Mergers in Two-Sided Markets: An Application to the Canadian Newspaper Industry

Ambarish Chandra
Strategy and Business Economics Division
Sauder School of Business
University of British Columbia
2053 Main Mall Vancouver
BC V6T 1Z2 Canada
ambarish.chandra@sauder.ubc.ca

Allan Collard-Wexler
Department of Economics
Stern School of Business
New York University
44 W 4th Street KMC 7-80
New York, NY 10012
wexler@stern.nyu.edu

In this paper, we study mergers in two-sided industries and, in particular, the effects of mergers in the newspaper industry. We present a model which shows that mergers in two-sided markets may not necessarily lead to higher prices for either side of the market. We test our conclusions by examining a spate of mergers in the Canadian newspaper industry in the late 1990s. Specifically, we analyze prices for both circulation and advertising to try to understand the impact that these mergers had on consumer welfare. We find that greater concentration did not lead to higher prices for either newspaper subscribers or advertisers.

1. Introduction

In this paper, we analyze mergers in two-sided markets. We present a model which shows that firms owned by competing duopolists may choose to set higher prices than if both firms were to be owned by

We thank Can Erutku, Shane Greenstein, Ulrich Kaiser, Aviv Nevo, Chuck Romeo, Tom Ross, Larry White, Ralph Winter, the coeditor, and two referees for helpful comments and Howard Hirshhorn for providing circulation data for the *Globe and Mail*. We are especially grateful to Rob Porter for giving us the initial idea for this project.

Journal of Economics & Management Strategy, Volume 18, Number 4, Winter 2009, 1045–1070

a monopolist setting prices jointly. More generally, we show that the effects on prices of a merger in two-sided markets can be ambiguous. We test this model empirically using data on a series of large mergers in the Canadian newspaper industry in the late 1990s. Our results indicate that these mergers did not lead to higher prices for either newspaper subscribers or advertisers.

Two-sided markets have recently been the focus of many research projects.[1] Due to the need for two-sided platforms to balance the interests of two different groups of consumers, it is often possible to observe firms in these industries behaving in ways that would be suboptimal for traditional firms. Therefore, standard economic predictions do not always hold in these markets. For example, it is possible to observe firms, even monopolies, consistently setting price below marginal cost on one side of the platform in order to increase revenues on the other side. Although much work has been done on optimal price setting in these industries, to our knowledge there has been little work done in analyzing mergers in such markets.

We provide a model that analyzes price-setting in a two-sided market where the willingness-to-pay by one side of the platform depends on the number of consumers, and their characteristics, on the other side. We show that the profit-maximizing optimum for firms in this market involves setting price below marginal cost for one group of consumers in order to extract surplus from the other group. More importantly, we show that it is not necessarily the case that a monopolist will choose to set higher prices than competing duopolists *on either side* of the platform.

Our model shows the circumstances under which joint ownership of two separate firms actually leads to lower optimum prices than if the two firms are owned separately. The intuition for this result is that the joint owner internalizes the effect that raising its price will have on both firms. In equilibrium, firms use price as a screening mechanism to attract more valuable consumers. Consider, for example, a media market duopoly. The marginal subscriber, that is, the subscriber who is indifferent between purchasing from either firm, can have either a positive or negative net effect on a firm's profits and this in turn induces the monopolist to set either a higher or lower subscription price than competing duopolists.

We then test our results with an empirical application involving newspaper markets. In general, media industries are good examples

1. Seminal papers in this area include Rochet and Tirole (2003) and Armstrong (2006). Anderson and Gabszewicz (2005) survey this literature.

of two-sided markets.[2] This is because the media owner has two sets of consumers: media subscribers such as radio listeners and television viewers, and advertisers. Advertisers' willingness-to-pay increases in the number of media subscribers.[3]

Our application involves studying the effect of a series of mergers in the Canadian newspaper industry. During the period 1995–1999, about 75% of Canada's daily newspapers changed ownership. Two newspaper chains in particular, Hollinger and Quebecor, acquired the majority of newspapers that changed hands. Not only did national concentration figures increase significantly, but county-level data indicate that multi-market contact also increased greatly over this period. However, we have not found any academic work studying the economic effects of the mergers. This is especially surprising for an industry that reaches 79% of adult Canadians every week and generates annual revenues of 3.3 billion Canadian dollars (about 2.9 billion US dollars).[4] In our paper, we attempt to fill this gap by examining whether the mergers affected prices or consumer welfare in the daily newspaper market.

There are two possible effects of an increase in consolidation that can cause concern: the potential for an exercise of market power by firms (the usual economic concern from large mergers) and the potential for reduced diversity of opinions and content from having fewer media sources. In this paper, we examine the first of these issues. As we describe in the next section, the Canadian newspaper market experienced huge changes through a number of acquisitions in a surprisingly short time. Our goal is to examine whether these mergers led to price changes or had observable effects on newspaper readership.[5]

Our results do not support the notion that increased concentration was associated with higher prices, either for circulation or for advertising. This is consistent with our theoretical model of mergers

2. Other examples of such industries include credit cards, operating systems and HMO networks.

3. However, it is not always clear how the number of advertisements affects subscribers' valuation of the media. Although it is safe to assume that subscribers in television and radio markets value advertisements negatively, the same may not necessarily hold in newspaper markets. Nevertheless, it is always the case that the media owner needs to keep the interests of both sets of consumers in mind when setting prices.

4. Figures are from the Canadian Newspaper Association and include totals for both daily and weekly newspapers. Revenue figures are the sum of advertising and circulation revenues.

5. In Canada, unlike in the United States, there are no special protection accorded to print media which would stop a merger in order to prevent a loss of diversity of editorial opinion. Thus, only strictly economic arguments could have been used to prevent the newspaper mergers in the late 1990s. We discuss this point in more detail in Section 4.

in two-sided markets, where the effect of a merger on prices for either advertisers or consumers is ambiguous. In particular, newspapers with changed ownership saw smaller price increases, or greater price declines, than newspapers with unchanged ownership. Additionally, newspapers in the two dominant chains (Hollinger and Quebecor in 1999 and Canwest and Quebecor in 2002) did not have significantly different price changes from the remaining newspapers. For example, we find that circulation prices at newspapers in the dominant chains rose by an average of between 11 and 14 cents, which was a smaller increase than the corresponding increase of around 15 cents for independent newspapers or those in smaller chains. Our results are robust to examining different lengths of time after the mergers; they also do not show a strong relation between local concentration (as indicated by county level data) and higher prices.

These results are reassuring from the point of view of consumer surplus in that there is no clear economic effect of increased concentration. There does not appear to have been an exercise of market power in the form of higher prices for either readers or advertisers. As a caveat, we note that our results do not have a causal interpretation, because the set of mergers was endogenous. In particular, we cannot rule out the possibility that, absent the merger, prices would have fallen more at the acquired newspapers. However, our results do not indicate that prices rose any more for acquired newspapers, or those in the dominant chains, compared to the other newspapers.

Our work is related to a number of different literatures. As discussed above, we add to the body of work analyzing two-sided industries. We also add to the existing literature on mergers, much of which has examined traditional industries.

Whinston (2006) discusses both the theoretical and empirical evidence concerning the effect of horizontal mergers. In particular, he finds mixed theoretical support for the claim that horizontal mergers increase price, in part because of Williamson's claim that mergers might increase efficiency, and the fact that firms are proposing a merger increases the probability that this is the case. Likewise, Whinston shows there is mixed empirical evidence in the literature that mergers increase prices, that is, certain studies find that mergers increase prices whereas other studies do not find this effect. Recent work by Nevo (2000) examines the effect of mergers on prices by estimating a structural model of demand and conduct and simulating the effect of mergers on prices. The norm in this research is to assume that the merger will change the ownership patterns in the industry, but will not alter the type of equilibrium firms play (such as allowing the possibility of tacit collusion) or change preferences of individuals. In contrast, our difference in difference approach can allow

for a broader class of effects such as a consumer boycott of merged papers.

There has been very little work examining the effects of mergers in two-sided markets. Evans (2002) describes how potential mergers in two-sided markets may not give rise to the same antitrust concerns as those in traditional markets. Even if prices were to rise for both sides of the market as a consequence of the merger, consumers, on both sides, may still see an increase in surplus.

Evans and Noel (2007) point out the difficulties associated with using conventional methods to analyze mergers in two-sided markets. As they show, the Lerner Index does not hold in such markets, and merger simulation models, which are now routinely used in traditional markets, are misspecified when applied to two-sided or multi-sided markets. Evans and Noel also perform an analysis of the merger between Google and DoubleClick—perhaps the first empirical analysis of mergers in two-sided industries. They show that relying on conventional methods would have led to significantly different results than using methods that explicitly incorporate the two-sided nature of this market. Nevertheless, they are limited to a calibration exercise due to lack of data.

Our paper adds to a vast body of work on media markets, but to a relatively small literature on the effects of concentration in these markets.[6] Recent studies of optimal pricing in these markets include Rysman (2004), Kaiser and Wright (2006), and Argentesi and Filistrucchi (2007).

The rest of the paper proceeds as follows. In Section 2, we construct a model of mergers in two-sided markets. In Section 3, we describe the data used for the project. In Section 4, we provide the historical background pertaining to the newspaper merger wave. Section 5 contains detailed results showing the effect that the mergers had on observable characteristics of the industry. Section 6 summarizes our findings and concludes.

2. A Model of Mergers in Two-Sided Markets

We now present a model that illustrates how mergers in two-sided markets may or may not lead to higher prices. To preserve the later analogy with our empirical application, consider the newspaper industry. The typical newspaper publisher has two sets of consumers—newspaper readers and advertisers—and therefore two prices. Advertisers' willingness-to-pay for advertising at any newspaper is generally

6. For references on studies of the newspaper industry, see Chandra (2009).

a function of the number of readers at that newspaper, and their characteristics.

Before describing the model, we first develop some intuition for the ambiguous effect of mergers on prices in a two-sided market. Consider two newspapers, A and B. When newspaper A raises its circulation price, some of its readers will switch to purchasing newspaper B. In a competitive duopoly, each newspaper will internalize the loss of these readers on its own profits, but will ignore the effect that these switching readers will have on the other firm. However, when newspaper A and B are acquired by a common owner, the monopolist will internalize the effect that raising price at A will have on B. Therefore, in traditional industries, standard merger theory predicts that the merged entity will have higher prices in equilibrium.

However, two-sided industries do not necessarily operate in the same manner. A commonly observed feature of two-sided markets is a subsidy offered to one side of the market. In the newspaper industry there is considerable evidence, both theoretical and empirical, that many publishers price their newspapers below marginal cost in order to maximize profits on the advertising side of the market.[7] This condition is often required in other two-sided markets as well. Rysman (2004) shows a similar condition in the market for Yellow Pages. Evans (2002) describes how some credit card companies offer credit cards for free to consumers, although earning significant margins from the merchant side of the business. Rochet and Tirole (2003) provide many examples of two-sided markets where one side serves as the loss leader or subsidized segment, and the other serves as the profit-making segment; these include operating systems, shopping malls, newspapers, network television, clubs and real estate.[8]

Our model relies on this feature of two-sided markets and the fact that newspapers value readers not just for circulation revenue, but also for the value that advertisers place on them. A key factor in determining the effect of mergers on prices is how newspapers value the marginal consumer, that is, the reader who is indifferent between the two papers and who would switch to the other paper in the event of a rise in prices at her current paper. If this reader provides a negative value to the newspaper then competing duopolists will set *higher* circulation prices in equilibrium than a monopoly owner of the two papers.

7. Examples of studies that have derived this condition and have supplied evidence include Compaine (1980), Chaudhri (1998), Kaiser (2007), and Argentesi and Filistrucchi (2007).

8. The profitable segment typically accounts for the vast majority of the two-sided firm's revenues or profits. Newspapers typically derive 80% of their revenue from advertising, and in 2001 American Express derived 82% of its revenue from the merchant side of the business (see Evans, 2002).

Why might a consumer provide negative value to a newspaper? If publishers set circulation price below marginal cost, then readers are only valuable to the extent that the advertising revenue they generate outweighs the cost-price margin. In our model, consumers who are indifferent between the two papers will turn out to be less valuable to advertisers, and hence will bring in advertising revenues that are lower than the subsidy they enjoy on the paper. It is important to note here that we do not assume that newspapers price below marginal cost on the circulation side. However, pricing below marginal cost is a necessary condition for mergers to lower circulation prices.

On the advertising side, our model has an even simpler prediction. Given the set of readers who buy either newspaper A or newspaper B, the newspaper is the monopoly supplier of its readers. All that advertisers care about is the number and characteristics of readers at a newspaper, not the price of advertising in the rival newspaper.[9] Thus, the change in the advertising price per reader depends solely on the change in average reader characteristics. If there is an increase in circulation price, this will increase the average value to advertisers of that newspaper. However, a merger has no direct effect on advertising price, just an indirect effect through the circulation price.

Consider the following Hotelling model which formalizes this intuition. There are two newspapers located at the end points of the line segment on [0, 1]. Denote the newspaper at 0 by A and at 1 by B. There is a continuum of readers distributed uniformly along this line segment. The utility to a reader located at i from reading newspaper A is given by

$$u_{iA\epsilon} = \delta(k_A) - p_A - \alpha \cdot i + \epsilon. \tag{1}$$

Here α represents the reduction in utility experienced by readers further away from the newspaper, $\delta(k_A)$ is the quality of the newspaper which can depend on the quantity of ads k_A in the newspaper, p_A is the price of newspaper A, and ϵ represents an idiosyncratic taste for newspapers. We assume that ϵ follows a uniform distribution given by

$$\varepsilon \sim U(0, \gamma].$$

This allows readers' preferences to vary along two dimensions: their relative taste for newspapers A and B, and their overall taste for

9. In our model, advertisers are free to advertise in more than one paper although, in equilibrium, they will not choose to do so. The key assumption is that the advertising decision is separable at each paper, that is, that an advertising firm will advertise in every paper where the expected profits from doing so are positive. This is similar to the assumption in Rysman (2004).

newspaper reading. These two taste parameters are orthogonal to each other. The assumption that ε is different from zero is important, because if there is no ε then a newspaper can perfectly screen readers.

The utility from newspaper B is analogously given by

$$u_{iB\epsilon} = \delta(k_B) - p_B - \alpha \cdot (1 - i) + \epsilon.$$

Note that readers may either like or dislike ads in newspapers. Classified ads can be useful for readers, whereas other types of advertising might be a nuisance. Thus, we do not place any structure on whether $\delta(k)$ is increasing or decreasing in the number of advertisements. The evidence on this subject is ambiguous as well.[10] Nevertheless, this assumption implies that our results may not generalize to other media markets. See Kaiser and Wright (2006) for a Hotelling model of the magazine market which models the feedback effect on readers of the amount of advertising.[11]

Readers will only purchase a newspaper if they gain positive utility from doing so. If both papers provide positive utility then readers will buy the paper providing greater utility. Thus, we assume away multi-homing, consistent with consumer choices in the Newspaper industry.[12]

Publishers earn revenue from newspaper sales, as well as from advertising. Advertisers are located at the endpoints 0 and 1 and have a greater valuation of readers located closer to them. Specifically, assume that advertisers receive profits of q for each consumer that buys a product at their store. The probability that a consumer located at i who reads the newspaper will buy the product from an advertiser located at 0 is given by

$$P^0(i) = \frac{\beta}{q} - \frac{w}{q} \cdot i.$$

Thus, readers located further away from the advertiser are less likely to visit the store, and w captures the decrease in the probability of visiting a store if a consumer is located further away from the store. This implies that the advertiser's willingness to pay for a consumer located

10. Gal-Or and Dukes (2006) assume ad aversion in broadcast media, whereas Rysman (2004) assumes ad-loving behavior in the market for Yellow Pages. Dertouzos and Trautman (1990) assume that newspaper readers are unaffected by ads and Kaiser and Song (2009) show that there is little evidence that magazine readers dislike advertising.

11. Unlike in our paper, their model allows advertisers' preferences to depend only on the number of readers, not their characteristics.

12. Gentzkow (2007) looks at the choice of consumers to read a newspaper online or on paper, or to do both. Although multi-homing (consuming multiple newspapers) may be salient for on and off-line newspapers, there is little evidence that consumers subscribe to more than one daily print newspaper.

at i is given by $\beta - \omega \cdot i$. Analogously, the willingness to pay by an advertiser at 1 for the same reader is $\beta - \omega \cdot (1 - i)$.

Note that there are two important assumptions in this model:

(1) Readers and Advertisers have correlated preferences, that is, readers who have a stronger preference for newspaper A are more valuable for advertisers located at 0. A natural interpretation of this assumption is in a geographic sense: readers located closer to the city center get more value out of the city newspaper and are more likely to visit stores in the city. Another interpretation is related to intensity of preference: readers with a higher valuation of the newspaper are likely to read the paper more carefully (or spend longer reading the paper), thus making them more likely to notice advertisements. Ceteris paribus, this makes them more valuable to advertisers.
(2) The preferences of readers and advertisers are not perfectly correlated. Suppose instead, that the preferences of readers and advertisers were perfectly correlated. Then the newspaper could screen readers perfectly, that is, pick a price such that only the readers on whom it will make positive profits choose to purchase this newspaper.

The revenue of newspaper A from selling to a reader located at i is given by

$$R_A(i) = p_A + \beta - \omega \cdot i$$

and note that the newspaper can extract all of the advertisers' surplus.

The total profit to newspaper A is given by

$$\Pi_A = \int_0^1 [p_A + \beta - \omega \cdot i] P(i = A) di - C(q_A),$$

where $C(q_A)$ is the newspaper's cost of delivering q_A papers, and $q_A = \int_0^1 P(i = A) di$.[13] Here, $P(i = A)$ represents the probability that the reader at i will purchase newspaper A. This probability is a weakly decreasing function of i.

There are three possible cases:

Case 1: *All readers buy a newspaper with probability 1.*

This implies that parameter values are such that there is no probability that a given reader will not purchase a newspaper. In a symmetric equilibrium this implies that the consumer indifferent

13. We do not make any assumptions on the cost function which may include fixed costs as well as marginal costs of distribution, printing and material inputs. Importantly, we do not rely on a returns to scale argument to generate lower prices post-merger.

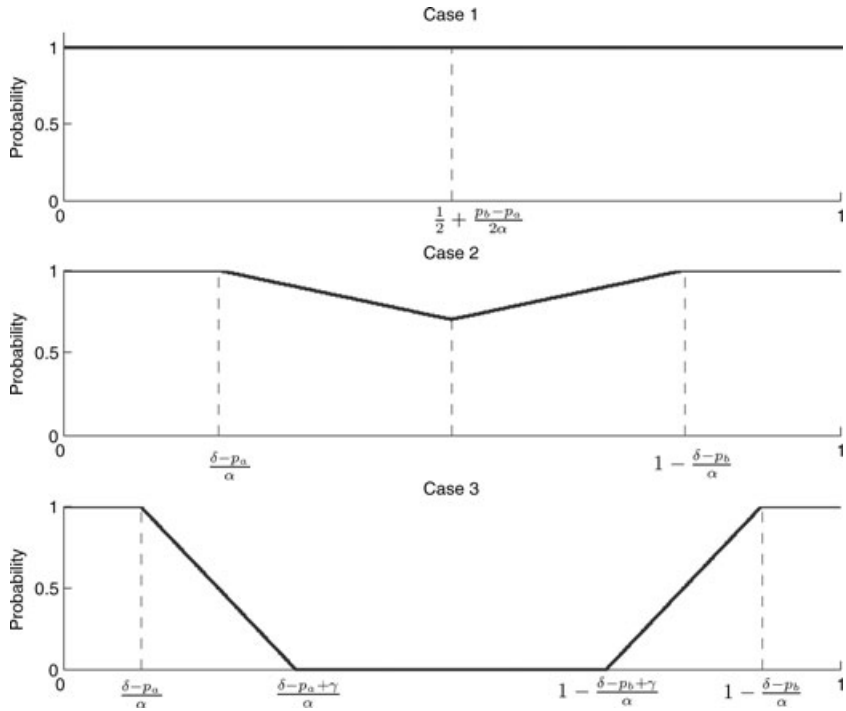

FIGURE 1. THREE DIFFERENT CASES FOR THE CONSUMER SHARES

between newspapers A and B is located at $i = 1/2$. Each newspaper sells to half the market with probability 1. This is illustrated by panel (1) of Figure 1.

Case 2: *All readers buy a paper with positive probability, not necessarily equal to 1.*

This corresponds to parameter values which imply a decreasing probability, as a function of i, that readers will purchase from A and analogously for B. Nevertheless, it is still the case that the reader located at $i = 1/2$ is indifferent between purchasing newspaper A or B, even though this reader may choose not to buy a newspaper. This is illustrated by panel (2) in Figure 1.

Case 3: *Some readers buy a paper with probability zero.*

This implies parameter values such that a set of consumers will not purchase a paper from either A or B. This case is shown in panel (3).

Note that Case 1 is simply a special case of Case 2, where all consumers will purchase the newspaper. Moreover, we do not consider Case 3 because it implies that the market shares of A and B do not overlap, that is, A and B do not compete for readers. In this case joint ownership of the two newspapers will not change the profit maximizing price at either paper and therefore an analysis of mergers is not interesting. Therefore, we restrict attention to Case 2.

The probability that a reader at i purchases newspaper A is given by

$$P(i = A) = \begin{cases} 1 & \text{if } i \in \left[0, \dfrac{\delta - p_A}{\alpha}\right] \\ 1 - \dfrac{\alpha \cdot i - \delta - p_A}{\gamma} & \text{if } i \in \left[\dfrac{\delta - p_A}{\alpha}, \dfrac{1}{2} + \dfrac{p_B - p_A}{2\alpha}\right] \\ 0 & \text{if } i \in \left[\dfrac{1}{2} + \dfrac{p_B - p_A}{2\alpha}, 1\right] \end{cases}.$$

That is, a certain fraction of consumers will purchase newspaper A no matter what their value of ϵ. Beyond a point, the probability that consumers buy A decreases with their distance from A, finally reaching zero when their utility from B exceeds their utility from A.

We refer to consumers in the interval $[0, \frac{\delta - p_A}{\alpha}]$ as A's "locked-in" consumers. We refer to consumers in $[\frac{\delta - p_A}{\alpha}, \frac{1}{2} + \frac{p_B - p_A}{2\alpha}]$ as A's "likely" consumers. That is, they clearly prefer A to B, but do not necessarily purchase A, unless their value of ϵ is high enough. Similarly, B has locked-in and likely consumers.

Firm A's revenue is given by the revenue per reader over the range of readers, i, who purchase the newspaper, which can be separated into the region of i consisting of A's locked-in consumers, where all consumers purchase newspaper A, and a region consisting of A's likely consumers, where consumers purchase A with probability less than 1 (those with high taste for newspapers, ϵ).

$$R_A = \int_0^{\frac{\delta - p_A}{\alpha}} (p_A + \beta - \omega i)\, di + \int_{\frac{\delta - p_A}{\alpha}}^{\frac{1}{2} + \frac{p_A - p_B}{2\alpha}} (p_A + \beta - \omega i) \left[1 - \frac{\alpha i - p_A - \dfrac{p_A - p_B}{2\alpha}\delta}{\gamma}\right] di. \quad (2)$$

Figure 2 shows the effect of firm A raising its price. Section (i) of the graph shows the *stoppers*, consumers who will reduce their probability of buying newspaper A (although still preferring A to B). Section (ii)

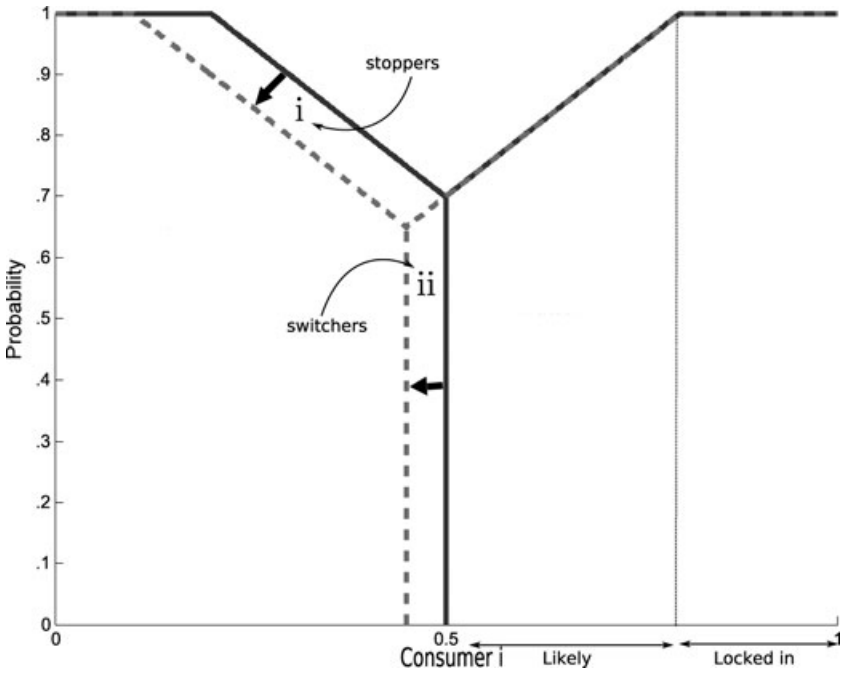

FIGURE 2. EFFECT OF AN INCREASE OF p_A ON CONSUMER SHARES

shows the *switchers*, consumers who switch from being A's likely readers to being B's likely readers. After a merger, when choosing the price of newspaper A, the firm must consider the fact that Section (ii) consumers will switch over to newspaper B. So a merger will raise or lower prices depending on the profitability of switchers, consumers in zone (ii) for newspaper B.

When newspapers A and B merge, the price of the newspaper A will now reflect the effect of p_A on profits of newspaper B.[14] Specifically, the sign of the change in price depends on $\frac{\partial \Pi_B}{\partial p_A}$ given by

$$\frac{\partial \Pi_B}{\partial p_A} = \frac{1}{2\alpha}\left(p_B + \beta - \omega\left(\frac{1}{2} + \frac{p_A - p_B}{2\alpha}\right) - \frac{\partial C}{\partial q}\right). \tag{3}$$

Thus, the sign of $\frac{\partial \Pi_B}{\partial p_A}$ depends on the the sign of $(p_B + \beta - \omega\ (\frac{1}{2} + \frac{p_A - p_B}{2\alpha}) - \frac{\partial C}{\partial q})$, the profitability of the consumer who is indifferent between newspaper A and newspaper B. Call the consumer located at

14. In reality, publishers did not withdraw any papers from the market following the mergers. Therefore, our model also follows this setup: after the newspaper acquisition, prices at the two papers are set jointly.

$\frac{1}{2} + \frac{p_B - p_A}{2\alpha}$ the *switching consumer*, that is, the consumer who is indifferent between purchasing newspaper A and newspaper B. The case where the switching consumer yields positive profits to the firm is easy to understand. Suppose the market shares are as in case 1, that is, all consumers purchase a newspaper. If the newspaper raises its price, it will lose the switching consumer but no other readers. Thus this price cannot be optimal if the switching consumer gives negative profits to the firm. In contrast, if shares are as in case 2, then when the paper raises its price it trades off losing its least profitable consumer (the switching one) against losing consumers with lower i but lower taste for newspaper ϵ. The profit on the switching consumer will be greater or smaller than zero based on the relative value of this consumer to the advertisers. In particular, a necessary condition for the switching consumer to yield negative value to the newspaper that they purchase is that the marginal cost of the newspaper, $\frac{\partial C}{\partial q}$, is higher than the price charged to readers, p_A.

We can show that, depending on parameter values, it is possible for joint ownership of these newspapers to result in either higher or lower profit maximizing prices. Moreover, we can show this result *without* resorting to increasing returns to scale in the cost function $C(q)$ which would decrease costs of a combined firm. Of course, efficiencies following a merger would provide another pathway for prices to fall; however these efficiencies do not seem to have played an important role in the Canadian newspaper merger wave. The intuition can be expressed as follows, and is displayed visually by Figure 2. In the duopoly case, with two competing newspapers, each publisher sets its optimal price taking into account its revenues and costs. The benefit from lowering its price is the expected gain in circulation and advertising revenue from two sources: (i) the increased probability that A's likely consumers actually purchase A and (ii) the switching of some readers from being B's likely consumers to being A's likely consumers. The cost of doing so is the increase in costs that A will incur from its expected increased sales to switching consumers, as well as the lower revenue from its existing consumers. Note, however, that the switching consumers that will now purchase A are less valuable to advertisers, and therefore provide a lower advertising revenue to A, than the stopping consumers. At the profit-maximizing equilibrium, therefore, the gain to A in expected circulation and advertising revenue from slightly lowering its price does not outweigh the loss from delivery costs because the switching consumer does not bring in enough advertising revenue to justify making the sale. Note that neither publisher will internalize the effect on the other one from changing its price.

A monopolist, however, will internalize the effect that lowering its price at one paper will have on revenues and costs at the other paper.

For certain parameter values, we can show that the monopolist will choose to set lower prices at each paper than competing duopolists.[15]

A final note on the demand side. Another change that could occur after a merger is that firms could change the quality of their newspaper, denoted by δ. Note that an increase in quality has the same impact on consumer shares as a decrease in price. Thus a firm might want to either lower or raise quality after a merger (in exactly the opposite way as the change in price) depending on the profitability of the switching consumer. Moreover, a firm could also change the number of ads in a newspaper following a merger. The effect of the merger on the number of ads is just $\frac{\partial \Pi_B}{\partial k_A} = -\frac{\partial \delta}{\partial k_A}\frac{\partial \Pi_B}{\partial p_A}$; this is the effect of price multiplied by the negative effect of ads on newspaper quality. This effect is straightforward because newspapers do not compete in the market for advertising.

We now turn to the effect of a merger on advertising price. Typically, advertising prices are quoted on a per-thousand basis, that is, it is assumed that total prices are proportional to the number of readers. The price per reader for newspaper A (denoted p_A^{ra}) is given by

$$p_A^{ra} = \frac{\int_0^1 (\beta - \omega i) P(i = A) di}{\int_0^1 P(i = A) di} \tag{4}$$

which can be rewritten as

$$p_A^{ra} = \frac{\int_0^{\frac{\delta - p_A}{\alpha}} (\beta - \omega i)\, di + \int_{\frac{\delta - p_A}{\alpha}}^{\frac{1}{2} + \frac{p_A - p_B}{2\alpha}} (\beta - \omega i) \left[1 - \frac{\alpha i - p_A - \frac{p_A - p_B}{2\alpha}\delta}{\gamma}\right] di}{\frac{\delta - p_A}{\alpha} + \int_{\frac{\delta - p_A}{\alpha}}^{\frac{1}{2} + \frac{p_A - p_B}{2\alpha}} \left[1 - \frac{\alpha i - p_A - \frac{p_A - p_B}{2\alpha}\delta}{\gamma}\right] di}. \tag{5}$$

The price per reader for advertisers will increase after the merger if the price charged to readers increases. If p_A increases, then p_A^{ra} will increase as well, because the average i of readers of newspaper A goes down. We have already established that the price charged to readers

15. Fix the parameters $\alpha = 3, \delta = 4$ and $c = 5.5$ (where we just use a linear cost function $C(q) = cq$. Given these parameters, if we look at $par_1 = \{\omega = 9, \gamma = 2.5, \beta = 6\}$ we find that the consumer located at $\frac{1}{2}$ yields negative profits for firms A and B. Therefore when both firms merge, the equilibrium price falls. Alternatively, for the parameter values $par_2 = \{\omega = 3, \gamma = 2, \beta = 4\}$ we find that the consumer located at $\frac{1}{2}$ yields positive profits and a merger would increase prices. The difference between these two parameter values is the fact that par_1 has an advertiser willingness to pay that is steeper than par_2, and thus the consumers located in the middle are less valuable than consumers located at either 0 or 1. MAPLE code for this exercise is available from the authors by request.

could rise or fall after the merger depending on the profitability of the switching consumer. Thus the change in the price for advertisers is ambiguous as well.

Note that our model implies that additional readers reduce average advertising prices. But this is not due to simply imposing decreasing returns in audience size to advertisers.[16] Rather, we have explicitly modeled why additional readers, in this setting, imply lower average advertising prices. This is due to the correlation between readers' location and advertisers' preferences. In other words, additional readers are less valuable because of their characteristics, not simply because of an ad hoc assumption of decreasing returns.[17]

3. Data

Our primary data source is Editor & Publisher Magazine, which is the weekly magazine of the newspaper industry. We obtain information on newspaper prices, advertising rates, aggregate circulation, and other newspaper characteristics (such as the number of pages per copy) for every daily newspaper in Canada.[18] We have collected these data for the years 1995, 1996, 1998, 1999, and 2002. There are, on average 101 daily newspapers in each year, with a small amount of entry.[19]

Summary Statistics at are in Table I; this contains all daily newspapers in Canada. Note that an observation in this table is a newspaper-year combination; we have data for the 5 years listed above. The data show that, during our sample period, the mean weekday newspaper circulation was 47,206 and the median circulation was 18,019. The mean circulation price is \$0.58 and the mean advertising price per column inch is \$2.3 on weekdays.

Supplementary data are obtained from county level circulation figures provided by the Audit Bureau of Circulations (ABC). ABC is an independent, not-for-profit organization that is widely recognized as the leading auditor of periodical information in North America and many other countries. The ABC data set contains extremely detailed information on the circulation of 73 Canadian newspapers for the years 1995–1999. These 73 newspapers constitute the major selling dailies in Canada,[20] and the only ones on which ABC collects information.

16. Crampes et al. (2009) discuss the effects of assumptions such as this.

17. This is related to the literature on targeted advertising. See Chandra (2009), Fu et al. (2007) and Thompson (1989) for details.

18. We have made (most) of our data available online so that it is available to other researchers. We have excluded the proprietary data that was purchased from ABC. The data set and variable descriptions can be accessed at: http://strategy.sauder.ubc.ca/chandra/canadadata.html

19. For example, during this period the *Lloydminster Times* became a daily paper (from a weekly paper), and the *National Post* was founded.

20. Along with the *Globe and Mail* as discussed below.

Table I.
Aggregate Summary Statistics

Variable	Obs	Mean	SD	Min	Max
Weekday circ.	515	47,206	74,041	1,000	494,719
Saturday circ.	408	68,366	106,508	2,675	739,108
Sunday circ.	139	110,750	112,708	13,693	491,105
Average price ($)	515	0.58	0.15	0.21	1.04
Average pages	491	39.7	26.3	8	140
Weekday ad. rate ($)	511	2.3	3.0	0.4	25.6
Saturday ad. rate	399	2.9	3.7	0.5	26.9
Sunday ad. rate	137	4.0	2.7	1.0	12.5
Evening paper	515	0.52	0.50	0	1
French	515	0.11	0.31	0	1
Ad. rate per 10 K readers	511	0.98	0.86	0.22	7.70

Source: Editor and Publisher Magazine.

Table II.
County Level Summary Statistics

Variable	Obs	Mean	SD	Min	Max
Newspaper-Counties					
Weekday circ.	3,612	4,638	16,020	1	220,930
Saturday circ.	2,007	4,719	19,020	3	305,227
Sunday circ.	2,789	4,233	16,134	0	188,326
Weekly circulation	3,612	31,446	108,994	9	1598,203
Weighted Herfindahl (Group)	3,612	0.61	0.19	0.34	1
Counties					
Total daily circ.	1,053	15,909	38,366	1	324,940
Total weekly circ.	1,053	107,880	262,910	62	2353,779

Source: Audit Bureau of Circulation (ABC) and Statistics Canada.

Table II has summary statistics at the county level; observations in the first panel are newspaper-county combinations. The average weekday circulation is 4,638 per newspaper per county. We also present measures of the Herfindahl index calculated according to county level market shares in weekday circulation. This measure is defined in the next section. Essentially, we compute the Herfindahl index in each county according to newspaper groups and then, for each newspaper, weight the value of the Herfindahl index in the counties in which it is present by its circulation in that county. This provides an indicator of the competitive environment faced by newspapers and chains, by

giving more importance to markets where the newspaper has a greater fraction of its circulation. The mean weighted Herfindahl is 0.61.

Panel (2) of Table II provides aggregate circulation figures at the county level. Total weekday circulation in the average county is 15,909. We have observations on 1,053 counties pooled across the four years of available data; this translates to observations on approximately 260 counties annually.

4. Background on the Canadian Mergers

In this section, we provide some historical background on the wave of newspaper mergers in Canada in the late 1990s and also present aggregate statistics detailing the extent of consolidation in the industry.

The Canadian newspaper mergers can be traced to three large business acquisitions between 1996 and 2000:

- Through a series of deals in 1995 and 1996, Hollinger Inc. acquired a controlling stake in the Southam group of newspapers (which included 16 daily newspapers) as well as completed the purchase of 25 daily newspapers from the Thomson group and seven independent dailies.[21,22]
- On March 1st, 1999, Quebecor Inc. acquired the Sun Media chain of newspapers, including 14 daily papers, in a $983 million deal. Quebecor surpassed a bid by Torstar for purchasing Sun Media, but in turn sold four of its existing dailies to Torstar.[23]
- On July 31st, 2000, Canwest purchased 28 daily newspapers from Hollinger Inc. The $3.5 billion purchase constituted the largest media deal in Canada's history. It allowed Canwest to go from having a zero stake in the Canadian newspaper market to becoming the country's biggest publisher, with 1.8 million daily readers.[24]

Table III shows that the market share of the top 3 newspapers chains in Canada rose from 56% to 78% from 1995 to 1999 with Hollinger's share rising from 0% to 44%.

By 2002, the 3-firm concentration ratio was back down to 67%. Note that over this time, aggregate newspaper circulation in Canada had been steadily declining. The 1995–1996 merger wave is a particularly interesting case study of the effects of media concentration for several reasons.

21. "Hollinger takes control of Southam: Black leading press baron", *The Gazette*, May 25, 1996.
22. "Newspapers Are Reshuffled Across Canada", *The New York Times*, May 13, 1996.
23. "It's Official: Sun Now Quebecor's", *The Toronto Sun*, March 2, 1999.
24. "New news empire is born: CanWest Global picks up dailies from Hollinger for $3.5 billion." *The Gazette*, August 1, 2000.

Table III.
Newspaper Ownership by Group

Ownership	Daily Circulation	National Market Share
1995		
Southam	1285,746	0.26
Thomson	997,425	0.20
Torstar	494,719	0.10
Sun Media	472,054	0.09
Quebecor	421,841	0.08
Trans Canada (JTC)	283,472	0.06
Others	1058,793	0.21
Aggregate national circulation	5014,050	
1999		
Hollinger/Southam	2211,945	0.44
Quebecor/Sun Media	1160,572	0.23
Thomson	536,346	0.11
Torstar	460,654	0.09
Trans Canada (JTC)	257,316	0.05
Others	345,218	0.07
Aggregate national circulation	4972,051	
2002		
Canwest	1575,936	0.33
Quebecor	973,059	0.20
Torstar	671,231	0.14
Trans Canada (JTC)	415,345	0.09
Hollinger	259,523	0.05
Others	918,383	0.19
Aggregate national circulation	4813,477	

In most western countries, media industries are subject to more stringent restrictions on mergers and concentration than are other industries. For instance, in the United States, the Federal Communications Commission is entrusted with regulating the communications and media sectors. In contrast, Canada does not have specific legislation regarding competition in media. Instead the Competition Bureau regulates newspapers as it does any other product market.[25,26]

Thus the issue of insuring diversity in media is substantially sidestepped by Canadian Competition law. This legal arrangement allowed for the unprecedented wave of consolidation in the Canadian newspaper industry in the mid 1990s. It is worth noting that the Canadian newspaper market was already quite concentrated in the early

25. "Media concentration is at crisis levels", *The Toronto Star*, May 2, 1997.
26. "The Competition Bureau's Work in Media Industries: Background for the Senate Committee on Transport and Communications" Competition Bureau, page 6.

1990s. Indeed only nine cities in the country at that time had more than one daily newspaper. The merger wave affected almost all newspaper markets in Canada; between 1995 and 1999, 75 daily newspapers changed hands. Over the same period, the national Herfindahl index rose from 1,600 to 2,400, indicating a shift from an industry with a moderate level of concentration to one with a high level of concentration.

Finally, we discuss the results using Herfindahl indices generated from county level circulation data. We create weighted Herfindahl indices that, for each newspaper, weight the standard Herfindahl index in each county that the newspaper circulates in, by its circulation in that county, thereby assigning greater importance to counties where the paper has larger audiences. Therefore, as with a regular Herfindahl index, this measure ranges between 0 and 1, and the higher it is, the less the competitive nature of a firm's market.

$$\underbrace{WH_i}_{\text{Weighted Herfindahl}} = \frac{\sum_k \left[\text{circ}_{ik} * \sum_g s_{gk}^2 \right]}{\sum_k \text{circ}_{ik}},$$

where circ_{ik} is i's circulation in county k and s_{gk} is the market share of group g in county k. The average Weighted Herfindahl is 0.68 in 1995 and rises to 0.69 in 1996, and to 0.72 in 1998 and 1999. Note that this increase in newspapers Herfindahls is due solely to merger activity as the market share of newspapers did not change substantially from 1995 to 1999.

It may appear that national concentration numbers are less important in an industry where competition tends to be local, for both newspaper readers and advertisers. Therefore, we now document the scale of the acquisitions using county level data. Because these data are more disaggregated, they provide a clearer picture of how a given newspaper chain's circulation overlapped with those of its rivals. In particular, we examine whether there was greater evidence of multi-market contact following the mergers. If the acquisitions increased the number of contact points between large national chains, it may have led to an increase in the probability of tacit collusion; this theory is referred to as the mutual forbearance hypothesis.[27] Table IV analyzes the effect that the newspaper acquisitions had on multi-market contact. We use data from 1995 and 1999 and document the extent to which the two dominant chains at the end of this period—Hollinger and Quebecor—

27. See Busse (2000) and Prince and Simon (2006) for recent empirical studies.

Table IV.
Fraction of Counties with Multi-Market Contact

		Hollinger	Quebecor	JTC	Torstar
Hollinger	1995 (90)	–	0.28	0.37	0.49
	1999 (199)	–	0.74	0.90	0.55
Quebecor	1995 (123)	0.38	–	0.97	0.09
	1999 (128)	0.73	–	0.98	0.98

Note: Figures in parentheses refer to the number of counties in which each chain—Hollinger or Quebecor—was present in the corresponding year.

increased multi-market contact with each other and with the other two large chains over this period.[28]

The figures in parentheses in Table IV refer to the number of counties in which the two dominant chains were present; for example, the Hollinger/Southam group increased its presence from 90 counties in 1995 to 199 in 1999. The remaining figures refer to the percentage of each chain's circulation counties in which a rival group was also present in the corresponding year. For example, Hollinger overlapped with Quebecor in 28% of the latter's counties in 1995; four years later that number had increased to 74%. The two smaller groups, JTC and Torstar, saw increases in multi-market contact with one of the dominant chains but not both. The fraction of JTC's counties that contained a Hollinger newspaper increased from 37% to 90%. The Toronto Star initially had hardly any overlap with Quebecor, but by 1999 it encountered a Quebecor paper in 50 of its 51 counties.

Increases in multi-market contact do not necessarily imply greater collusion. However these results suggest that there was at least the possibility of tacit collusion in the period following the acquisitions. This is due not just to greater concentration as measured by national market shares of circulation, but due to increased contact points in local markets. Each of the smaller chains greatly increased its multi-market contact with one of the larger chains, and the two large groups significantly increased the number of markets in which they competed against each other.

5. Results

We now examine empirically the effect on prices of the merger activity described in Section 4. We identify the average treatment effect of the merger using both difference-in-differences and difference-in-differences matching methods. We compare newspapers that changed

28. At this point in time Canwest did not control any newspapers. Additionally, Sun Media had been acquired by Quebecor.

hands versus those that did not; as well as those in the dominant newspaper chains versus the rest. Because the predictions of the model are ambiguous, that is, they depend on parameters of the valuation of advertisers and consumers that are difficult to estimate, we use difference-in-difference and matching approaches to evaluate the impact of mergers on prices. In particular, if mergers decrease prices, this suggests that the switching consumer yields negative value to the firm, as discussed in Section 2. Likewise, if mergers increase prices, then the switching consumer is profitable. If there is no effect of mergers on prices, either we are in a situation where newspapers A and B do not compete for the same readers, or we are in a situation where the switching consumer yields profits of about 0 to the firm. Note that an important testable prediction of the model is that the change in the circulation price will be in the same direction as the change in the advertising price. Thus, if these prices move in different directions, this would invalidate the model.

Notice that we are adopting the language of natural-experiments; however in reality we do not believe that the treatment and control groups are randomly chosen representative samples, because firms self-select into these groups. Nevertheless, because these labels have become commonplace in the quasi-experimental literature in economics, we shall continue to use them here.[29] Moreover, it is not clear that a truly natural experiment is useful for a Competition Authority deciding on whether to approve a merger. The collection of mergers that come before the Competition Authority is never exogenous because firms initiate mergers. In addition, mergers which are likely to increase market power will also be more profitable for the merging firms. In this context, we present an empirical examination of whether newspapers with greater market power exercised that market power in the form of higher prices.

We will look at two different merger treatments T_{it}:

(A) Newspapers with changed ownership between 1995 and 1999–2002.
(B) Newspapers acquired by Quebecor or Hollinger between 1995 and 1999 and by Canwest between 1999 and 2002.

We study the effect of these treatments on several outcome variables (henceforth denoted y_{it}) of interest to analyzing the effect of mergers.

The standard method for difference-in-differences calculations involves comparing the changes in the means for two groups—the treatment and control groups—before and after the treatment. The outcomes are determined by:

29. See Meyer (1995) for a discussion.

$$y_{it} = \underbrace{\mu_i}_{\text{newspaper fixed effect}} + \underbrace{\delta_t}_{\text{year effect}} + \underbrace{\alpha T_{it}}_{\text{treatment effect}} + u_{it}, \tag{6}$$

where α is the effect of mergers on the outcome variable, and we allow for time trends (δ_t) and newspaper fixed effects (μ_i). The difference in difference estimator is just the difference between the change in Δy_{it} for the merged group and unmerged group:

$$\alpha = E(y_{it} - y_{it-1}|T_{it} = 1) - E(y_{it-1} - y_{it}|T_{it} = 0). \tag{7}$$

For the difference in difference estimate of α to be correct, we need to assume that assignment to the merger group is not confounded: $T_{it} \perp (u_{it} - u_{it-1})$. For instance, if it was the case that Hollinger acquired small newspapers, and the ad rates for small newspaper were falling from 1995 to 2002, this would violate unconfoundedness. We relax this assumption by presenting estimates using the difference-in-differences matching estimators described in Todd (2008) and Wooldridge (2002) chapter 18, which only requires unconfoundedness conditional on observables, that is, $T_{it} \perp (u_{it} - u_{it-1})|X_{it}$. The difference-in-differences matching estimators will yield similar conclusions as the straight difference in differences estimator.

Table V shows estimates of the effect of mergers using a diff-in-diff nearest neighbor matching estimator using the software developed by Abadie et al. (2004). We use the following matching variables X_i: daily circulation, circulation price, pages, province, ad rate per 10 K and ad rate. These observables were used to try to control for different trends by province, newspaper size and price. However, changing the matching variables has little substantive effect on key outcomes such circulation price, ad rates and circulation.

The results do not suggest that newspapers that were taken over, or those in the dominant chains, had any different price changes from papers in the respective control groups. The coefficient on circulation price is both economically and statistically insignificant in all specifications. Similarly, the advertising rate is not estimated to be any different between the treatment and control groups. When we examine advertising rates normalized by circulation, the coefficient is marginally significant in one specification but indistinguishable from zero in the rest.

Results using the straight difference-in-differences estimator are very similar to the results in 5 and are available in the online appendix. No matter which method is used, the results do not suggest higher prices in the dominant chains. For instance, the effect of changing ownership between 1995 and 1999 on ad rates per 10,000 readers is 13 cents in the diff-in-diff estimate and 13 cents in the matching estimator. Likewise, the

TABLE V.
DIFF-IN-DIFF MATCHING ESTIMATE OF THE EFFECT OF OWNERSHIP CHANGES AND OWNERSHIP BY HOLLINGER OR QUEBECOR USING THE NEAREST NEIGHBOUR MATCHING ESTIMATOR

	Ownership Change				Hollinger-Quebecor		Canwest-Quebecor	
Change in	1995–1999		1995–2002		1995–1999		1995–2002	
Variable	Coef.†	S.E.	Coef.†	S.E.	Coef.†	S.E.	Coef.†	S.E.
Circulation price	−0.01	(0.02)	0.03	(0.07)	0.00	(0.02)	0.01	(0.02)
Ad rate	0.13	(0.15)	−0.21	(0.42)	0.24	(0.18)	0.24	(0.23)
Average pages	−1.86	(1.57)	0.82	(4.40)	2.90	(1.55)	1.38	(2.03)
Rate per 10 K	−0.13*	(0.06)	−0.10	(0.28)	−0.12	(0.08)	−0.01	(0.11)
Log circ.	0.00	(0.02)	−0.10	(0.16)	0.00	(0.02)	0.06	(0.05)
Circulation daily	288	(1,448)	−4,688	(8,335)	1,014	(1,166)	1,945	(2,730)
N	97		92		97		92	

*Significant at the 5% level.
†Matching variables: daily circulation, circulation price, pages, province, ad rate per 10 K, ad rate.

effect of changing ownership on circulation price is −1 cent in the diff-in-diff estimate versus 8 cents in the diff-in-diff matching estimator.[30]

We also performed an analysis using county level data. We regressed the variables of interest on the Weighted Herfindahl described above, as well as on other control variables. We add newspaper fixed effects to control for newspaper characteristics. We also introduce year effects to account for changes in the newspaper industry over time. Finally, we add newspaper specific time trends (γ_i) to the model to control for trends in newspaper ad rates and circulation prices.

The results of these regressions are presented in the online appendix. We note here that, once all controls are added, there is no relationship between concentration measures and advertising or circulation prices. However, we acknowledge again that the direction of causality cannot be inferred from our results, because the Herfindahl index and the ad rate per reader are jointly determined.

30. Regressions of the treatments T_{it} on observables X_i yields r-squares on the order of at most 30%. Thus there is ample data to find observations such that $T_{it} = 0|X_i$ and $T_{it} = 1|X_i$, a requirement for our matching strategy to work. The online appendix presents probit regressions to illustrate the fact that observables can account for a large fraction of the variation in merger activity between newspapers.

To summarize this section, we find no relationship between indicators of concentration or increased market power on the one hand, and advertising and circulation prices on the other. All of our results are consistent with the model that we presented, for either the case where the switching consumer yields a profit of about zero to the firm or the case where readership of newspaper A and B does not overlap before the merger, which will induce no change in cover price and hence no change in the advertising rate.

6. Conclusion

In this paper, we discussed the effect of mergers in two-sided markets, and in particular we examined the consequences of the wave of mergers and ownership changes that took place in the Canadian newspaper industry in the mid 1990s. Our goal was to focus on economic effects that are easily quantifiable, namely the effect on circulation and advertising prices.

We first built a model of the effect of mergers in a two-sided market. Because newspapers have an incentive to screen consumers who have low value to advertisers, it is possible that the indifferent consumer yields either positive or negative profits for the firm. Thus a merger in a two-sided market may raise or lower the prices charged to readers and advertisers. Moreover, in our model, consumer welfare may increase or decrease after a merger, whereas advertiser welfare is unchanged.

We then tested these predictions using data from immediately before and after the newspaper mergers, as well as more recent data, to infer whether changes in the competitive environment had observable effects on prices and circulation. The answer appears to be that the ownership changes did not lead to higher prices for either set of consumers. Our findings hold true throughout the period of study, whether we examine price changes immediately following mergers, or after a 3 year gap. These results are consistent with the predictions of our model: it is not obvious that increased concentration in two-sided markets would lead to higher prices on either side of the market.

An important caveat to our results is that we cannot identify the causal effect of the mergers, because firms self-selected into the treatment and control groups. Indeed, the possibility exists that firms with greater market power following the mergers would have had lower prices had they not merged, and that they exercised their market power to keep prices at about the same level as the remaining newspapers. However, from the point of view of consumers, there does not appear to have been an obvious collusive effect of the mergers, or an exploitation

of concentration to raise prices by chains with market power. Acquired papers, and those that were part of the dominant chains, saw smaller price rises or greater price declines than other papers. Interestingly, there is only weak evidence that the mergers impacted circulation; it may have been expected that new ownership could have an initial adverse effect on circulation, through editorial changes or other policies which could alienate existing readers.

Our results support the predictions of our model; however, they are also not inconsistent with other explanations. First, if there are efficiency gains from mergers in these markets then it is possible that the post-merger profit-maximizing prices are unchanged, because the increase in market power is offset by lower costs for the merged entity. Second, there is some evidence that media mergers are motivated by reasons unrelated to profits, having more to do with political motives or empire building. See Anderson and McLaren (2008) for one such study.

Our empirical specifications cannot distinguish among these hypotheses. In general, establishing causal relationships for mergers in two-sided markets is challenging. Doing so would require, at a minimum, a structural model that takes into account the effect of each side of the market on the other. In the context of media industries this would also require detailed data on the characteristics of subscribers and advertisers, and on the quantity of advertising. Given the considerable—and growing—interest in investigating two-sided markets, and the potential for counter-intuitive results that they generate, we expect that future work will take a keen interest in evaluating mergers and other antitrust considerations in these industries. We hope that our work provides a starting-point for the analysis of mergers and other issues of market power in two-sided markets.

References

Abadie, A., D. Drukker, J. Herr, and G. Imbens, 2004, "Implementing Matching Estimators for Average Treatment Effects in Stata," *Stata Journal*, 4, 290–311.

Anderson, S.P. and J.J. Gabszewicz, 2005, "The Media and Advertising: A Tale of Two-Sided Markets," CEPR discussion papers 5223.

—— and J. McLaren, 2008, "Media Mergers and Media Bias with Rational Consumers," Working paper, University of Virginia, Charlottesville.

Argentesi, E. and L. Filistrucchi, 2007, "Estimating Market Power in a Two-Sided Market: The Case of Newspapers," *Journal of Applied Econometrics*, 22, 1247–1266.

Armstrong, M., 2006, Autumn, "Competition in Two-Sided Markets," *RAND Journal of Economics*, 37(3), 668–691.

Busse, M.R., 2000, "Multimarket Contact and Price Coordination in the Cellular Telephone Industry," *Journal of Economics & Management Strategy*, 9(3), 287–320.

Chandra, A., 2009, "Targeted Advertising: The Role of Subscriber Characteristics in Advertising Markets," *Journal of Industrial Economics*, 57(1), 58–84.

Chaudhri, V., 1998, March, "Pricing and Efficiency of a Circulation Industry: The Case of Newspapers," *Information Economics and Policy*, 10(1), 59–76.

Compaine, B., 1980, *The Newspaper Industry in the 1980s: An Assessment of Economics and Technology*, White Plains, NY: Knowledge Industry Publications.

Crampes, C., C. Haritchabalet, and B. Jullien, 2009, "Advertising, Competition and Entry in Media Industries," *Journal of Industrial Economics*, 57(1), 7–31.

Dertouzos, J.N. and W.B. Trautman, 1990, "Economic Effects of Media Concentration: Estimates from a Model of the Newspaper Firm," *Journal of Industrial Economics*, 39(1), 1–14.

Evans, D.S., 2002, "The Antitrust Economics of Two-Sided Markets," *SSRN eLibrary*.

—— and M.D. Noel, 2007, "Defining Markets that Involve Multi-Sided Platform Businesses: An Empirical Framework with an Application to Google's Purchase of DoubleClick," *SSRN eLibrary*.

Fu, W.W., H. Li, and S.S. Wildman, 2007, "Explaining Prices Paid for Television Ad Time: The Purchasing Profile Model," Working paper.

Gal-Or, E. and A. Dukes, 2006, "On the Profitability of Media Mergers," *Journal of Business*, 79(2), 489–526.

Gentzkow, M., 2007, "Valuing New Goods in a Model with Complementarity: Online Newspapers," *American Economic Review*, 97(3), 713–744.

Kaiser, U., 2007, April, "When Pricing Below Marginal Cost Pays Off: Optimal Price Choice in a Media Market with Upfront Pricing," CIE discussion papers 2007-05, University of Copenhagen. Department of Economics (formerly Institute of Economics). Centre for Industrial Economics.

—— and M. Song, 2009, "Do Media Consumers Really Dislike Advertising? An Empirical Assessment of the Role of Advertising in Print Media Markets," *International Journal of Industrial Organization*, 27(2), 292–301.

—— and J. Wright, 2006, "Price Structure in Two-sided Markets: Evidence from the Magazine Industry," *International Journal of Industrial Organization*, 24, 1–28.

Meyer, B.D., 1995, April, "Natural and Quasi-Experiments in Economics," *Journal of Business & Economic Statistics*, 13(2), 151–161.

Nevo, A., 2000, "Mergers with Differentiated Products: The Case of the Ready-to-Eat Cereal Industry," *The RAND Journal of Economics*, 31(3), 395–421.

Prince, J. and D.H. Simon, 2006, "Multimarket Contact and On-Time Performance in the US Airline Industry," *SSRN eLibrary*.

Rochet, J.-C. and J. Tirole, 2003, "Platform Competition in Two-Sided Markets," IDEI Working Papers 152, Institut d'Economie Industrielle (IDEI), Toulouse.

Rysman, M., 2004, "Competition Between Networks: A Study of the Market for Yellow Pages," *Review of Economic Studies*, 71(2), 483–512.

Thompson, R.S., 1989, "Circulation Versus Advertiser Appeal in the Newspaper Industry: An Empirical Investigation," *Journal of Industrial Economics*, 37(3), 259–271.

Todd, P., 2008, "Matching Estimators," in S.N. Durlauf and L.E. Blume, eds., *The New Palgrave Dictionary of Economics*. New York: Palgrave Macmillan. Available at http://www.dictionaryofeconomics.com/article?id=pde2008_M000365 (accessed 28 August 2009).

Whinston, M., 2006, *Lectures on Antitrust Economics*, Cambridge, MA: The MIT Press.

Wooldridge, J., 2002, *Econometric Analysis of Cross Section and Panel Data*, Cambridge, MA: The MIT Press.