Copy Sold				
Quality	1.51	.58	.09	3.38
Non-Quality	.77	.31	.123	1.69
Total	1.07	.57	.09	3.38
Share of Ad Revenue in Total Revenue				
Quality	.60	.12	.09	.82
Non-Quality	.48	.10	.14	.71
Total	.52	.12	.09	.82

Table 5: Market Shares Dutch Language Newspapers

	Antwerpen	Limburg	Oost Vlaand.	Vlaams Brabant	West Vlaand.
Belang van Limburg	1.4	70.0	0.3	2.5	0.2
De Morgen	5.5	1.8	4.4	4.9	3.5
De Standaard	8.5	3.9	6.5	11.2	7.3
De Tijd	4.7	2.5	3.7	5.5	4.0
Gazet van Antwerpen	40.2	1.3	4.6	3.0	0.8
Het Laatste Nieuws	22.2	9.7	28.4	40.2	34.0
Het Volk	3.4	1.9	22.1	3.9	19.8
Het Nieuwsblad	14.2	8.9	30.0	28.8	30.5

Table 6: Market Shares French Language Newspapers

	Hainaut	Liège	Luxembourg	Namur	Brabant Wallon
La Dernière Heure	15.7	8.9	7.2	10.0	20.1
L'Echo	3.3	2.2	1.1	2.3	6.7
La Libre Belgique	6.1	7.4	4.8	5.8	14.5
Le Soir	16.9	14.5	12.1	13.3	34.0
Sud Presse	40.5	48.0	13.6	18.1	7.1
Vers L'Avenir	16.0	16.1	61.4	50.6	18.0

Table 7: Results First Stage Ad Demand

	(1)	(2)	(3)	(4)	(5)
	GMM1 Price	GMM2 Price	GMM2 Readers	GMM3 Price	GMM FE
Size	0.212*** (.0345)	0.189*** (.0357)	-0.0145* (.00741)	0.177*** (.0332)	0.151*** (.0267)
Lag Log Readers		0.708*** (.0259)	1.010*** (.00739)		
Log Readers	0.695*** (.0269)			0.801*** (.0771)	0.332*** (.0914)
Dutch	-0.124* (.0654)	-0.103 (.0666)	0.00939 (.0187)		
Qual	0.375*** (.0539)	0.383*** (.0577)	-0.0127 (.0149)		
% Male				1.444* (.686)	
% High Soc.				1.315*** (.218)	
% Children				-0.293 (.758)	
% Purch. Resp.				2.225*** (.673)	
Obs.	810	630	630	756	810
Nr. Clusters	15	15	15	14	15
R Squared	0.950	0.951	0.997	0.898	0.691

Standard errors in parentheses

* p<0.10, ** p<0.05, *** p<0.01

Table 8: Results Ad Demand

	(1)	(2)	(3)	(4)	(5)
	OLS	GMM1	GMM2	GMM3	GMM FE
Log Ad Price	-1.297*** (.198)	-1.543*** (.226)	-1.751*** (.192)	-1.536*** (.306)	-1.158*** (.328)
Log Readers	1.206*** (.148)	1.377*** (.164)	1.552*** (.138)	1.454*** (.279)	1.904*** (.739)
Dutch	-0.174* (.0938)	-0.168* (.0886)	-0.184** (.082)		
Qual	0.797*** (.122)	0.917*** (.123)	0.950*** (.116)		
% Male				-1.809 (1.43)	
% High Soc.				3.001*** (.596)	
% Children				0.711 (1.35)	
% Purchases Resp.				2.339** (1.19)	
Obs.	810	810	630	756	810
Nr. Clusters	15	15	15	14	15
Price Shea R2		.606	.571	.531	.683
Readers Shea R2			.605		
Price F Stat		37.8	467	28.3	31.9
Readers F Stat			9412		

Standard errors in parentheses

* p<0.10, ** p<0.05, *** p<0.01

All specifications include dummies for every year/month combination Standard errors are robust against heteroskedasticity and clustered at the newspaper level. Excluded instruments are newspaper size in columns (2), (4), (5) and readership lagged 12 months and the newspaper size in column (3).

Table 9: Results readers' demand

	(1)	(2)	(3)	(4)	(5)
	Logit OLS	Logit GMM	Logit GMM	Nest.Logit	Nest.Logit
Cover Price	.525* (.313)	-1.44* (.803)	-1.55 (1.1)	-1.4** (.554)	-.79* (.411)
lnsjg				.423** (.185)	.743*** (.118)
Origin	3.48*** (.563)	3.48*** (.559)	2.15*** (.381)	1.28*** (.447)	.972** (.458)
Size	-.000128 (.238)	.0401 (.238)	-2.82** (1.2)	-1.55* (.917)	.0631 (.126)
Trend	-.00162** (.000704)	.000487 (.00115)	.00138 (.00179)	.000304 (.000993)	-.00118** (.000556)
Ned X Trend	.00105 (.000792)	.000998 (.000861)	-.000664 (.00184)	.000753 (.00105)	.00238*** (.000415)
Qual			-.0578 (.291)	-.524** (.26)	
Obs.	9890	9890	9890	9890	9890
Nr. Clusters	80	80	80	80	80
p Hansen		.616	.335	.581	.319
Price Shea R2		.142	.0965	.0594	.141
ln(sjg) Shea R2				.0297	.133
Price F Stat		259	62.2	41.3	259
ln(sjg) F Stat				3.73	8.02

Standard errors in parentheses

* p<0.10, ** p<0.05, *** p<0.01

All specifications include month, newspaper and province dummies except for columns (3) and (4) where newspaper dummies are excluded. Standard errors are robust against heteroskedasticity and clustered at the newspaper/province level. Excluded instruments for logit model are average price of newspapers in the other region and average price of newspapers in the same group in the other region. For the nested logit a variable indicating whether there is a regional competitor in the province is added as instrument.

Table 10: Price elasticities readers demand

	Own price	Cross Price	
		Same Group	Other Group
BVL	-2.11	0.194	0.012
DM	-1.98	0.582	0.006
DS	-1.67	0.895	0.010
FET	-2.86	0.605	0.007
GVA	-2.03	0.281	0.013
HLN	-1.65	0.591	0.033
HV	-2.12	0.184	0.010
NB	-1.82	0.488	0.025
DH	-1.91	0.397	0.012
LECH	-3.05	0.285	0.003
LLB	-1.83	0.482	0.006
LS	-1.25	1.055	0.012
SUD	-1.51	0.800	0.026
VA	-1.73	0.575	0.020

Cross price elasticities are for example in the first row

$\frac{\partial q_i}{\partial p_{BVL}} \frac{p_{BVL}}{q_j}$, these are the same for each newspaper

in the same group (property of nested logit model)

Table 11: Markups Readers and Advertising Side

	Mark-up in €		Profit per Copy Sold		
	Readers	Advertising	Readers	Advertising	Total
All Newspapers	-0.38 [-.73 .42]	9390 [7971 11545]	-0.38 [-.73 .42]	0.61 [.52 .75]	0.23 [-1.1 1.0]
Quality	-0.85 [-1.22 -.012]	7686 [6524 9449]	-0.85 [-1.22 -.012]	0.97 [.83 1.20]	0.12 [-.26 .93]
Popular	-0.24 [-.58 .55]	9902 [8405 12174]	-0.24 [-.58 .55]	0.50 [.43 .62]	0.26 [-.08 1.03]

Table 12: Markups Different Ownership Structure

	Single Ownership	Multi Products	Merger
All Newspapers	-0.406	-0.384	-0.362
Quality	-0.855	-0.849	-0.758
Popular	-0.272	-0.244	-0.243