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ASSESSING UNILATERAL MERGER EFFECTS IN A TWO-SIDED MARKET: AN APPLICATION TO THE DUTCH DAILY NEWSPAPER MARKET

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ABSTRACT

We compare different methods to assess unilateral merger effects in a two-sided market by applying them to a hypothetical merger in the Dutch newspaper industry. We first specify and estimate a structural model of demand for differentiated products in both the readership and the advertising sides of the market. This allows us to recover price elasticities and indirect network effects. Marginal costs are then recovered from an oligopoly model of the supply side. We use these estimates of price elasticities, network effects, and marginal costs to perform a concentration analysis based on the Herfindahl-Hirschmann index, to conduct a small but significant non-transitory increase in price test, to measure upward pricing pressure, and to run a full merger simulation.

JEL: L13; L40; L82

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I. INTRODUCTION

The newspaper market is a typical example of a so-called two-sided market: Publishers sell content to readers and advertising slots to advertisers while taking into account that the demand for advertisements in a newspaper depends positively on its circulation and that readers might be affected by the number of advertisements in the newspaper.[1] The presence of these *indirect network effects* between the two sides of the market is well known to firms active in the industry, which take them into account when devising their pricing strategies.

Understanding how to evaluate mergers in two-sided markets is important for competition policy, as there has recently been a surge in merger cases in these markets. Well-known mergers include the Google-DoubleClick merger, the merger between Dutch flower auction houses,[2] the merger between Dutch yellow page directories,[3] and the recently proposed merger between Deutsche Börse and NYSE Euronext.[4] There have also been a number of mergers between newspaper publishers. Yet very often, the two-sided nature of the market has played only a minor role in the decision.[5] In particular, the presence, the sign, and the extent of the indirect network effects have not

[1] Simon J. Anderson & Jean J. Gabszewicz, *The Media and Advertising: A Tale of Two-Sided Markets*, *in* 1 HANDBOOK OF THE ECONOMICS OF ART AND CULTURE 567 (Victor A. Ginsburg & David Throsby eds., Elsevier, 2006). The issue of whether and to what extent readers like or dislike advertising in a newspaper is an open one. Whereas Argentesi and Filistrucchi find no effect of advertising on the number of readers of daily newspapers in Italy, and Ying Fan reaches the same conclusion for U.S. daily newspapers, Kaiser and Wright and Kaiser and Song find that advertising increases readers demand for magazines in Germany. Interestingly, when estimating demand non-parametrically, Sokollu finds that advertising has a non-linear effect on demand for magazines in Germany. Elena Argentesi & Lapo Filistrucchi, *Estimating Market Power in a Two-Sided Market: The Case of Newspapers*, 22 J. APPLIED ECONOMETRICS 1247 (2007); Ying Fan, *Ownership Consolidation and Product Characteristics: A Study of the U.S. Daily Newspaper Market* (University of Michigan, Mimeographed, 2011); Ulrich Kaiser & Julian Wright, *Price Structure in Two-Sided Markets: Evidence from the Magazine Industry*, 24 INT'L J. INDUS. ORG. 1 (2006); Ulrich Kaiser & Minjae Song, *Do Media Consumers Really Dislike Advertising? An Empirical Assessment of the Role of Advertising in Print Media Markets*, 27 INT'L J. INDUS. ORG. 292 (2009); Senay Sokullu, *Nonparametric Analysis of Two-Sided Markets* (Mimeographed, 2010).

[2] Decision of the Board of Directors of the Netherlands Competition Authority, as referred to in Section 41 of the Competition Act, Case No. 5901/Bloemenveiling Alsmeer – Flora Holland (2007) (Neth.).

[3] Decision of the Board of Directors of the Netherlands Competition Authority, within the meaning of Section 41 of the Competition Act, Case No. 6246/European Directories – Truvo Nederland (2008) (Neth.).

[4] Commission Decision of 1 Feb. 2012, DG-Comp Case No. 11/948 Deutsche Börse/NYSE Euronext (EC).

[5] For cases involving the print media industries, see Elena Argentesi & Marc Ivaldi, *Market Definition in Printed Media Industries: Theory, Practice and Lessons for Broadcasting*, *in* THE ECONOMIC REGULATION OF BROADCASTING MARKETS (Paul Seabright & Juergen von Hagen eds., Cambridge Univ. Press 2007). For cases involving two-sided markets in general, see Lapo Filistrucchi, Damien Geradin, Eric E.C. van Damme & Pauline Affeldt, *Market Definition in Two-Sided Markets: Theory and Practice* (Mimeographed, 2012).

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been fully assessed. For instance, in some cases, competition authorities took into account the effects of the merger only on one side of the market, like the U.K. Competition Commission when it looked only at the advertising side in *Archant/Independent News and Media*[6] and *Newsquest (London) Limited and Independent News & Media.*[7] In other cases, competition authorities assessed the merger effects on the two sides of the market separately, as the U.K. Office of Fair Trading did in *Future/Highbury House.*[8] In *Gruner + Jahr/Financial Times/JV,*[9] *Newspaper Publishing*,[10] and *GIMD/Socpresse*,[11] the European Commission acknowledged that the type of readers differentiates newspapers from the point of view of advertisers, but it failed to recognize that the demand from readers might be affected by the quantity of advertising and that the number of readers (of a given type) affects the demand for advertising slots. In other cases, while recognizing that the number (and type) of readers affects the demand for advertising slots in a newspaper, competition authorities failed to recognize that the level of advertising in a newspaper might affect demand from readers. Examples are the decision of the French Competition Commission in *Socpresse/Groupe Express-Expansion*,[12] the decision of the U.K. Competition Commission in *Regional Independent Media Ltd and Gannett Ltd/Johnston Press plc/Guardian Media Group*,[13] and the decision concerning *Springer and ProSieben/Sat*,[14] in which the Bundeskartellamteven failed to recognize that TV viewers might dislike advertising.

[6] Final Report on the Acquisition by Archant Limited of the London Newspapers of Independent News and Media Limited, Case No. 491, Competition Commission, (2004) (UK).

[7] Newsquest (London) Limited and Independent News & Media PLC: A Report on the Proposed Transfers, Case No. 484, Competition Commission (2003) (UK).

[8] Anticipated Acquisition by Future plc of Highbury House plc: The OFT's Decision on Reference Under Section 33 Given on 14 April 2005, Case No. ME/1586/05, Office of Fair Trading (UK).

[9] Commission Decision of 20 Apr. 1999 in Case No. IV/M.1455 – Gruner+ Jahr/Financial Times/JV, Regulation (EEC) No 4064/89 Merger Procedure (EC).

[10] Commission Decision of 14 March 1994 in Case No. IV/M.423 – Newspaper Publishing, Regulation (EEC) No 4064/89 Merger Procedure (1994) (EC).

[11] Commission Decision of 16 June 2004 in Case No. COMP/M.3420 – GIMD/Socpresse, Regulation (EEC) No 4064/89 Merger Procedure (2004) (EC).

[12] Lettre du Ministre de l'Économie, des Finances et de l'Industrie en date du 31 Décembre 2002, au Conseil de la Société Socpresse Relative à une Concentration dans le Secteur de Presse Écrite, Direction Générale de la Concurrence, de la Consommation et de la Répression des Fraudes [Letter from the Minister of Economy, Finance and Industry dated 31 December 2002, on the Board of the Company Socpresse on a Concentration in Print Media, Directorate General for Competition, Consumption and Fraud Repression] *available at* http://www.bercy.gouv.fr/fonds_documentaire/dgccrf/boccrf/04_01/a0010008.htm (Fr.).

[13] Regional Independent Media Limited and Gannett U.K. Limited/Johnston Press plc/Guardian Media Group plc: A Report on the Proposed Transfers, Case No. 447, Competition Commission (2000) (U.K.).

[14] Axel Springer AG & ProSiebenSat.1 Media AG, Case No. B 6 - 92202 - Fa – 103/05, Bundeskartellamt [Federal Cartel Office] (2006) (Ger.).

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It is difficult to judge, without access to the data of a case, whether the case's conclusions would have been different had the two-sided nature of the market been fully taken into account. The conclusion is likely to depend on the sign and size of the indirect network effects and their importance with respect to other features of the market, like the elasticity of demand with respect to prices and the degree of product differentiation. Still, it is natural to wonder to what extent competition authorities should dedicate more resources to the assessment of the two-sided nature of a market and thus to the identification of the relevant network effects.[15] In this article, we show what type of data is needed for this exercise and how the data can be used to assess unilateral effects of a proposed merger.

Competition authorities have devised different methods to assess whether a horizontal merger is likely to raise concerns with respect to unilateral or non-coordinated effects (that is, whether the merger might increase the market power of the merging firms). For instance, initial screening has traditionally been based on the analysis of the market shares of the merging parties and (the changes in) the Herfindahl-Hirschman index (HHI). This has often meant that mergers among firms with market shares below a given threshold and mergers characterized by a post-merger HHI and a change in the HHI below certain thresholds were almost automatically approved. For mergers judged to be worthy of further investigation, full merger simulations have only seldom been conducted. More often, preference has been given to a type of small but significant non-transitory increase in price (SSNIP) test, where it is asked whether the merging firms would find it profitable to raise prices post-merger by a given threshold, usually 5 or 10 percent, if rivals were assumed not to react.[16] More recently, Joseph Farrell and Carl Shapiro proposed to use the concept of upward pricing pressure (UPP), which measures the tendency to increase prices post-merger due to the internalization of the cross effects between the merging products when one allows for a benchmark level of efficiency gains from the merger, again 5 or 10 percent.[17] The UPP concept has been modified by Steven Salop and Serge

[15] This was for instance the main reason for the NMa commissioning a report on mergers in two-sided markets to a group of researchers, which included the authors of this article. *See* Eric C. van Damme, Lapo Filistrucchi, Damien Gerardin, Simone Keunen, Tobias J. Klein, Thomas Michielsen & John Wileur, *Mergers in Two-Sided Markets: A Report to the NMa* (Dutch Competition Authority 2010) [hereinafter *NMa Report*].

[16] SSNIP stands for "small but significant and non-transitory increase in price." Originally, the SSNIP test was devised for market definition and as such asks the question of whether a hypothetical monopolist would find it profitable to raise the price by 5 or 10 percent. This is why the test is sometimes called the hypothetical monopolist test. In the original context of the test, it is somewhat more natural to assume that the prices of the products not owned by the hypothetical monopolist remain unchanged. *See* Part VI *infra* for further discussion.

[17] Joseph Farrell & Carl Shapiro, *Antitrust Evaluation of Horizontal Mergers: An Economic Alternative to Market Definition*, 10 THE B.E. J. THEORETICAL ECON. art. 9 (2010).

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Moresi[18] and has been generalized to generalized upward pricing pressure (GeUPP) by Sonia Jaffe and Glen Weyl.[19] Importantly, UPP has been adopted in the 2010 U.S. merger guidelines. It is a subject of debate whether such pricing pressure indexes only represent an improvement with respect to market concentration analysis or whether they may also substitute for merger simulation.

One reason why the two-sidedness of markets has not been fully taken into account in many cases is that these tools for assessing unilateral merger effects have mainly been developed for single-sided markets. Wright, however, shows that analyzing a two-sided market as if it were a single-sided market may lead to mistakes and unintended consequences in the application of competition policy.[20] This is mainly because a firm's pricing decisions depend not only on own-price and cross-price elasticities of demand on both sides of the market, as they would in a single-sided market with a multi-product firm, but also on the own-price and cross-elasticities of demand on one side with respect to demand on the other side—that is, the indirect network effects.

For example, in the newspaper market, when considering whether to increase subscription prices after a merger, newspapers will take into account that such an increase will not only have a negative effect on subscription revenues through its negative effect on circulation, but also a negative effect on advertising revenues as decreased circulation leads to a decline in the demand for advertising. For the same reason, such an increase in price might lead to a decline not only in readers' welfare but also in advertisers' welfare (the former effect is partly offset if readers dislike advertising and enhanced if they like advertising). This example shows that in the presence of indirect network effects, a merger is less likely to result in a price increase and also that a price increase on one side is likely to affect welfare on the other side too.

When it comes to assessing unilateral mergers, it has been known for some time already that, in a market characterized by positive direct network effects, it is not necessarily the case that a higher concentration will be detrimental to consumer welfare. On the one hand, higher concentration may lead (in the absence of efficiency gains) to a higher price; on the other hand, it is also likely to correspond to a higher utility derived from the good and a higher willingness to pay for the good. Since consumer welfare is usually conceived as dependent on the difference between the willingness to pay of

[18] Steven Salop & Serge Moresi, *Updating the Merger Guidelines: Comments* (Mimeographed, 2009), *available at* http://www.ftc.gov/os/comments/horizontalmergerguides/545095-00032.pdf.

[19] Sonia Jaffe & Glen Weyl, *The First-Order Approach to Merger Analysis* (Mimeographed, 2010), *available at* http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1765024.

[20] Julian Wright, *One-sided Logic in Two-sided Markets*, 3 Rev. Network Econ. art. 3 (2004).

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consumers and the price they pay, the net effect will depend on whether the price increases more than the willingness to pay.

In a two-sided market, the issue is more complex than in a single-sided market with a direct network effect. This is due to the presence of (often two) indirect network externalities that link two distinct demands and that need not necessarily both be positive. Therefore, the question arises of whether the two-sided nature of the market increases or decreases the tendency of merging firms to raise prices after the merger and, in an economic approach to competition policy, whether a higher price necessarily leads to a higher loss in consumer welfare and in turn higher allocative inefficiency.

The theoretical literature distinguishes between the price level (roughly the sum of the two prices) and the price structure (roughly their ratio) and shows that, in general, in a two-sided market a merged firm will tend to raise the price level, but it is also likely to change the price structure.[21] In fact, a two-sided market is often defined as a market in which not only the price level but also the price structure matters for the profits of the firm. Consequently, not only the price level but also the price structure determines consumer welfare and, more generally, total welfare. The literature shows that more concentration leads in general to a less-efficient price level but not necessarily a less-efficient price structure. As a result, it is not clear whether higher concentration and more market power lead to a welfare loss, even if one restricts attention to consumer welfare.

In this article, we show how one can proceed to assess unilateral effects in a two-sided market. We analyze a hypothetical merger in the Dutch newspaper market. We first specify a structural model of demand for differentiated products on both the readers' and the advertisers' side of the market. We use it to recover price elasticities, indirect network effects, and (following the method of Lapo Filistrucchi, Tobias Klein, and Thomas Michielsen[22]) marginal costs. We then compare different methods to assess unilateral effects in a two-sided market: a concentration analysis based on the HHI, a SSNIP-type test, the measurement of upward pricing pressure, and a full merger simulation. All these methods, except for the concentration analysis, are redesigned to take the two-sided nature of the market into account.

Turning to the literature, theoretical work on mergers among two-sided platforms is still scarce. Most of the policy implications derived from theory stem from the comparison between oligopoly and monopoly equilibria.

[21] We use the word "roughly" because in a two-sided market without a transaction among users of the platform, one needs to reduce the two prices to the same unit of measurement by appropriate weights. In a newspaper market, the price level is equal to the per-copy revenues from both the readership and the advertising side, while the price structure is the ratio of the revenues from both sides.

[22] Lapo Filistrucchi, Tobias J. Klein & Thomas Michielsen, *Merger Simulation in a Two-Sided Market: The Case of the Dutch Daily Newspapers* (NET Institute, Working Paper No. 10-15, 2010).

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Ambarish Chandra and Allan Collard-Wexler have published an article specifically focused on mergers,[23] in which they present an economic model of the newspaper market and show that a monopolist will not necessarily set higher prices than competing duopolists on either side of the market, provided that readers are heterogeneous with respect to the value they bring to advertisers, and that the less-valuable readers are also those who are more price-sensitive. A recent paper by Agnese Leonello analyzes mergers in a similar setting.[24] Her model also has differentiated products à la Hotelling on both sides of the market and two oligopolistic platforms merging into a monopoly. She finds that, even in the absence of efficiency gains, because of the existence of indirect network effects, merging platforms have an incentive to keep their prices low after the merger on at least one side of the market. Finally, Craig Malam proposes a model of differentiated products—based on the approach of Steven Salop[25]—on both sides of the market, in which the side consuming content does not pay.[26] He finds mergers (to monopoly) among ad-sponsored platforms to have a competition-intensifying effect, which offsets the incentive to increase prices on the advertiser side.

Further, the empirical literature on mergers involving two-sided platforms is still scarce. David Evans and Michael Noel[27] point out that, as the Lerner pricing formula does not hold in such markets, traditional merger simulation models are wrongly specified if applied without modifications to two-sided or multi-sided platforms. They also perform an analysis of the merger between Google and DoubleClick, which is the first empirical analysis of a merger in a two-sided industry in the literature. They show that relying on conventional methods would have led to significantly different conclusions from using methods that explicitly incorporate the two-sided nature of this market. However, they are only able to perform a calibration exercise due to a lack of data. Chandra and Collard-Wexler assess mergers in the Canadian newspaper market, but their analysis is mainly an *ex post* evaluation of the effects of the merger.[28] They use a two-sided Hotelling model to explain their finding that greater concentration did not lead to higher prices for either readers or advertisers. Yet, they do not build and estimate a structural econometric model and, therefore, their framework cannot be used to simulate mergers.

[23] Ambarish Chandra & Allan Collard-Wexler, *Mergers in Two-Sided Markets: An Application to the Canadian Newspaper Industry*, 18 J. ECON. & MGMT. STRATEGY 1045 (2009).

[24] Agnese Leonello, *Horizontal Mergers in Two-Sided Markets* (European Univ. Institute, Mimeographed, 2010).

[25] Steven C. Salop, *Monopolistic Competition with Outside Goods*, 10 BELL J. ECON. 141 (1979).

[26] Craig R. Malan, *Mergers of Ad-sponsored Media Platforms* (Mimeographed, 2011).

[27] David S. Evans & Michael D. Noel, *The Analysis of Mergers That Involve Multisided Platform Businesses*, 4 J. COMPETITION L. & ECON. 663 (2008).

[28] Chandra & Collard-Wexler, *supra* note 23.

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In our merger simulation, we follow the approach of Filistrucchi, Klein, and Michielsen, who build a structural econometric framework to simulate the effects of mergers among two-sided platforms selling differentiated products and competing based on the Bertrand model on each side of the market.[29] Their framework extends the supply model of Elena Argentesi and Filistrucchi[30] to the more general case of a two-sided market with two network effects.[31] For this reason, it also differs from the method of Patrick van Cayseele and Stijn Vanormelingen[32] who, consistent with their empirical findings, assume no effect of advertising on readership when analyzing mergers in the Belgian newspapers market. Przemyslaw Jeziorski studies mergers between U.S. radio stations. In his model, listeners do not pay a monetary price to listen to the radio, but advertising generates a nuisance cost.[33] Our model is more general in that customers on both sides—readers and advertisers—pay a price to access the platform. Finally, Ying Fan analyzes mergers among U.S. newspapers.[34] Whereas the framework of Filistrucchi, Klein, and Michielsen[35] is more general than Fan's when it comes to analyzing merger effects on prices, as it allows for advertising to affect readers, Fan's model allows for endogenous changes in the quality of the newspaper after the merger. As we do not have data on quality, we abstract from quality changes due to the merger.[36]

This article proceeds as follows. Part II describes the data set. In Part III, we identify the main features of the Dutch market for daily newspapers. In Part IV, we specify a model of demand for both sides of the market. Part V reports estimation results and estimated elasticities. In Part VI, we turn to the hypothetical merger and present results from a concentration analysis, a

[29] Filistrucchi, Klein & Michielsen, *supra* note 22.

[30] Argentesi & Filistrucchi, *supra* note 1.

[31] Song also extends the framework used by Argentesi and Filistrucchi to two network effects and then uses it to analyze market power in the German TV magazine market. He estimates markups and shows that TV magazines typically set copy prices below marginal costs and earn profits from selling advertising pages. Minjae Song, *Estimating Platform Market Power in Two-Sided Markets with an Application to Magazine Advertising* (The Bradley Policy Research Center Financial Research and Policy, Working Paper No. FR 11-22, 2011), *available at* http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1908621; Argentesi & Filistrucchi, *supra* note 1.

[32] Patrick J.G. van Cayseele & Stijn Vanormelingen, *Prices and Network Effects in Two-Sided Markets: The Belgian Newspaper Industry* (Mimeographed, 2009), *available at* http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1404392.

[33] Przemyslaw Jeziorski, *Merger Enforcement in Two-Sided Markets* (Mimeographed, 2011), *available at* http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1700763.

[34] Fan, *supra* note 1.

[35] Filistrucchi, Klein & Michielsen, *supra* note 22.

[36] In practice, although in many circumstances it would probably be relevant, the assessment of unilateral merger effects does not tackle the issue of product repositioning or, if it does, the analysis is mainly qualitative.

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SSNIP-type test, UPP measures, and results from the full merger simulation. Part VII summarizes our findings and concludes.

II. DATA

Our most important data source on the readership side is yearly circulation data at the level of 512 municipalities, which we obtained from Cebuco. These are merged with data on subscription prices. We use subscription prices because unlike in other countries, almost all of the copies (91 percent according to our data) are sold in the form of subscriptions.

For the advertising side, we obtained quarterly data from Nielsen on the amount of advertising, which is measured in column millimeters, and the advertising revenues of each newspaper according to list prices. From these, we calculate the (weighted) average list price per column millimeter. Nielsen also provided us with data on the total number of pages of the newspapers, and information on the format, which is measured by the number of column millimeters per page.

We allow the demand for advertising in a newspaper to depend on the characteristics of the readers of this newspaper. For this, we obtained Nederlands Onderzoek Media (NOM) Print Monitor national level data on reach by age, gender, income, and wealth, being a breadwinner or not, shopping for groceries or not, as well as reach by region.[37]

The market size is given by the total population over thirteen years of age in the Netherlands. Data on this was provided by Statistics Netherlands (CBS). CBS also provided data on the consumer price index, which we use to express prices in year-2002 euros, and geographical data that we use in Figure 3 below.

III. THE DUTCH MARKET FOR DAILY NEWSPAPERS

The Dutch market for daily newspapers shows patterns that are typical for a newspaper market in the first decade of the 21st century. We have previously documented that in this period, real newspaper prices have increased, while at least some input prices such as wages and print costs have not.[38] Readership demand has decreased, which is most likely due to the increased availability of online news. Also, free newspapers have entered, but it is not clear whether this has caused a significant decrease in readership in the other daily newspapers. Finally, the total amount spent on advertising has remained constant.

[37] Reach differs from circulation in that reach is the number of people reading a newspaper, whereas circulation is the number of copies that are distributed. Circulation can be divided into paid and unpaid circulation. Most of the circulation is paid, and as already pointed out above, most of the paid circulation is paid subscriptions.

[38] Filistrucchi, Klein & Michielsen, *supra* note 22.

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To put our merger simulation in perspective, we describe the market in a bit more detail. There are eight important national newspapers, the Algemeen Dagblad, De Telegraaf, De Volkskrant, Het Financieele Dagblad, Het Parool, NRC Handelsblad, nrc.next, and Trouw. In addition, there are two important free newspapers, Metro since the second quarter of 1999 and Sp!ts since the fourth quarter of 2001.[39] They distribute a significant number of copies in public areas such as train stations.

In 2005, the Algemeen Dagblad merged with eight regional newspapers, and their editions were replaced by regional editions of the AlgemeenDagblad. Sixty-three percent of the shares of the newly formed AD NieuwsMedia were from then on owned by PCM and 37 percent by Wegener. The effects of this are shown in Figure 1 and Figure 2. In both sets of figures, the vertical bar indicates the time of the merger, and figures on the left refer to merging newspapers while those on the right refer to non-merging newspapers. The dotted lines, where present, refer to the sum of the values (for example, advertising revenues or subscription revenues) for the AlgemeenDagblad and for the eight regional newspapers before the merger. For the merging parties, Figure 1 shows that the average advertising price per reader increased after the merger, while advertising revenues stabilized. As shown in Figure 2, circulation continued to drop, but subscription prices stabilized after the merger.

Then, in 2009, PCM bought the remaining shares in AD NieuwsMedia from Wegener, and at the same time, De Persgroep Nederland—also owning de Volkskrant, NRC Handelsblad, nrc.next, Het Parool, and Trouw—bought 51 percent of PCM. This merger needed to be approved by the Dutch competition authority (NMa). The NMa imposed as a condition on De Persgroep Nederland to sell NRC Handelsblad and nrc.next. The reason for this was that otherwise, PCM would dominate the market for quality newspapers in Amsterdam, as it owns Het Parool, Trouw, and de Volkskrant.

In the merger simulation below, we first simulate the effect of this remedy; then we simulate the effect of a merger between NRC Handelsblad, nrc.next, and De Telegraaf, De Gooi- en Eemlander, Haarlems Dagblad, Leidsch Dagblad, and Noordhollands Dagblad.[40]

[39] We model them as part of the outside good when estimating readership demand and allow the value of the outside good to increase with time. Also, the increased value of not buying a newspaper and reading news online is captured by the dependence of the value of the outside good on time.

[40] Sp!ts is also part of the Telegraaf group, but we treat it as part of the outside good for the entire analysis. This is not likely to alter our conclusions on the readership side, as long as it remains a free newspaper. In Part IV.A, we explain our use of a model for the advertising side in which newspapers do not directly compete with one another. Given that we also use this model, conclusions for the advertising market are likely to be unaffected.

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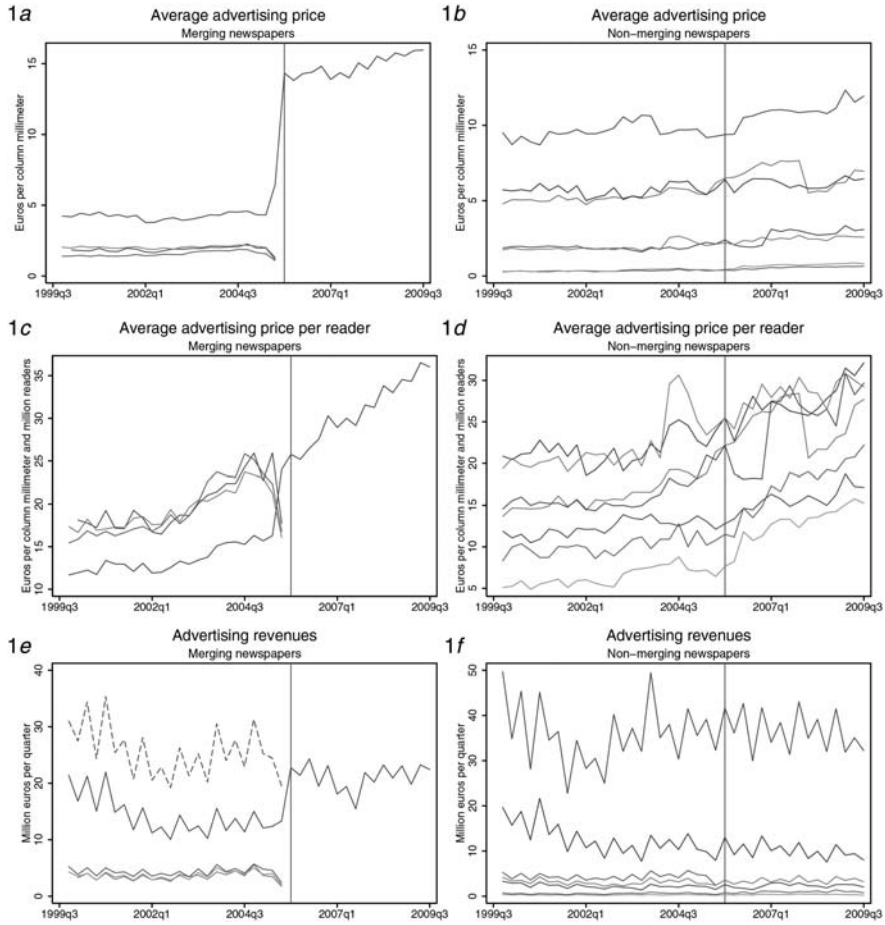


Figure 1. Effects of the 2005 merger: advertising side

IV. A MODEL OF DEMAND

As argued above, when predicting merger effects in a two-sided market, key inputs into the economic analysis are price elasticities and indirect network elasticities on each side of the market, or equivalently, diversion ratios.

Lacking other sources of information on diversion ratios, we proceed to estimate the responsiveness of readership demand to changes in newspaper prices and advertising intensity and the responsiveness of advertising demand to changes in advertising prices and the circulation of a newspaper.[41] To do so, we use a model of demand for differentiated products on

[41] An antitrust authority might instead have access to internal documents of the merging firms indicating how much of the loss in sales—that is due to a price increase that the firm has been considering—is expected to benefit rival products.

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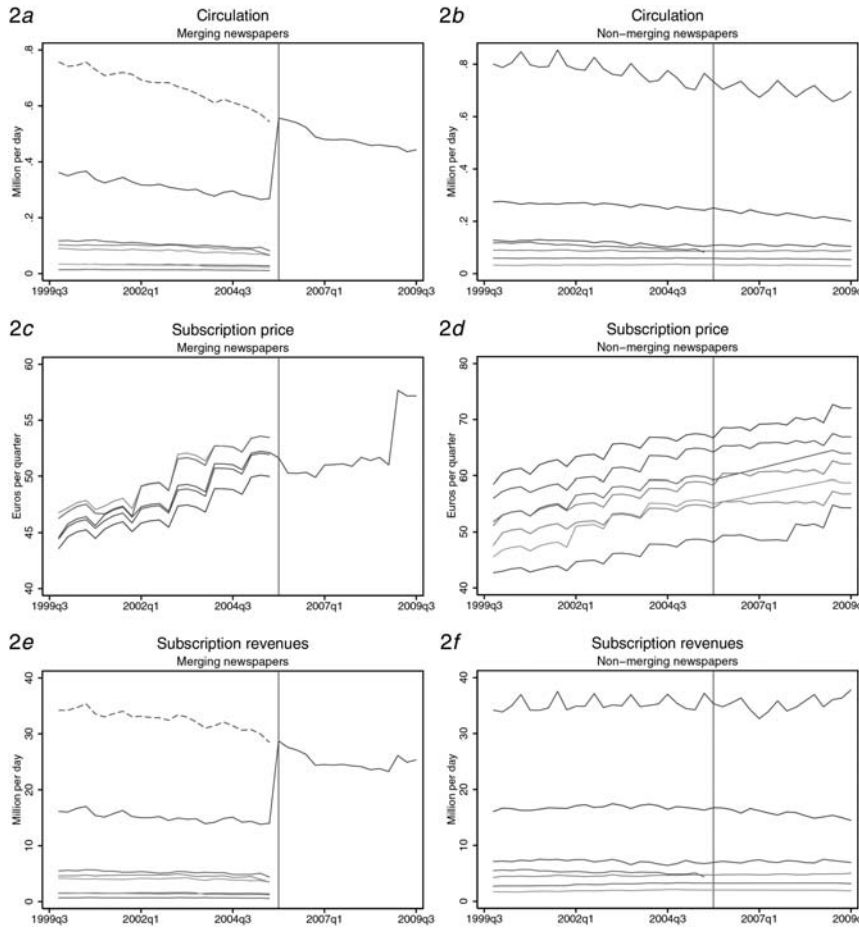


Figure 2. Effects of the 2005 merger: readership side

each side of the market. The next section introduces a model of advertising demand; the subsequent section then specifies a model of readership demand. Throughout, the superscript "a" stands for "advertising" (as in the *price* of advertising) and the superscript "r" stands for "readership" (as in the *cover price* of that newspaper).

A. Advertising Demand

We specify advertising demand to be linear in the log of the advertising price per reader. That is,

$$\log q_{jt}^{a} = \alpha^{a} \log\left(p_{jt}^{a}/q_{jt}^{r}\right) + \beta^{a} x_{jt}^{a} + \xi_{jt}^{a}, \tag{1}$$

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where q^a_{jt} is the quantity of advertising in newspaper j at time t, which is measured in column millimeters; p^a_{jt} is the advertising price per column millimeter; q^r_{jt} is the number of readers; and x^a_{jt} are characteristics of the newspapers from the point of view of advertisers, such as the demographics of readers of newspaper at time t. The term ξ^a_{jt} is a taste shock to advertising in newspaper j at time t.

Such a specification is natural in a model in which readers buy at most one newspaper and advertisers buy advertising slots from all platforms. It is similar to the specification proposed by Marc Rysman,[42] which is used also by van Cayseele and Vanormelingen[43] and Fan,[44] in that it assumes that there are no direct cross price effects and no direct network effects, so that the decision to advertise in a newspaper only depends on the costs and benefits of advertising in that newspaper and is independent of the decision to advertise in other newspapers. We follow their approaches in imposing that the reduced form is of the constant elasticity form and additionally assume that the network effect enters the demand function in such a way that it is the price per reader that matters to the advertisers. This is a common assumption in theoretical models of media markets, such as the model developed by Simon Anderson and Jean Gabszewicz.[45] It can also be justified by looking at the evolution of the average advertising price per reader for the merging parties around the time of the merger in Figure 1. For this specification, the elasticity of demand with respect to the advertising price per column millimeter is equal to α^a, and the elasticity with respect to the number of readers is given by the negative of that, $-\alpha^a$. From the obtained estimate of α^a , marginal effects can be calculated by multiplying it by q^a_{jt}/p^a_{jt} and $-q^a_{jt}/q^r_{jt}$, respectively.

We use an instrumental variables estimator and control for newspaper fixed effects and also control for quarter dummies in order to account for changes in overall demand for print advertising. These time effects could originate in the business cycle, to which advertising demand is in general linked, and the emergence of online advertising as a substitute for print advertising.

Our instrument is the total number of pages of content in the newspaper, which is related to the endogenous variable, p^a_{jt}/q^r_{jt}, through the increased value of the newspaper to readers, which translates into an increased circulation. It is unrelated to advertising demand if newspaper companies decide on this without knowing the realization of ε^a_{jt}, which is plausible, as we already control for time effects and newspaper fixed effects. Put differently,

[42] Marc Rysman, *Competition Between Networks: A Study of the Market for Yellow Pages*, 71 REV. ECON. STUD. 483 (2004).
[43] Van Cayseele & Vanormelingen, *supra* note 32.
[44] Fan, *supra* note 1.
[45] Anderson & Gabzsewicz, *supra* note 1.

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we assume that advertising demand depends on the number of content pages only through the price advertisers pay per reader. Then, the instrument is valid.

B. Readership Demand

On the readership side, we estimate a Berry[46] type market level logit model of demand for newspapers. However, departing from the usual practice, we do so at the municipality level. The advantage of this is that the substitution patterns that are implied for the national level are much more realistic. This is because we add up cross effects over municipalities. If, for example, two regional level newspapers never compete because there is no municipality in which both are available, then added-up cross effects will be zero, whereas they will not if we use national level data with a standard logit model. In the following, however, we suppress the municipality subscript, m, for ease of the exposition.

We assume the potential market size to be the population above thirteen years of age and that each consumer buys at most one newspaper. The utility from buying a newspaper depends on the price of that newspaper and the amount of advertising in that newspaper, among other things. Formally, the utility of consumer i from buying newspaper j in t is given by

$$u^r_{ijt} = \alpha^r p^r_{jt} + \beta^r q^a_{jt} + \gamma^r x^r_{jt} + \xi^r_{jt} + \varepsilon^r_{ijt},$$

where p^r_{jt} is the price of the newspaper, q^a_{jt} is the amount of advertising content in the newspaper, x^r_{jt} are other characteristics of the newspaper such as its format and size, ξ^r_{jt} captures unobserved characteristics, and ε^r_{ijt} is the part of the utility derived from buying newspaper j that is specific to individual i at time t. We assume that ε^r_{ijt} is distributed according to the type 1 extreme value distribution and independently across j and t. Individuals buy one newspaper or choose the outside good, $j = 0$, buying no newspaper, which yields average utility 0 so that $u^r_{i0t} = \varepsilon^r_{i0t}$.

Under these assumptions, the market share of newspaper j at time t is given by

$$s^r_{jt} = \frac{\exp\left(\alpha^r p^r_{jt} + \beta^r q^a_{jt} + \gamma^r x^r_{jt} + \xi^r_{jt}\right)}{1 + \sum_{l=1}^{\mathcal{J}} \exp\left(\alpha^r p^r_{lt} + \beta^r q^a_{lt} + \gamma^r x^r_{lt} + \xi^r_{t}\right)}. \tag{2}$$

[46] Steven T. Berry, *Estimating Discrete-Choice Models of Product Differentiation*, 25 RAND J. ECON. 242 (1994).

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Similarly, for the outside good, we have

$$s_{0t}^{r} = \frac{1}{1 + \sum_{l=1}^{J} \exp\left(\alpha^{r} p_{lt}^{r} + \beta^{r} q_{lt}^{a} + \gamma^{r} x_{lt}^{r} + \xi_{t}^{r}\right)}. \tag{3}$$

From equations (2) and (3), based on Berry's method,[47] we obtain the estimation equation

$$\log\left(s_{jt}^{r}\right) - \log\left(s_{0t}^{r}\right) = \alpha^{r} p_{jt}^{r} + \beta^{r} q_{jt}^{a} + \gamma^{r} x_{jt}^{r} + \xi_{jt}^{r},$$

in which the difference between the natural logarithm of the market share of good j and the natural logarithm of the market share of the outside good is equal to the utility from observed characteristics p_{jt}^{r} and q_{jt}^{a}, and unobserved characteristic ξ_{jt}^{r}. The left-hand side of this equation is observed because s_{jt}^{r} and s_{0t}^{r} are observed, and the coefficients α^{r}, β^{r}, and γ^{r} can be consistently estimated if ξ_{jt}^{r} is uncorrelated with p_{jt}^{r} and q_{jt}^{a}. For this to be plausible, we control for a flexible time trend by means of year dummies to capture the increased importance of outside options such as online news and free newspapers, and also control for newspaper-region fixed effects.[48] It is important to allow for different fixed effects per region, as a national level newspaper with a focus on Amsterdam, such as Het Parool, will be valued differently, on average, in the region around Amsterdam, as opposed to in the south of the country. To summarize, we assume that price changes and changes in the amount of advertising are not related to ξ_{jt}^{r} once we control for newspaper-region fixed effects and a flexible time trend. Then, the price coefficient and the coefficient on the amount of advertising are identified from differences (across newspapers) in changes in newspaper prices and amounts of advertising (over time).

From the estimates of α^{r} and β^{r}, and using the observed market shares, we can calculate the responsiveness of readership demand with respect to own prices,

$$\frac{\partial s_{jt}^{r}}{\partial p_{jt}^{r}} = s_{jt}^{r}\left(1 - s_{jt}^{r}\right)\alpha^{r},$$

prices of other newspapers,

$$\frac{\partial s_{jt}^{r}}{\partial p_{kt}^{r}} = -s_{jt}^{r} s_{kt}^{r} \alpha^{r},$$

[47] Berry, *supra* note 46.

[48] There are five regions with on average about 3 million people living in each region. These regions are reasonably small in terms of geographical distance.

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own advertising,

$$\frac{\partial s^r_{jt}}{\partial q^a_{jt}} = s^r_{jt}\left(1 - s^r_{jt}\right)\beta^r,$$

and advertising in other newspapers,

$$\frac{\partial s^r_{jt}}{\partial q^a_{kt}} = -s^r_{jt}s^r_{kt}\beta^r.$$

At this point, it is important to notice that these marginal effects do not take into account the feedbacks from one side of the market to the other. For instance, the own price effect on the readers side is the change in readership that directly follows from an increase in the subscription price, holding the advertising quantity constant. However, as argued above, the decline in sales due to the increase in the cover price is likely to lead to a decline in the number of advertisements sold (and/or in the advertising prices), which in turn affects circulation, and so on. Whereas the direct effects above do not take these feedbacks into account, the total effects and the total elasticities would take them into account. In order to recover these total effects—that is, those that account for all feedbacks—one needs to apply the implicit function theorem to the system of estimated equations, as shown by Filistrucchi, Klein, and Michielsen.[49] Then, the total elasticities will be functions of the direct elasticities and thus indirectly, once again, of the estimated parameters α^r, β^r, and γ^r, and of the observed market shares and prices.

V. ESTIMATION RESULTS AND ESTIMATED ELASTICITIES

We now present our demand parameter estimates, on which we base our subsequent analysis. We start with the advertising demand parameters in Table 1, only reporting the coefficient on the log price per reader that was denoted by α^a in Part IV.A.

There are four specifications that differ by the variables included in x^a_{jt}. We do not include any variables in specification (1); we control for age categories and gender in specification (2); we additionally control for income and wealth categories as well as the fraction of breadwinners and people shopping for groceries among the readers in specification (3); and we additionally control for region in specification (4). Throughout, we control for newspaper fixed effects and quarter dummies. The number of observations decreases the more variables we include because there are missing values for

[49] Filistrucchi, Klein & Michielsen, *supra* note 22. Such a numerical approach is also used by Song, *supra* note 31.

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Table 1. Advertising demand parameter estimates

	(1)	(2)	(3)	(4)
log price per reader	−0.702	−0.636	−0.617	−0.738
	(0.085)	(0.092)	(0.138)	(0.147)
age and gender	No	Yes	Yes	Yes
income and wealth	No	No	Yes	Yes
region	No	No	No	Yes
obs.	1051	858	732	732

Note: This table shows instrumental variables estimates from a regression of the natural logarithm of the column millimeters of advertising sold per quarter on the natural logarithm of the price of advertising per reader. Standard errors are shown in parentheses. Throughout, we control for newspaper fixed effects and quarter dummies. Controlling for income and wealth includes controlling for the fraction of individuals who are breadwinners and the fraction of individuals who go shopping for groceries. We use the number of total pages of content in the newspaper as an instrument.

Table 2. Readership demand parameter estimates

	Estimate	Standard Error
subscription price per year	−0.00771	0.00014
millimeters of advertising	0.00918	0.00117
size	0.00264	0.00021
small format	0.08838	0.00346

Note: Municipality level logit estimates. We report coefficient estimates and corresponding standard errors. The number of observations is 31,282. The subscription price per year is measured in 2002 euros. Millimeters of advertising are measured in million column millimeters, and size is measured in billion column millimeters. A newspaper is of a small format if it has less than 2800 column-millimeters per page. We also include a full set of year dummies and region-paper fixed effects.

some of these added variables. The instrumental variables estimates of α^a are remarkably stable across specifications, and we estimate the elasticity of advertising demand with respect to the price per reader to be about −0.7.[50]

Table 2 contains readership demand parameter estimates. We estimate mean utility to decrease significantly in the subscription price and to increase in the amount of advertising and the amount of content in the newspaper. We also estimate that readers value newspapers to be of small format. Following the approach of Filistrucchi, Klein, and Michielsen,[51] we calculate the implied marginal effects and elasticities from the model. The average own-price elasticity is about −1.75, and the average advertising

[50] The corresponding first stage *F*-statistics for the four specifications were 204, 136, 59, and 56, respectively. The fixed-effects estimate (without instrumenting) of the elasticity of advertising demand with respect to the price per reader is −0.143, with a standard error of 0.030. Such an upward bias arises because of a positive correlation between p^a_{jt} and ξ^a_{jt}.

[51] Filistrucchi, Klein & Michielsen, *supra* note 22.

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elasticity is about 0.05. This means that readers are on average advertising-loving, but this is not very pronounced. This is plausible, as the percentage of advertising content is relatively low and readers have the possibility to skip advertisements if they do not find them interesting, unlike when watching a movie on TV, and some advertisements may be informative and hence valued by readers.

VI. A HYPOTHETICAL MERGER

From the point of view of economics, the correct way to evaluate whether a merger is likely to raise concerns with respect to unilateral effects is to specify a model of the market in question, estimate demand in order to recover values for the parameters of the model, and then use the model and the estimated parameters to predict the price chosen by the firms after the merger. One can then compare the prices, consumer surplus, and total welfare in the new equilibrium with those in the old equilibrium. If correctly undertaken, this method is rigorous, as it involves making all the assumptions underlying the analysis explicit and stating all the limitations of the data; and ideally, it allows the reader to evaluate the robustness of the results. In Part VI.D, we show the results of such a full merger simulation.

Merger simulation can be very time consuming. As a result, it is often not performed in practice. In fact, in many cases, a SSNIP-type test is used to predict the effects of a merger. As suggested by its name, such a test is used to measure the likelihood of a small but significant non-transitory increase in price by the merging parties. Instead of simulating—as in market definition—the effects of a given price increase by a hypothetical monopolist above the current (competitive) level, practitioners simulate the effects of a given price increase above the current level by the merging parties, assuming rivals do not change their prices, and check whether that price increase is profitable or not.[52] Clearly, the simplification of the SSNIP test comes at the cost of the assumption that rivals' prices remain unchanged after the merger.

Farrell and Shapiro propose instead to measure the UPP that is due to a merger, allowing for threshold levels of efficiency gains with various levels of precision.[53] Their approach and the SSNIP-type test have in common the assumption that rivals do not react to price changes of the merging firms.

[52] This is the test in the European Union. In the United States, the formulas are often used to calculate the optimal price increase above the current level by the merging parties keeping rivals' prices constant. Both in the European Union and in the United States, the test is often performed by using critical loss analysis and critical elasticity analysis formulas derived under the assumption of constant marginal costs and either linear or iso-elastic demand. As with market definition, the difference between the SSNIP and the hypothetical monopolist tests appears to be very small at first sight, and it is a matter of debate whether this difference is relevant in practice. In Part VI.C, we present results from both versions of the test.

[53] Farrell & Shapiro, *supra* note 17.

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Farrell and Shapiro's proposal has been incorporated into the 2010 U.S. merger guidelines. While they derived formulas to measure UPP when firms compete under Bertrand competition, Jaffe and Weyl generalize the concept to other forms of competition and argue that it can be used as a first order approximation to merger effects.[54] In Part VI.B, we present results from a two-sided market extension of the UPP measure of Farrell and Shapiro.

According to the EU merger guidelines, and up to the most recent version of the U.S. ones, a first screening of mergers is based on the expected change in concentration in the relevant market. Although requiring market definition as a previous step in the analysis, such an assessment is *per se* the quickest and easiest one. It is well known, however, that the relationship between market power as measured by the Lerner index and the HHI index holds perfectly only in the case of Cournot competition with homogeneous products. Thus, once again, from a theoretical point of view, simplicity comes at the cost of assumptions that are unrealistic in many contexts. We perform a market concentration analysis in Part VI.A.

In this article, we apply the methods above to assess the effects of a hypothetical merger between NRC Handelsblad (NRC) and nrc.next (NRN) on the one hand, and De Telegraaf (TEL), Gooi- en Eemlander (GOO), Haarlems Dagblad (HAR), Leidsch Dagblad (LEI), and Noordhollands Dagblad (NOR) on the other hand.[55] We assess the merger as if it were to take place in 2009 and use the market shares, market sizes, prices, and ownership structure of 2009 as the pre-merger situation.

We do so in the context of the demand model we described in Part IV and using the estimated parameters reported in Part V. Specifically, following the method of Filistrucchi, Klein, and Michielsen,[56] we first recover marginal costs that would rationalize observed behavior of profit-maximizing firms that compete in prices with differentiated products on each side of the market. This involves first finding the derivatives of both demands with respect to prices on all sides of the market in order to write the first order conditions, then inverting the set of first order conditions, one for each newspaper and each price, taking the ownership structure in the industry into account. We find margins to be about 60 percent on the readership side and 40 percent on the advertising side. This is somewhat different from the models of Kaiser and Wright[57] and Song,[58] who find negative margins on the readers' side for German magazines. As explained in Part III above, we first simulate the equilibrium in what we take as the initial situation in which NRC and nrc.next become independent after having belonged to De Persgroep.

[54] Jaffe & Weyl, *supra* note 19.
[55] The abbreviations in parentheses are used in Table 3 below.
[56] Filistrucchi, Klein & Michielsen, *supra* note 22.
[57] Kaiser & Wright, *supra* note 1.
[58] Song, *supra* note 31.

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In each of the following four subsections, we present the application of one of the four methods to the assessment of the unilateral effects that were described above. We proceed in increasing order of complexity.

A. Herfindahl-Hirschmann Index

One of the most common ways to assess market power is to use the HHI, which is given by the sum of the squared market shares in a market, multiplied by 10,000. On the advertising side, assuming the relevant product market is the one for advertising in paid daily newspapers in Dutch (thus excluding free newspapers) and the relevant geographic market is the national one, the pre-merger HHI is 2,174 and the post-merger one is 2,366, which means that the expected change due to the merger is ΔHHI of 192 an 8 per cent increase on the pre-merger value.[59]

Likewise, on the readership side, assuming the relevant product market is the one for copies of paid daily newspapers in Dutch (once more excluding the free press) and the relevant geographic market is the whole of the Netherlands, the pre-merger HHI is 2,571, the post-merger one is 3,099, and hence ΔHHI is 528 (a 20 per cent increase on the pre-merger value).[60] Applying the thresholds of the EU merger guidelines the merger would thus be investigated.

One of the major criticisms against the use of the HHI in screening mergers is that it is highly dependent on the definition of the relevant market.[61] In fact, the above conclusions regarding the readership side may change drastically if we define the relevant geographic markets to be municipalities. In our case, the post-merger HHI and the ΔHHI calculated at the municipality level would also lead the merger to be scrutinized because of concerns about unilateral effects in many of the municipalities. This is

[59] Here and in the following, we first aggregate the market shares by newspaper company, then square them, and finally add them up. This process is necessary, as newspaper publishing companies are multi-product firms.

[60] Absent a price, we do not have a straightforward way to estimate cross-price elasticities or diversion ratios for the free press. Therefore, even though it is straightforward to calculate HHIs without doing so, we prefer to abstract from them also in this part in order to be consistent in our comparison of the different methods for assessing unilateral effects.

[61] *See* Lapo Filistrucchi, *A SSNIP Test for Two-Sided Markets* (NET Institute, Working Paper No. 08-34, 2008), *available at* http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1287442; Filistrucchi, van Damme & Affeldt, *supra* note 5, for a discussion of the correct SSNIP test for market definition in a two-sided market. While the former also presents the correct formulas for critical loss analysis in a two-sided non-transaction market, the latter compares the theory to the practice of market definition in two-sided markets. Alexei Alexandrov, George Deltas & Daniel F. Spulber, *Antitrust and Competiton in Two-Sided Markets*, 7 J. COMPETITION L. & ECON. 775 (2011), instead extend critical loss analysis to two-sided transaction markets. Their results support an idea proposed for payment cards by Eric Emch & T. Scott Thomson, *Market Definition and Market Power in Payment Card Networks*, 5 REV. NETWORK ECON. art. 4 (2006).

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Figure 3. Municipalities in which a merger would be scrutinized

because many newspapers are regional and therefore, at the municipality level, concentration is much higher, as indicated by a pre- and post-merger HHI of more than 5,000 on average. At the same time, the change in concentration due to the merger would be considerably higher. Figure 3 shows a map of the Netherlands, where we indicate in which municipalities the merger would be scrutinized if the relevant geographic markets were to be defined as the municipalities.

In addition to the problem of finding an appropriate definition of the geographical market, the use of the HHI leads to another potential fallacy in a two-sided market, namely the failure to account for the existence of indirect network effects. If these network effects are strong enough, then the conclusions drawn from looking at concentration on each side of the market might be wrong even if the market definitions on both sides of the market are the correct ones. Although a two-sided market is not a market for complementary products, the case is similar to that made by Weisman[62] and Tardiff and

[62] Dennis L. Weisman, *Assessing Market Power: The Trade-Off Between Market Concentration and Multi-Market Participation*, 1 J. COMPETITION L. & ECON. 339 (2005).

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Weisman,[63] who show that traditional market power measures, such as the HHI, often used also in merger evaluation, are biased under the conditions of multi-market participation and demand interdependence.[64] In particular, when complementarity in demands dominates, traditional market power measures are upward-biased.

B. Upward Pricing Pressure

UPP is a more refined measure of unilateral effects. It was proposed by Farrell and Shapiro[65] and measures the tendency of the merging firms to raise prices due to the merger. The underlying idea is that if two firms merge, they have lesser restraints on raising prices because part of the sales they would lose when increasing prices would go to the product of the other firm with which they have now merged. Clearly, provided that the products of merging parties are substitutes, UPP is always positive (assuming the merging firms were not colluding). For this reason, if one wants to use it to screen mergers, one must establish a benchmark. Farrell and Shapiro therefore propose to give an efficiency credit of 5 or 10 percent to the merging firms, and they show how this can be done in different ways.

In the following, we allow only for a direct effect of the efficiency gains. Then, extending the logic of Farrel and Shapiro to a two-sided market,[66] the UPP formula for two multi-product firms j and k that compete under Bertrand competition with differentiated products is

$$UPP^{a}_{kj} = D^{aa}_{kj}\left(p^{a}_{j} - mc^{a}_{j}\right) + D^{ar}_{kj}\left(p^{r}_{j} - mc^{r}_{j}\right) - e^{a}_{k}mc^{a}_{k} \tag{4}$$

for the advertising side and

$$UPP^{r}_{kj} = D^{ra}_{kj}\left(p^{a}_{j} - mc^{a}_{j}\right) + D^{rr}_{kj}\left(p^{r}_{j} - mc^{r}_{j}\right) - e^{r}_{k}mc^{r}_{k} \tag{5}$$

for the readership side. Here, p^{a}_{j} is the vector of advertising prices and mc^{a}_{j} is the vector of marginal costs of firm j on the advertising side. The terms e^{a}_{k} and e^{r}_{k} are the percentage efficiency credits given to the products of firm k, on the advertisers' and the readers' sides, respectively. The term D^{aa}_{kj} is the

[63] Timothy J. Tardiff & Dennis L. Weisman, *The Dominant Firm Revisited*, 5 J. COMPETITION L. & ECON. 517 (2009).

[64] Importantly, in a two-sided market, the buyers on each side of the market are different, while in a market for complementary products, buyers may buy all products. As such, in a market for complementary products, buyers internalize, to some extent at least, the link between demands. In a two-sided market, they do not.

[65] Farrell & Shapiro, *supra* note 17.

[66] *See* Pauline Affeldt, Lapo Filistrucchi & Tobias J. Klein, *Upward Pricing Pressure in Two-Sided Markets* (Mimeographed, 2012), for a discussion of UPP in two-sided markets and the derivation of the formulas.

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Table 3. Upward pricing pressure

	Advertising Price			Readership Price		
	one-s. UPP	**two-s. UPP**	**eff. credit**	**one-s. UPP**	**two-s. UPP**	**eff. credit**
GOO	0.00	8.18	−0.02	7.93	8.19	−4.71
HAR	0.00	7.11	−0.04	6.90	7.12	−4.52
LEI	0.00	5.83	−0.05	5.66	5.85	−4.52
NOR	0.00	2.79	−0.08	2.72	2.81	−4.35
TEL	0.00	3.71	−0.38	3.62	3.77	−5.49
NRC	0.00	11.23	−0.21	10.57	11.69	−8.84
NRN	0.00	9.97	−0.11	9.39	10.63	−2.62

Note: This table shows one-sided (one-s.) and two-sided (two-s.) UPP measures as defined in the text, as well as corresponding efficiency credits (eff. credit), which are given by 5% of the corresponding marginal costs of selling one additional column millimeter of advertising or newspaper subscription. All but the last two newspapers belong to the Telegraaf group, which is assumed to be merging with the NRC group consisting of the last two newspapers. The initial ownership structure and the full names of the newspapers are listed in the notes to Table A1.

matrix containing diversion ratios when firm k increases the advertising prices, and we look at the effect of this on advertising demand of firm j, hence the subscripts and superscripts. This matrix can be calculated from the estimated price effects by pre-multiplying the matrix derivatives of advertising demand of firm j with respect to advertising prices of firm k by the negative of the inverse of the matrix of derivatives of advertising quantities of firm k with respect to advertising prices of firm k. The other diversion ratios can be calculated accordingly. This yields a set of numbers, one for each newspaper and each market side.

Table 3 shows UPP measures gross of the granted efficiency gains, and separately efficiency credits of 5 percent. If the sum of the UPP measure and the efficiency gain—sometimes termed net UPP—is positive, then prices are predicted to increase. The one-sided UPP measures are the ones proposed by Farrell and Shapiro.[67] They ignore the second term on the right-hand side of equation (4) and the first term on the right-hand side of equation (5).

Turning first to the advertising side, no gross UPP is found. This is because each newspaper's advertising demand does not depend on the prices for advertising in other newspapers and here, network effects are not taken into account. Looking only at those measures, one would therefore tend to conclude that the merger does not raise concerns with respect to unilateral effects on the advertising side. However, once we take into account that advertising has an effect on newspaper readership, we find that the merger would lead to UPP also in the advertising market. This can be seen in the second column. This means that we find that the merger does

[67] Farrell & Shapiro, *supra* note 17.

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also raise concerns in the advertising market once we take the two-sided nature of the market into account. Put differently, analyzing only the advertising side of the market, disregarding the readers' side, would lead to a wrong decision in favor of the merging parties.

On the readership side, once one allows for an efficiency credit of 5 percent, net UPP is negative for some newspapers (De Telegraaf, TEL, and Noordhollands Dagblad, NOR), meaning that these newspapers would be expected to lower their prices following the merger. Since the network effect on the readership side is relatively small, this is the case irrespective of whether or not we take the network effect into account.

Generally, comparing the first to the second and the fourth to the fifth column shows that accounting for the two-sided nature of the market always increases UPP. Intuitively, this is because the network effects on both market sides are positive.

C. SSNIP Test

SSNIP stands for "small but significant non-transitory increase in price." The SSNIP test was originally designed to define the relevant market, but it is often used to measure the likelihood of a substantial non-transitory increase in prices by the merged firm. For this, one simulates the effects of a price increase of 5 or 10 percent above the current level by the merging parties, assuming that rivals do not change their prices. Then, one checks whether this price increase is profitable or not. If it is, it is said to be likely to take place.

In the following, we use the extension of the SSNIP test to two-sided markets that Filistrucchi develops for market definition.[68] Separately for each side of the market, the SSNIP test asks whether an increase of the prices set by the merging parties, by 5 percent, is profitable, assuming that rivals keep their prices unchanged. The difference between the test we conduct here and the standard SSNIP test is that it is modified in a way so

[68] Filistrucchi, *supra* note 61. As discussed in *NMa Report*, *supra* note 15, when using the SSNIP approach to assess the likelihood of a price increase post-merger in a two-sided market, similar issues as discussed in Filistrucchi for market definition arise, as one needs to decide which price the merged parties should be raising and whether to assess profitability by taking into account only profits on one side or on both sides of the market. In a two-sided market, in order to correctly assess the competitive constraints faced by the merged firm and therefore the profitability of a price increase, one should take both sides of the market into account. The risk of applying a test that does not account for feedback effects is that in such cases the merger will be found to be anticompetitive even if, according to the same standards used in a single-sided market, it should not. In addition, as explained in *NMa Report*, in a non-transaction market such as the newspapers one, the test should be implemented by first raising the price on one side of the market and then the price on the other side of the market. The reason is that the two markets are in fact interrelated and one needs to assess the competitive constraints faced by the merged firm on each of them. Filistrucchi, *supra* note 61; *NMa Report*, *supra* note 15.

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that it accounts for the presence of the indirect network effects. This change is important because otherwise, we would not correctly assess the profitability of such a price increase. For instance, when assessing whether an increase in the subscription price of a newspaper leads to a loss in profits, one does not only need to assess whether a higher cover price will lead to lower demand and profits from the readership side, but also whether the lower number of readers will lead to lower demand and therefore lower profits on the advertising side. On top of that, if readers appreciate advertising, then the lower number of advertisements will lead to an additional loss in demand on the readers' side and so on and so forth. In fact, positive indirect network effects between the different sides of the platform reduce the profitability of any price increase.

There is a U.S. and an EU version of the SSNIP test, and we implement both. For the EU version, we implement it either allowing or not allowing the merged firm to adjust the price optimally on the advertising side when the cover price is raised.[69] Throughout, we present the most complete version of the test, using the profit functions to numerically find optimal prices given the prices of the rivals and possibly own prices on one side of the market.[70] As a result, the only difference with respect to the full merger simulation is not allowing rivals to react to the price increase.

Table 4 shows results for different versions of the SSNIP test. It reports (simulated) advertising tariffs, subscription prices, and profit changes in percentage terms. The first row refers to the initial situation, the last row refers to the U.S. test. Rows two to five refer to two different versions of the EU test (with and without optimal adjustment of the price structure, respectively), conducted separately for each market (advertising and readership). As shown in row six, performing the U.S. version of the SSNIP test to assess the merger would not lead to the merger raising competitive concerns in the readers' market (as average post-merger optimal prices are lower), but it would in the advertising market (as the optimal price increase exceeds 5 percent on

[69] *NMa Report*, *supra* note 15, argues that, whereas in the case of market definition the test should be conducted by allowing the monopolist to adjust the price structure optimally, in the assessment of the merger effects, the issue is somewhat less important from a theoretical point of view. The reason is that in a two-sided market, the SSNIP test suffers from the same restrictive assumptions regarding rivals' behavior that we already highlighted for a single-sided market. If one does not allow the merged firm to adjust the price structure optimally, as proposed by Evans & Noel, *supra* note 27, for market definition, then the profitability of the increase in prices would be lower, as the optimal adjustment reduces the loss in profits due to the increase in prices. Since accounting for rivals' reactions will in general tend to increase the profitability of the increase in prices, it is not *a priori* clear which one of the two effects prevails.

[70] We constrain the merged firm to set prices that are not negative and that do not exceed twice the prices we observe in our original data. In practice, both in the European Union and in the United States, the test is often conducted using formulas derived under the assumption of constant marginal costs and either linear or iso-elastic demand. *See* Filistrucchi, *supra* note 61, for a discussion of these formulas and their extension to two-sided markets.

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Table 4. SSNIP test

	Average p^a	Average p^r	Profit Change
initial situation	4.42	244.14	0.00
5% increase in p^a, no adjustment of p^r	4.64	244.14	3.05
5% increase in p^r, no adjustment of p^a	4.42	256.35	−2.43
5% increase in p^a, optimal adjustment of p^r	4.64	196.37	8.94
5% increase in p^r, optimal adjustment of p^a	8.83	256.35	35.36
optimal adjustment of both prices	8.83	157.34	61.99

Note: This table shows results of different variants of the SSNIP test. These are average prices and profit changes when only the merging parties adjust prices. Profit changes are in percentages.

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average). Consistent with our theoretical discussion, comparing the second row to the fourth and the third row to the fifth shows that allowing the firms to optimally adjust prices on the other side of the market indeed increases profitability of the increase in price. In addition, a comparison of row one to rows four and five shows that the merged firm would increase prices on the advertising side of the market as well when exogenously forced to raise prices on the reader side of the market by 5 percent, while the merged firm would want to lower the cover price when forced to raise the advertising tariff by 5 percent. The latter result moves in the same direction of the U.S. test.

Overall, results from the SSNIP-type test suggest that the merger raises concerns of unilateral effects mainly on the advertising side of the market, contrary to what is predicted by an HHI analysis but consistent with the UPP analysis.

D. Full Merger Simulation with Welfare Analysis

From an economics point of view, the correct way to evaluate whether a merger is likely to lead to higher prices is to specify a model of the market in question, estimate demand in order to recover values for the parameters of the model, and then use the model and the estimated parameters to predict the price chosen by the firms after the merger. If cost data are not available, it is possible to recover estimates for them from the first order conditions of a model, as first proposed by James Rosse,[71] and use these estimates to predict the post-merger prices. For this, one numerically solves for the new prices for which the first order conditions are satisfied under the new ownership structure, assuming that marginal costs stay the same. One can then compare the prices, consumer surplus, and/or total welfare in the new

[71] James N. Rosse, *Estimating Cost Functions Parameters Without Using Cost Data: Illustrated Methodology*, 38 ECONOMETRICA 255 (1970).

Table 5. Effects of the hypothetical merger

	Merged	Not Merged
advertising price	0.000	0.000
column millimeters sold	−1.713	0.063
subscription price	1.524	0.052
circulation	−2.430	0.090
advertising profits	−1.713	0.063
readership profits	0.076	0.180
total profits	−0.604	0.135

Note: This table shows unweighted average effects of the merger between the NRC Handelsblad, nrc.next and the Telegraaf group. Numbers are percentage changes.

equilibrium with those in the old equilibrium. Here, one can either assume that there are no efficiency gains, or one can allow for efficiency gains.[72] Alternatively, one can estimate the size of the (productive) efficiency gains necessary to counter-balance the post-merger tendency to increase prices and to leave consumer surplus unchanged.

In a two-sided market, assuming firms set prices on each side of the market and demands are inter-dependent, all of the above is possible, but there are additional technical complications involved, due to the presence of two indirect network effects. Filistrucchi, Klein, and Michielsen discuss this at length.[73] Under some regularity conditions on the demand function and on the size of the network effects, it is possible to simulate the new equilibrium.[74]

Here, we use their framework to recover marginal costs, simulate the new equilibrium, and predict the unilateral effects of the hypothetical merger above. Table 5 summarizes the estimated effects of the merger on average prices, average quantities, and profits. More detailed results are presented in Tables A1, A2, and A3 in the Appendix. Table 5 shows that advertising prices would not be affected by the merger, which is a result of our specification of advertising demand, while subscription prices would rise by

[72] In order to calculate the change in consumer welfare, one needs to assume that marginal costs are unchanged or that they change by a given percentage. To evaluate instead the change in total welfare, one needs to calculate the change in firm profits due to the merger, under the additional assumption that fixed costs remain unchanged also or that they too changed by a fixed percentage. In fact, to the extent that a competition authority has a consumer-welfare standard, the second assumption may not be necessary.

[73] Filistrucchi, Klein & Michielsen, *supra* note 22.

[74] As an alternative to the necessary assumptions on the demand function, White and Weyl propose a refinement of Nash equilibrium, insulating tariffs. It guarantees the existence and uniqueness of an equilibrium. In their setting, firms do not choose prices but commit to a price schedule, whereby prices on one side of the market depend on participation in each and every platform on the other side of the market. Alexander White & Glen Weyl, Insulated Platform Competition (NET Institute, Working Paper No. 10-17, 2011), *available at* http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1694317.

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Table 6. Welfare

	Advertisers	Readers
ownership as at the end of 2009	−21.03	111.60
as before, only NRC and NRN independently owned	0.00	111.94
as before, but NRC and NRN joined Telegraaf group	−33.63	111.64

Note: This table shows advertiser and reader welfare for different ownership combinations. The former is relative to the situation at the end of 2009, but with NRC and NRN independently owned. Both are measured in euros per year and reader. NRC stands for NRC Handelsblad, and NRN stands for nrc.next.

1.5 percent.[75] As a result, circulation would decline by 2.4 percent, which in turn would lower advertising demand by 1.7 percent.[76] Overall, advertising profits would decline by 1.7 percent, while subscription profits would only marginally increase.[77] The merging parties would even lose in terms of profits, while outsiders would marginally gain.[78]

Finally, Table 6 shows the effects of the merger on advertiser and reader welfare. For the former, we report the sum of the welfare changes, over all newspapers, relative to the situation at the end of 2009, but with NRC and NRN being independently owned, which is our baseline. This sum of changes is given by the negative of the sum of the integral over the demand functions (1), where the integral is taken from the advertising price per reader under the respective ownership situations to the advertising price per reader in the baseline situation.[79] For the readers, we report average welfare per person over 13 years of age and per year, as implied by the estimated price coefficient and the well-known log-sum welfare formula for the logit model.

[75] Intuitively, the assumption of no direct cross-price effects on the advertising side implies that there are no price effects that could be internalized in addition by the merging parties. At the same time, changes in the optimal subscription prices will affect circulation, and this will shift the advertising demand, but because of the constant elasticity specification for advertising demand, it is the case that advertising prices will be unaffected by those shifts in demand, unless there are efficiency gains from the merger on the advertising side. Note, however, that advertising prices per reader will change.

[76] We assume here that platforms do not bundle advertising slots on the newspapers they own, neither before nor after the merger. *See NMa Report*, *supra* note 15, for a discussion of how bundling may affect the welfare effects of a merger among two-sided platforms.

[77] Note that the decline in advertising demand and therefore in advertising profits would not take place in the absence of an indirect network effect from readers to advertisers.

[78] This finding is reminiscent of the results of Salant, Switzer, and Reynolds for a Cournot oligopoly with homogeneous products. Here, however, firms set prices. Stephen W. Salant, Sheldon Switzer & Robert J. Reynolds, *Losses from Horizontal Merger: The Effects of an Exogenous Change in Industry Structure on Cournot-Nash Equilibrium*, 98 Q.J. ECON. 185 (1983).

[79] We do not report absolute levels of welfare here because the area under the demand function is not finite.

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The table shows that readers' welfare is almost unaffected by the hypothetical merger. Overall, results from full merger simulation suggest, contrary to what is predicted by an HHI analysis but consistent with a UPP analysis and a SSNIP-type test, that the merger raises concerns of unilateral effects mainly on the advertising side of the market. The latter is due to the fact that, as subscription prices are raised after the merger, readership declines and advertisers pay a much higher price per reader, although the price per column millimeter is unchanged. So, clearly, the two-sided nature of the market plays an important role here.

VII. CONCLUSION

We compare different ways to assess unilateral merger effects in a two-sided market—HHI, SSNIP, UPP, and a full merger simulation—by applying them to a hypothetical merger in the Dutch newspaper industry.

Lacking other sources of information on diversion ratios and profit margins, we first specify and estimate a structural model of demand for differentiated products on both the readership and the advertising sides of the market. In particular, we specify demand for advertising slots to be of the constant elasticity form and readership demand to be given by a logit model. Our estimates indicate that not only is a higher readership associated with a higher demand for advertising, but also a higher level of advertising leads to a small rise in readership, so the average reader seems to like advertising. Therefore, for recovering marginal costs, we cannot proceed in the same way as Argentesi and Filistrucchi[80] do for the Italian daily newspapers market, as Van Cayseele and Vanormelingen[81] do for the Belgian newspaper market, or as Fan[82] does for the U.S. daily newspapers market. Instead, we follow the method of Filistrucchi, Klein, and Michielsen[83] and recover marginal costs from an oligopoly model of the supply side.

We then use these estimates of price elasticities, network effects, and marginal costs to compare the different methods to evaluate unilateral merger effects. This means that our results are based on the assumption that the estimated parameters are the true ones, which is subject to demand being correctly specified. But making these assumptions enables us to perform what we believe is a fair comparison of methods in a realistic context, as it allows us to abstract from differences in the quality of the data used in the different approaches.

Our results are consistent with the newspaper market being characterized by a positive indirect network effect of readership on advertising demand

[80] Argentesi & Filistrucchi, *supra* note 1.
[81] Van Cayseele & Vanormelingen, *supra* note 32.
[82] Fan, *supra* note 1.
[83] Filistrucchi, Klein & Michielsen, *supra* note 22.

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and a positive (albeit smaller) indirect network effect of advertising demand on readership. On the one hand raising the newspaper price is likely to lead not only to a loss in readers but also to a loss in advertising, and therefore the tendency to increase prices will be lower than in the absence of network effects. On the other hand, for the same reason, a greater effect on the merging parties will be internalized with the merger. This will tend to push prices upward.

In our case, the effects of the hypothetical merger on subscription prices and readers' welfare are found to be small. Concerns mainly arise with respect to the advertising side. Importantly to this regard, with the exception of market concentration analysis, there does not seem to be a significant difference between the different methods used to assess the unilateral effects of the hypothetical merger we analyzed. This is because we used SSNIP and UPP formulas adjusted for two-sided platforms, so that only the HHI-based analysis did not take the two-sided nature of the market into account. So, for the example studied here, we find that commonly used methods to assess mergers work well in two-sided markets as long as one properly adjusts them—in the way we have described above—for the two-sided nature of the market.

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APPENDIX: ADDITIONAL TABLES AND FIGURES

Table A1. Subscription prices and circulation

	Price per Quarter			Circulation in Thousands		
	init	**pre**	**post**	**init**	**pre**	**post**
AD1[a]	251.48	249.36	249.51	445.20	451.15	451.61
BAK[e]	179.91	179.78	179.93	11.33	11.33	11.34
BND[b]	247.19	247.09	247.18	114.54	114.46	114.53
BRA[b]	255.58	255.48	255.58	132.00	131.91	132.00
EIN[b]	251.30	251.20	251.29	110.82	110.75	110.82
GEL[b]	252.72	252.61	252.72	153.08	152.96	153.07
GOO[c]	246.12	245.81	250.14	28.14	28.08	27.33
HAR[c]	242.55	242.28	246.03	41.28	41.21	40.27
LEI[c]	235.41	235.18	238.26	33.19	33.13	32.49
LEW[d]	234.34	234.25	234.36	94.58	94.52	94.59
LIM[b]	271.11	271.03	271.10	128.32	128.26	128.32
NED[e]	281.28	281.12	281.26	30.63	30.59	30.62
NOO[d]	237.38	237.25	237.36	143.07	142.96	143.06
NOR[c]	246.12	245.98	247.45	141.04	140.93	139.82
NRC[a]	316.98	310.40	316.28	207.20	217.61	208.25
NRN[a]	197.22	190.57	195.79	83.69	87.84	84.57
PAR[a]	249.87	246.12	246.38	87.51	89.68	89.84
PZC[b]	247.19	247.07	247.18	55.15	55.11	55.15
REF[e]	258.61	258.45	258.57	55.14	55.07	55.12
STE[b]	252.55	252.42	252.55	134.30	134.19	134.30
TEL[c]	238.98	238.79	240.75	653.09	652.15	643.52
TRO[a]	294.31	292.14	292.32	105.52	107.00	107.13
TWE[b]	243.44	243.36	243.46	114.69	114.63	114.70
VOL[a]	273.07	270.63	270.83	258.24	262.44	262.82

Note: This table shows prices and quantities for different situations. Within each of the two panels, the columns are for the initial ownership situation (init), the situation after the NRC Handelsblad and nrc.next have become independently owned (pre), and the situation in which they are bought by the Telegraaf group (post). The ownership structure in the initial situation is indicated by superscripts. A superscript "a" indicates that the newspaper was initially owned by De Persgroep, "b" by Wegener, "c" by the Telegraaf group, "d" by NDC Mediagroep, and "e" that the newspaper was independently owned. The full names of the newspapers are Algemeen Dagblad, Barneveldse Krant, BN DeStem, Brabants Dagblad, Eindhovens Dagblad, De Gelderlander, De Gooi- en Eemlander, Haarlems Dagblad, Leidsch Dagblad, Leeuwarder Courant, Dagblad De Limburger, Nederlands Dagblad, Dagblad van het Noorden, Noordhollands Dagblad, NRC Handelsblad, nrc.next, Het Parool, Provinciale Zeeuwse Courant, Reformatorisch Dagblad, de Stentor, De Telegraaf, Trouw, De Twentsche Courant Tubantia, and de Volkskant, respectively.

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Table A2. Advertising prices and sold quantities

	Price per Column Millimeter			Million Column Millimeters Sold		
	init	**pre**	**post**	**init**	**pre**	**post**
AD1	17.43	17.43	17.43	5.79	5.84	5.85
BAK	0.39	0.39	0.39	5.20	5.19	5.20
BND	11.56	11.56	11.56	9.16	9.16	9.16
BRA	12.71	12.71	12.71	8.33	8.33	8.33
EIN	11.00	11.00	11.00	9.63	9.62	9.63
GEL	5.50	5.50	5.50	8.12	8.12	8.12
GOO	0.68	0.68	0.68	7.32	7.31	7.17
HAR	1.41	1.41	1.41	9.73	9.71	9.56
LEI	1.82	1.82	1.82	7.51	7.50	7.40
LEW	1.92	1.92	1.92	12.98	12.97	12.98
LIM	5.82	5.82	5.82	4.56	4.56	4.56
NED	0.71	0.71	0.71	2.03	2.03	2.03
NOO	3.16	3.16	3.16	11.77	11.77	11.77
NOR	2.72	2.72	2.72	9.04	9.04	8.99
NRC	7.32	7.32	7.32	5.94	6.15	5.96
NRN	3.86	3.86	3.86	2.02	2.09	2.03
PAR	2.90	2.90	2.90	5.76	5.86	5.87
PZC	1.79	1.79	1.79	7.94	7.93	7.94
REF	0.92	0.92	0.92	4.80	4.80	4.80
STE	4.89	4.89	4.89	7.74	7.73	7.74
TEL	13.11	13.11	13.11	12.14	12.12	12.01
TRO	3.43	3.43	3.43	3.21	3.24	3.24
TWE	3.18	3.18	3.18	8.21	8.21	8.21
VOL	7.68	7.68	7.68	5.59	5.65	5.66

Note: This table shows prices and quantities for different situations. Within each of the two panels, the columns are for the initial ownership situation (init), the situation after the NRC Handelsblad and nrc.next have become independently owned (pre), and the situation in which they are bought by the Telegraaf group (post). The initial ownership structure and the full names of the newspapers are listed in the notes to Table A1.

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Table A3. Advertising and readership profits

	Advertising Profits			Readership Profits		
	init	**pre**	**post**	**init**	**pre**	**post**
AD1	42.84	43.24	43.27	64.33	64.24	64.37
BAK	0.86	0.86	0.86	1.71	1.71	1.71
BND	44.95	44.93	44.95	16.99	16.96	16.98
BRA	44.95	44.93	44.95	19.28	19.25	19.28
EIN	44.95	44.93	44.95	16.33	16.31	16.33
GEL	18.97	18.96	18.97	21.94	21.90	21.94
GOO	2.10	2.10	2.06	4.27	4.26	4.26
HAR	5.80	5.80	5.70	6.28	6.26	6.27
LEI	5.80	5.80	5.72	4.81	4.80	4.81
LEW	10.58	10.57	10.58	13.48	13.46	13.48
LIM	11.27	11.26	11.27	19.46	19.44	19.46
NED	0.61	0.61	0.61	3.93	3.92	3.93
NOO	15.82	15.81	15.82	20.39	20.35	20.39
NOR	10.42	10.42	10.36	22.44	22.40	22.43
NRC	18.46	19.11	18.52	29.04	29.07	29.05
NRN	3.30	3.42	3.33	12.12	12.14	12.13
PAR	7.08	7.20	7.21	12.84	12.83	12.87
PZC	6.03	6.02	6.03	8.57	8.56	8.57
REF	1.88	1.87	1.87	7.04	7.02	7.03
STE	16.07	16.06	16.07	19.47	19.44	19.47
TEL	67.55	67.48	66.85	84.39	84.15	84.29
TRO	4.67	4.72	4.72	14.96	14.94	14.98
TWE	11.07	11.07	11.07	18.01	18.00	18.02
VOL	18.24	18.45	18.46	35.87	35.81	35.91

Note: This table shows advertising and readership profits in million euros of 2002 and for different situations. Within each of the two panels, the columns are for the initial ownership situation (init), the situation after the NRC Handelsblad and nrc.next have become independently owned (pre), and the situation in which they are bought by the Telegraaf group (post). The initial ownership structure and the full names of the newspapers are listed in the notes to Table A1.

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