For Official Use **DAF/COMP/WD(2017)31**

Organisation for Economic Co-operation and Development

12 June 2017

English - Or. English

DIRECTORATE FOR FINANCIAL AND ENTERPRISE AFFAIRS
COMPETITION COMMITTEE

Cancels & replaces the same document of 26 May 2017.

Measuring Market Power in Multi-Sided Markets - Note by Kurt Brekke

Hearing on Re-thinking the use of traditional antitrust enforcement tools in multi-sided markets

21-23 June 2017

This paper by Kurt Brekke was submitted as background material for Item 8 at the 127th meeting of OECD Competition Committee on 21-23 June 2017. It will be revised and finalised by the author(s) after the discussion takes place. The document is available in PDF format only.

The opinions expressed and arguments employed herein do not necessarily reflect the official views of the Organisation or of the governments of its member countries.

More documents related to this discussion can be found at

www.oecd.org/daf/competition/rethinking-antitrust-enforcement-tools-in-multi-sided-markets.htm

JT03415815

Mesuring Market Power in Multi-Sided Markets*

Kurt R. Brekke†

May 25, 2017

1 Introduction

Multi-sided markets are markets in which a firm serves two or more distinct groups of consumers. Classical examples include markets for newspapers (serving readers and advertisers), credit cards (serving shoppers and merchants), and taxis (serving travellers and drivers). This kind of markets has been around for decades. However, the importance of multi-sided markets in the economy has increased tremendously, mainly due to digitalization and the rapid growth of online markets.[1] While many of these markets are offering entirely new products to consumers, they also transform traditional one-sided markets into multi-sided markets due to new business models often based on advertising.

A key feature of multi-sided markets is the existence of network externalities between the different sides (consumer groups) in the market, which are by definition not present in one-sided markets. Network externalities arise when the utility (or profit) obtained by a consumer (or firm) of one type depends on the number of consumers (or firms) of the other types in the market and the different consumer groups cannot internalize these externalities. While the strength of the externality

*This note is prepared on request from the OECD Competition Committee for the Hearing on "Rethinking the Use of Traditional Antitrust Enforcement Tools in Multi-Sided Markets", which takes place in Paris on 22nd of June 2017

†Chief Economist in the Norwegian Competition Authority (NCA) and Professor at the Norwegian School of Economics (NHH).

[1]See, for instance, Evans and Schmalensee (2016) who clearly demonstrates the importance new markets related to multi-sided platforms (*matchmakers*).

depends on the size of the network, the sign of the externality can be positive or negative. In the classical newspaper example, it is quite clear that readers are imposing a positive externality on advertisers, as they are also potential buyers of the advertised products. This implies that newspapers with large circulation is likely to attract more advertising revenues. However, the externality on readers of advertising can be positive, negative or even zero, depending on how advertising is affecting readers' utility.[2]

The presence of network externalities between the different consumer groups in multi-sided markets changes the strategic nature of the market game. This has been clearly demonstrated by the large economic literature that has emerged on multi-sided markets.[3] A main reason is that network externalities affect demand from the different consumer groups, which in turn influence the firms' strategic behavior, including pricing decisions. In the newspaper market, a higher subscription fee will increase the profit margin on readership but at the same time reduce advertising revenues due to lower circulation. Thus, the positive network externality from readers to advertisers constrains newspapers in setting high prices to readers. Indeed, in many online markets, firms' are charging zero user fees to maximize network effects and thus advertising revenues.

The growing importance of multi-sided markets in the economy poses a key challenge for competition authorities. A main reason for this is the lack of appropriate tools for assessing possible anti-competitive effects of firm behavior in such markets. This has been clearly demonstrated in recent antitrust cases, including the EU cases against Google, Microsoft and Facebook.[4] While there has been major developments in antitrust analysis for traditional one-sided markets, such as price pressure tests in merger cases, these tools cannot directly be applied to multi-sided markets without any adjustments. Indeed, the nature and strength of the network externalities in multi-sided markets are likely to determine the anticompetitive effects of firm behavior in such markets. Applying tools developed

[2] See, Kaiser and Wright (2006), Kaiser and Song (2009), and Wilbur (2008), for empirical evidence on this relationship.

[3] See, for instance, Anderson and Jullien (2015) or Evans and Schmalensee (2016).

[4] Google/DoubleClick (Case COMP/M.4731) Commission Decision 11 March 2008 OJ C 184; Microsoft/Yahoo (Case COMP/M.5727) Commission Decision 18 February 2010 OJ C 020; Microsoft/Skype (Case COMP/M.6281) Commission Decision 7 October 2011 OJ C 341; Facebook/WhatsApp (Case COMP/M.7217) Commission Decision 3 October 2014 OJ C 417.

for one-sided markets may therefore lead competition authorities to make wrong decision, such as stopping beneficial mergers (type 1 error) or clearing harmful mergers (type 2 error).

The purpose of this paper is to explore recent developments in the economic literature on market power in multi-sided markets, focusing on practical methods and tools that can be applied by competition agencies, especially in their assessment of horizontal mergers in such markets. The paper is organized as follows. Section 2 briefly describes the traditional measures of market power in one-sided markets and the new developments related to price pressure tests. Section 3 reviews the recent developments in the literature on merger assessment tools for multi-sided markets, whereas Section 4 discusses how these tools can be implemented in practice by competition authorities. Section 5 concludes the paper with some policy recommendations.

2 Market power in one-sided markets

Traditionally, competition authorities' have measured market power by using concentration indices. The main measure in merger cases has been the post-merger Herfindahl-Hirschman-Index (HHI) and the merger-related change in the HHI. The HHI is defined as the sum of each firm's market share

$$HHI = \sum_{i=1}^{n} s_i^2,$$

where s_i is firm i's market share and n is the total number of firms in the market where the merger takes place. The higher the HHI, the more concentrated is the market, with monopoly yielding a maximum value of 10,000 (i.e., one firm having a market share of 100 percent). Since the post-merger HHI is not observed by competition authorities, this is usually computed by imputing the pre-merger market shares (i.e., assuming each firm's market share remains constant after the merger).[5] This implies that the merger-related change in the HHI, assuming firm

[5] This is obviously a simplification, as it is well known from the economic literature that both merging and non-merging firms are likely to change their behaviour as a consequence of the merger.

1 and 2 merge, is simply given by

$$\Delta HHI = 2s_1 s_2,$$

yielding the following post-merger HHI

$$HHI^{Post} = \sum_{i=1}^{n} s_i^2 + 2s_1 s_2,$$

where s_i is firm i's (observed) pre-merger market share.

According to the U.S. merger guidelines (2010), markets in which the HHI is between 1,500 and 2,500 points are considered to be moderately concentrated, and markets in which the HHI is in excess of 2,500 points are considered to be highly concentrated.[6] Mergers resulting in highly concentrated markets that involve an increase in the HHI of between 100 points and 200 points potentially raise significant competitive concerns and often warrant scrutiny. Mergers resulting in highly concentrated markets that involve an increase in the HHI of more than 200 points are presumed to be likely to enhance market power and will usually be investigated by the competition agencies.

However, the use of HHI as a measure of market power has been heavily criticized in recent years. First, the foundation of HHI in economic theory is based on Cournot competition with homogeneous products. In such markets firm sell identical products and compete in quantities, and the price is established by an "auctioneer" that clears demand and supply. If these are key characteristics of the industry where the merger takes place, then the HHI is likely to be an appropriate tool for competition authorities. However, in most markets firms compete in prices and sell differentiated products, which implies that the HHI can be misleading as an indicator of possible anti-competitive effects of the merger.

Second, the use of HHI requires a definition of the relevant market, which is usually done using a so-called "Small but Significant and Non-transitory Increase in Price" (SSNIP) test. Following this practice is problematic in differentiated product markets, as any HHI-based analysis neglects information on the substitutability between products, which is decisive for measuring market power in such

[6] See U.S. Department of Justice & FTC, Horizontal Merger Guidelines § 5.2 (2010).

markets. While substitutability between products is a matter of degree, market definition is conceptually different because it involves a zero/one decision of whether or not to include a given product in the relevant market.

As a response, *pricing pressure indices* have been proposed as alternative measure for competition authorities when assessing horizontal mergers involving differentiated products. The framework is based on Bertrand competition with firms selling differentiated products. The price pressure indices characterize the unilateral price effects of a horizontal merger by calculating the post-merger effects of marginal price increases above the pre-merger level. The idea is that, prior to the merger, if one of the merging firms raises its price by a small amount above the observed equilibrium price, its profits remain unchanged. Post-merger, if the merged firm increases the price of one of its products, some of the lost sales will be recaptured by the second product (which used to be a competing product). Therefore, this price increase is now profitable and thus likely to occur in the absence of efficiency gains.

The concept of Upward Pricing Pressure (UPP), recently proposed by Farrell and Shapiro (2010), is based on the idea that a merger changes the firms' pricing incentives in two ways: (i) it creates upward pressure on prices due to the loss of competition between the merging parties' products and (ii) it leads to downward pressure on prices caused by merger-related efficiencies (marginal cost decreases). The difference between these two effects is the UPP. The UPP measure is derived by evaluating the merging firms' post-merger first-order conditions at the optimal pre-merger prices, granting the merging firms an efficiency credit. Considering a merger between firm 1 and 2 selling differentiated products 1 and 2, respectively, Farrell and Shapiro (2010) define the UPP on product 1 as follows:[7]

$$UPP_1 = (P_2 - C_2)\, D_{12} - E_1 C_1 \geq 0$$

where D_{12} is the diversion ratio from product 1 to product 2,[8] P_2 is the price

[7] There is, of course, an equivalent UPP condition for product 2.

[8] The diversion ratio is formally defined as follows

$$D_{12} := \frac{\partial Q_2 / \partial P_1}{-\partial Q_1 / \partial P_1},$$

of product 2, C_1 and C_2 are the marginal costs of product 1 and 2, respectively, and E_1 captures possible merger-related cost synergies in producing product 1, measured in relative terms (percentage).[9] Hence, given that the price of product 2 remains the same, the merging firm would like to increase the price of product 1 after the merger as long as $UPP_1 \geq 0$. The condition is a trade-off between downward price pressure from a lower marginal cost E_1C_1, and the upward pricing pressure from the value of diverted sales $(P_2 - C_2)\, D_{12}$.[10]

The upward pricing pressure is explained in U.S. Horizontal Merger Guidelines (2010) as follows:

> 'Adverse unilateral price effects can arise when the merger gives the merged entity an incentive to raise the price of a product previously sold by one merging firm and thereby divert sales to products previously sold by the other merging firm, boosting the profits on the latter products. Taking as given other prices and product offerings, that boost to profits is equal to the value to the merged firm of the sales diverted to those products. The value of sales diverted to a product is equal to the number of units diverted to that product multiplied by the margin between price and incremental cost on that product.' (p. 21)

In their comment on the U.S. merger guidelines (2010), Salop and Moresi (2009) propose to use the Gross Upward Pricing Pressure Index (GUPPI) to measure the upward pressure on post-merger prices. Differently from UPP, GUPPI does not

where Q_1 and Q_2 are the demands for product 1 and 2. Thus, the diversion ratio measures the share of consumers of product 1 that switch to product 2 due to a price increase of product 1.

[9] Formally, the merger-related efficiency gain of product 1 is defined as follows:

$$E_1 := \left(C_1 - C_1^N\right)/C_1,$$

where C_1^N is the post-merger marginal cost of product 1. It is assumed that $C_1^N \leq C_1$ such that $E_1 \in [0, 1]$.

[10] Schmalensee (2014) provides an alternative version of the UPP by allowing for also efficiency gains in the production of both products, yielding the following condition

$$UPP_1 = [P_2 - (1 - E_2)\, C_2]\, D_{12} - E_1C_1 \geq 0.$$

E_2 is the merger-related efficiency gain in production of product 2, which evidently increases the upward pricing pressure by increasing the value of diverted sales.

grant an efficiency credit and then evaluates whether UPP is positive. Rather, it expresses UPP in terms of percentage margins. The GUPPI can be written as follows

$$GUPPI_1 = \frac{P_2 - C_2}{P_2} D_{12} \frac{P_2}{P_1}.$$

Since GUPPI only captures the upward price pressure due to internalization of competition between the merging parties' products post-merger, it will always be positive if the merging parties' products are substitutes. Hence, if GUPPI is to be used as a horizontal merger screening device, some threshold GUPPI level needs to be specified below which the merger is considered not to give rise to substantial unilateral effects.

A novelty of the UPP and GUPPI measures is that no assumptions are needed on the demand structure or pass-through rates. The reason is that these measure do not calculate the magnitude of the price change but only its direction (i.e., whether a price increase following the merger is likely or not). This implies that the measures can, in principle, be applied to any (one-sided) market, independent of specific market characteristics. However, it is important to be aware that the UPP and GUPPI are not direct measures of the expected price effects of the merger. Moreover, the UPP and GUPPI formulas are derived assuming prices of all other products are constant, including products of the merging parties but also rival firms. This is a main reason why the UPP and GUPPI measure are to be interpreted as indicative and not predicted price effects of the merger.

Hausmann et al. (2011) advances the price pressure tests by allowing for *feedback* effects between the merging firms' products. More precisely, considering a merger between firm 1 and 2 selling differentiated products 1 and 2, respectively, they allow for prices of both products to change following the merger. However, to derive the price pressure formulas, they need to assume linear demand functions, which implies that the diversion ratios are constant and do not vary with price levels. Despite this caveat, their price pressure test can be useful to competition agencies, especially for mergers where linear demand can be an reasonable assumption. One can also argue that linear demand implies a concervative measure as the pass-through rate to consumers is 50% of the price change.

In cases where data allow for demand estimation, competition agencies are in

a position to conduct merger simulations, that also account for price responses by outsiders. As prices usually are strategic complements, accounting for such price responses reinforce any price effect of horizontal mergers. While merger simulations are highly useful in predicting true price effects of mergers, they are demanding in terms of data and can be sensitive to methodological assumptions. This often implies that most competition agencies are not in a position to make use of these tools given the time constraints in merger cases. In the proceeding we therefore mainly focus on price pressure tests when considering measures of market power in two-sided markets.

3 Market power in multi-sided markets

In this section we explore measures of market power in multi-sided markets that can be employed by competition agencies. A key question is how the measures developed for one-sided markets can be adjusted to analyze merger effects in multi-sided markets. As pointed out in the introduction, multi-sided markets differ from traditional one-sided markets in that (i) firms serve more than one consumer group and (ii) there exists indirect network effects across the consumer groups. The vast economic literature that has emerged on multi-sided markets clearly demonstrates that the presence of network effects changes firms' strategic behavior and thus the nature of competition.

However, in absence of network effects across consumer groups, there is really no difference between one-sided and multi-sided markets. In this case, the competition authorities can assess the effects of the merger on the different sides of the market separately, using the standard tools for one-sided markets, as presented above. Indeed, this is what has been done by competition authorities in many cases until recently. Below we will show that the standard tools can be misleading in the presence of network effects, and present new tools for analyzing mergers in multi-sided markets.

While the literature on multi-sided markets is vast, there are only a few recent studies developing operational tools for competition authorities' assessment of mergers in such markets. An important contribution is the paper by Affeldt et al. (2013) who extend the UPP measures to two-sided markets. They show

that, due to the two-sidedness, the UPP measures depend on four sets of diversion ratios that can either be estimated using market-level demand data or elicited in surveys. In an application, they evaluate a hypothetical merger in the Dutch daily newspaper market. Their results demonstrate that it is important to take the two-sidedness of the market into account when evaluating UPP.

Let us briefly present the UPP measured developed by Affeldt et al. (2013) for two-sided markets. In two-sided markets, firms set two prices, one to each consumer group. Following their example, newspaper 1 set a price P_1^A in the advertising market and price P_1^R in the readership market, where each of the prices are affecting newspaper 2 in both markets. A higher P_1^R shift readers from newspaper 1 to newspaper 2. This makes newspaper 2 more attractive for advertisers, yielding a shift in advertisers to newspaper 2 from newspaper 1. Moreover, a higher P_1^A shifts advertisers from newspaper 1 to newspaper 2. If consumers dislike (like) ads, this shifts readers to (from) newspaper 1 from (to) newspaper 2. Thus, price changes in multi-sided markets involve direct demand effects, as in one-sided markets, but importantly also *feedback effects across sides* (consumer groups) due to network externalities.

Building on Farrell and Shapiro (2010), Affeldt et al. (2013) derive two UPP conditions for each firm, one for each side of the market. Considering a merger between newspaper 1 and 2, the UPP condition for newspaper 1 in the readership market is given by

$$UPP_1^R = \left(P_2^R - C_2^R\right) D_{12}^{RR} - E_1^R C_1^R + \left(P_2^A - C_2^A\right) D_{12}^{RA} + E_1^A C_1^A D_{11}^{RA} \geq 0,$$

where the two first terms are the standard UPP measure for one-sided markets, consisting of the "upward pricing pressure" based on the value of diverted sales from newspaper 1 to newspaper 2, $\left(P_2^R - C_2^R\right) D_{12}^{RR}$, net of the "downward pricing pressure" due to merger-related cost synergies in the production of newspaper 1, $-E_1^R C_1^R$. However, it is worth emphasizing that firms in multi-sided markets often set user prices below marginal costs, $P_2^R < C_2^R$, in order to capitalize on the network effect in the advertising market. In this case the first term in the UPP measure would be negative, which is different from one-sided markets.[11]

[11]Note, however, that if $P_2^R < C_2^R$, this must imply that $P_2^A > C_2^A$, otherwise the firm is

The two last terms in the UPP condition capture the network effects in two-sided markets. The first term $\left(P_2^A - C_2^A\right) D_{12}^{RA}$ is the value of diverted sales from newspaper 1 to newspaper 2 in the advertising market of an increase in the reader price of newspaper 1, where the diversion ratio D_{12}^{RA} measures the share of advertisers that switch due to fewer readers of newspaper 1. This is likely to be positive in the case of newspapers, but generally D_{12}^{RA} can take any sign depending on the nature of the network externality.

The second term $E_1^A C_1^A D_{11}^{RA}$ is the synergy effect in advertising costs for newspaper 1, as a result of the change in the number of advertisers induced by the increase in the reader price. For the newspaper market, this term is likely to involve a downward pricing pressure on the reader price. The reason is that synergies in advertising costs imply a higher profit margin on advertisers, which makes newspaper 1 more reluctant to increase reader prices, as this lowers circulation and thus demand from advertisers. Thus, the "diversion ratio" D_{11}^{RA} is likely to be negative in the case of newspapers, but generally the sign depends on the nature of the network externalities across the different sides of the market.

Affeldt et al. (2013) derive an equivalent condition for the UPP on the advertising side, which is

$$UPP_1^A = \left(P_2^A - C_2^A\right) D_{12}^{AA} - E_1^A C_1^A + \left(P_2^R - C_2^R\right) D_{12}^{AR} + E_1^R C_1^R D_{11}^{AR} \geq 0.$$

As for the previous condition, the two first terms are the standard UPP measures for one-sided markets. The third term is the value of diverted sales from newspaper 1 to newspaper 1 on the reader side, resulting from an increase in the advertising price P_1^A of newspaper 1. The diversion ratio D_{12}^{AR} measures the share of readers that switch newspaper as a result of less advertising in newspaper 1, where the sign depends on whether readers like or dislike advertising. Notice also that the profit margin on the user side can be, and often is, negative $\left(P_2^R < C_2^R\right)$, which further complicates the computation of the UPP condition in multi-sided markets. If the profit margin is negative, then $\left(P_2^R - C_2^R\right) D_{12}^{AR}$ is positive (negative) if readers dislike (like) ads, and zero if readers are indifferent.

The last term $E_1^R C_1^R D_{11}^{AR}$ captures merger-related synergies in the news pro-

running deficits.

duction, where D_{11}^{AR} is the change in the number of readers relative to advertisers. A higher advertising price P_1^A implies less advertisers, which may have an impact on the number of readers, depending on the nature of the network externality, as explained above. Lower costs in news production yield a higher (or less negative) profit margin on readership. Thus, if readers like (dislike) ads, this term implies a downward (upward) price pressure on the advertising price of newspaper 1.

Affeldt et al. (2013) derive also GUPPI measures, which ignore efficiency gains, for two-sided markets:

$$GUPPI_1^R = m_2^R D_{12}^{RR} \frac{P_2^R}{P_1^R} + m_2^A D_{12}^{RA} \frac{P_2^A}{P_1^R},$$

$$GUPPI_1^A = m_2^A D_{12}^{AA} \frac{P_2^A}{P_1^A} + m_2^R D_{12}^{AR} \frac{P_2^R}{P_1^A},$$

where m_2^R and m_2^A are the profit margins (in percentage) of newspaper 2 in readership and advertising markets, respectively. The first term in each of the conditions is the standard GUPPI measure in one-sided markets, whereas the second term captures the network externalities across the two sides of the market, as explained above.

A recent paper by Cosnita-Langlais et al. (2017) extends the UPP measures developed by Affeldt et al. (2013). A key point in their paper is that Affeldt et al. (2013), when deriving the UPP measures, fails to account for *within* firm feedback effects in the pricing on the two sides. More precisely, they argue that it is unreasonable to assume that the price on one side (say, advertising price P_1^A) is constant when setting the price on the other side (say, reader price P_1^R). Allowing for within firm feedback effects across the two sides of the market, they derive modified versions of the GUPPI formula, though under the assumptions of symmetry and linear demand

$$GUPPI_1^R = m_2^R \left(D_{12}^{RR} + \frac{D_{11}^{RA}}{2} D_{12}^{AR} \right) + m_2^A \left(D_{12}^{RA} + \frac{D_{11}^{RA}}{2} D_{12}^{AA} \right),$$

$$GUPPI_1^A = m_2^A \left(D_{12}^{AA} + \frac{D_{11}^{AR}}{2} D_{12}^{RA} \right) + m_2^R \left(D_{12}^{AR} + \frac{D_{11}^{AR}}{2} D_{12}^{RR} \right).$$

Notice that the first term inside each bracket is the same as in Affeldt et al.

(2013). The additional effect that is pointed out by Cosnita-Langlais et al. (2017) is represented by the second term in each of the brackets. These measures allow for changes in prices within each firm on both sides. Notice that the set of diversion ratios are the same as for the UPP measures by Affeldt et al. (2013).

4 Measurement issues in multi-sided markets

In this section we explore how competition authorities can operationalize the market power tools described above, and obtain reliable estimates of key parameters in multi-sided markets. An important feature of the pricing pressure indices is that they are based on parameters that, in principle, are observable to competition authorities, such as diversion ratios and profit margins in the pre-merger (today) situation. This is not the case for cost synergies, where the estimates usually are based on plausible "guesses" of future merger-related cost savings.

The price pressure indices for two-sided markets suggest that competition authorities need to (i) look at both sides of the market, as an upward pricing pressure on one side can imply a downward pricing pressure on the other side, and (ii) obtain estimates for diversion ratios across sides (readers and advertisers) both within and across the merging firms (newspaper 1 and 2). Following Affeldt et al. (2013), competition authorities, when assessing mergers in two-sided markets, have to obtain estimates of the following diversion ratios for the merging parties:

1. Across products diversion ratios on each of side of the market: D_{12}^{RR} and D_{12}^{AA}
2. Across products and sides diversion ratios: D_{12}^{AR} and D_{12}^{RA}
3. Within products but across sides diversion ratios: D_{11}^{AR} and D_{11}^{RA}

Estimates of the six diversion ratios can be obtain by using market or survey data from the different consumer groups on each side of the market. To illustrate the importance of accounting for network externalities in two-sided markets, Affeldt et al. (2013) consider a hypothetical merger in the Dutch daily newspaper. Using estimates for demand elasticities, prices and marginal costs based on market data, as derived by Filistrucchi et al. (2012), they compute different UPP

measures. Their exercise demonstrates significant differences between the UPP measures for one-sided and two-sided markets. In particular, the merger effect in the advertising market is only detected when allowing for network externalities in the UPP formula.

However, estimates for demand elasticities and marginal costs are usually not available, and competition authorities need to collect information on diversion ratios using customer surveys. In a multi-sided market, the survey would need to be more comprehensive, as one would need to survey consumer groups on all sides of the market. Moreover, one need to ask the different consumer groups not only how they would react to a price increase but also how they would react to a change in participation on the other side.[12] A further complication is that survey results are sensitive to the design of the survey.

Before concluding, let us briefly describe a merger case in the newspaper market in Norway that was investigated by the Norwegian Competition Authority (NCA).[13] In late 2011 the NCA assessed a proposed merger between the second and the third largest media houses in Norway. While the parties had several overlapping activities, the concern for competition was related to local newspapers in overlapping geographical areas. In the merger assessment, the NCA examined the effects of the merger in both the reader and advertising markets. The assessment was based on customer surveys of subscribers and advertisers in six local newspapers. The samples of readers and advertisers were based on a randomized selection from the actual customer lists of the newspaper, with the final sample consisting of 200 subscribers and 25 percent of the advertisers for each of the six newspapers. Information on the consumer groups' second choice of newspaper was collected through telephone surveys, asking the question of which newspaper the subscribers and advertisers would choose if their first choice did not exist. Table

[12] This has already been done by competition agencies in some merger cases, there are no example, to our knowledge, of these being used to compute UPP measures accounting for the network externalities in multi-sided markets.

[13] This case (Case 2011/0925: A-pressen AS – Edda Media AS) is described in OECD report (2016) on the Roundtable on Market Definition in Two-Sided Markets.

1 summarizes the diversion ratios on the two sides of the market.

Table 1: Merger A-pressen – Edda Media, Diversion ratios

		Subscribers	Advertisers
Telemark	Telemarks avisa → Varden	60%	84%
county	Varden → Telemarks avisa	51%	49%
Østfold	Fredrikstad blad → Demokraten	20%	37%
county	Demokraten → Fredrikstad blad	20%	58%

To capture the network externality across the two sides of the newspaper market, the NCA conducted a survey among the subscribers on how they would respond to more advertisement in the newspaper. The survey showed that consumers were more or less indifferent towards advertising, suggesting only a one-way network externality from readers to advertisers. The latter was not measured. The NCA proceed by considering the two sides of the market independently, but with a discussion of the network externality from readers to advertisers. The merger was eventually approved in June 2012, with the remedy that the parties divested two newspapers, one in each of the local markets.

While this case is an early attempt to account for network externalities of mergers in two-sided markets, the analysis by the NCA has, in light of the UPP measures described above, analysis several shortcomings. First, the NCA did not estimate the profit margins, which is important in two-sided markets. As shown above, if the newspaper profit margin on the reader side is negative, the network externality effect is likely to impose a downward pricing pressure on the reader price, whereas the opposite is true if this profit margin is positive. Second, the NCA did not estimate diversion ratio related to the network externality from readers to advertisers, which would be a necessary input in the computation of the UPP measures accounting for the two-sidedness, as shown by Affeldt et al. (2013).

5 Concluding remarks

In this paper we have reviewed the recent literature on market power measures in multi-sided market, and based on this described operational tools that can be

employed by competition agencies, especially in the assessment of mergers in such markets. The paper has focused mainly on the recent developments of pricing pressure indices, which is probably the most likely tools to be used by most competition authorities, as full merger simulations are quite demanding due to tight time constraints in merger cases. The key lessons from this review can be summarized as follows:

1. Upward pricing pressure on one side of the market may result in downward price pressure on the other sides due to network externalities;

2. Upward pricing pressure can be reinforced or weakened depending on the nature of the network externality, i.e., whether the externality is positive or negative.

3. In case of one-way network externalities (say, only from readers to advertisers), then standard UPP measures can be employed on the side that benefit from network externality (advertising side) but not on the other sides causing the network externality (reader side).

By way of conclusion, we should stress some limitations with the UPP measures. First, the general critique that applies to using pricing pressure indices in one-sided markets remains valid also for multi-sided markets. In particular, the fact that no assumption on demand systems are needed (which determines pass-through) is because both UPP and GUPPI only calculate the incentive to increase prices unilaterally post-merger but not the actual price increase. However, what one is ultimately interested in is the change in total welfare and consumer surplus due to the merger, which is determined by the merger-induced price change.[14]

Second, the UPP measures ignore responses by competitors. If the merging parties increase their prices post-merger, competitors have an incentive to also increase their prices in response. This is turn gives the merging parties the incentive to raise prices further. Hence, UPP and GUPPI tend to underestimate the incentive to increase prices post-merger in a one-sided market. In a two-sided market, depending on the sign and size of the indirect network effects, prices on one

[14] See, for instance, Fan (2013) for a full merger simulation in the US newspaper market.

side might be strategic complements (as in one side markets) and strategic substitutes on the other side. Therefore, UPP and GUPPI may either underestimate or overestimate the incentives to increase prices.

References

[1] Affeldt, P., Filistrucchi, L., Klein, T.H., 2013. Upward pricing pressure in a two-sided market. Economic Journal, 123, 505-523.

[2] Anderson, S.P., Jullien, B., 2015. The advertising-financed business model in two-sided media markets. Chapter 2 in Handbook of Media Economics (Eds. Anderson, S., Waldfogel, J., Strömberg, D.), Elsevier, 41-90.

[3] Argentesti, E., Filistrucchi, L., 2007. Estimating market power in a two-sided market: the case of newspapers. Journal of Applied Econometrics, 22, 1247-1266.

[4] Cosnita-Langlais, A., Johansen, B.O., Sørgard L., 2016. Upward price pressure in two-sided markets: incorporating feedback effects. Memo.

[5] Fan, Y., 2013. Ownership consolidation and product characteristics: a study of the U.S. daily newspaper market. American Economic Review, 103, 1598-1628.

[6] Farrell, J., Shapiro, C., 1990. Horizontal mergers: an equilibrium analysis. American Economic Review, 80, 107-126.

[7] Farrell, J., Shapiro, C., 2010. Antitrust evaluation of horizontal mergers: an economic alternative to market definition. B.E. Journal of Theoretical Economics, 10, article 9.

[8] Filistrucchi, L., Klein, T.J., Michielsen, T., 2012. Assessing unilateral merger effects in a two-sided market: an application to the Dutch daily newspaper market. Journal of Competition Law and Economics, 8, 1–33.

[9] Hausmann, J., Moresi, S., Rainey, M., 2011. Unilateral effects of mergers with general linear demand. Economics Letters, 111, 119-121.

[10] Kaiser, U., Wright, J., 2006. Price Structure in Two-Sided Markets: Evidence from the Magazine Industry. International Journal of Industrial Organization, 24, 1-28.

[11] Kaiser, U., Song, M., 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, 292-301.

[12] Moresi, S., 2010. The Use of Upward Pricing Pressures Indices in Merger Analysis. Antitrust Source, February 2010.

[13] OECD, 2012. Roundtable on market definition: Note by the delegation of Norway. DAF/COMP/WD(2012)21.

[14] Salop, S.C., Moresi, S., 2009. Updating the merger guidelines: comments. Mimeo, Charles River Associates, London.

[15] Wilbur, K.C., 2008. A two-sided, empirical model of television advertising and viewing markets. Marketing Science, 27, 356-378.