

Areeda-Turner in Two-Sided Markets*

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20 March 2014

Abstract

[Areeda and Turner \(1975\)](#) were the first to argue that a price below marginal costs should be considered a sign of predation. Recognizing that marginal cost data were typically unavailable, the authors concluded that a price below average variable cost should be presumed unlawful. This so-called Areeda-Turner Rule has become the standard to assess claims of predation. We first show that in two-sided markets price cost margins on the two-sides of the market are interrelated and that a monopolist, even in the absence of actual or potential competition, may find it optimal to charge a price below marginal cost on one side of the market. As a result, showing that the price is below average variable cost on one side of the market cannot be considered a sign of predation in such markets. This is in contrast to a recent decision of the Commercial Court of Paris that sanctioned Google for giving away for free its online mapping services. We thus extend the Areeda-Turner rule to two-sided markets. We argue that one should apply the rule by taking into account revenues and costs from both sides of the market. As applications, we analyse three alleged cases of predatory behaviour in the market for daily newspapers. Our examples highlight that applying a one-sided Areeda-Turner rule may lead to assess a perfectly legitimate profit maximizing pricing policy as a predatory attempt.

JEL Classification: L12, L41, L82.

Keywords: predation, market definition, two-sided markets, network effects, daily newspapers

*We would like to thank Pauline Affeldt, Enrico di Tomaso and Martin Duch for their precious research assistance. We also thank Cedric Argenton for pointing out to us the case *Éditions Philippe Amaury vs Le Journal du Sport* and the case *Bottin Cartographes vs Google*. We are grateful for financial support from the NET Institute, <http://www.NETinst.org>. Lapo Filistrucchi also acknowledges a Microsoft grant to TILEC, which was provided in accordance with the [KNAW Declaration of Scientific Independence](#). The views expressed here are not necessarily the ones of the Net Institute nor of the Microsoft Corporation.

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1 Introduction

In their seminal article, [Areeda and Turner \(1975\)](#) set out to identify a rational dividing line between legitimately competitive prices and prices that should be properly regarded as predatory. Adopting the classical definition of predation as the deliberate sacrifice of present revenues for the purpose of driving rivals out of the market and then recouping the losses, they proposed that “[u]nless at or above average cost, a price below reasonably anticipated (i) shortrun marginal costs or (ii) average variable costs should be deemed predatory, and the monopolist may not defend on the grounds that his price was “promotional” or merely met an equally low price of a competitor”. In addition “[r]ecognizing that marginal cost data are typically unavailable” they concluded that “[a] price below reasonably anticipated average variable cost should be conclusively presumed unlawful”.¹ Despite the debate on whether predatory pricing can in practice be observed, the Areeda-Turner Rule has become the standard in assessing claims of predation. In *AKZO*, the European Court of Justice (ECJ) clearly drew on the analysis of [Areeda and Turner \(1975\)](#) to establish criteria to assess predatory pricing. It stated that a price above average cost could not be predatory, a price between average cost and average variable cost would be predatory in the presence of the intent to eliminate a competitor, a price below average variable cost should instead be presumed predatory.² In *Tetra Pak II*, the ECJ clarified that a price below average variable cost must be considered predatory, without the need to prove first the intention to eliminate competitors.³ More generally, although the Areeda-Turner rule is not always considered sufficient to establish predation, it is in general considered at least necessary.⁴

In this paper, we extend the Areeda-Turner rule to two-sided markets. Two-sided markets are markets in which a firm acts as a platform and sells two different products or services to two distinct groups of customers.⁵ An example is the newspapers’ market, in which publishers sell content to readers and advertising slots to advertisers. A two-sided market is further characterised by indirect network externalities between the two groups of consumers. These arise when the utility (or increase in profits) obtained by a customer (whether a final consumer or a firm) of one group depends on the number of customers of the other group and the two groups of customers do not internalise these externalities.⁶ In the case

¹[Areeda and Turner \(1975\)](#), pag. 733.

²Case C-62/86 *AKZO Chemie v. Commission* [1991] ECR I-3359 (hereafter *Akzo*, paragraphs 71-72).

³Case C-333/94P *Tetra Pak v. Commission* [1996] (hereafter *Tetra Pak II*, paragraphs 41-42)

⁴See [Motta \(2004\)](#).

⁵See [Caillaud and Jullien \(2001, 2003\)](#), [Rochet and Tirole \(2002, 2006, 2003\)](#), [Evans \(2003\)](#), [Parker and van Alstyne \(2005\)](#) and [Armstrong \(2006\)](#).

⁶As a result, a two-sided platform is different from a firm selling complement products. Indeed in the latter case there is only one group of customers who typically buy both goods (e.g. the ink-jet printer and the ink-jet cartridge) and thus, unless they are naive, they respond to changes in the prices of both. In a newspaper market, instead, a reader does not care about the price charged to advertisers and viceversa advertisers do not decide whether to place an ad in a newspaper based on the cover

of newspapers, advertisers value advertising in a given newspaper more the more readers the newspaper has. It is not clear whether readers like, dislike or are indifferent towards advertising in a newspaper⁷, but for the market to be two-sided already the presence of one indirect network effect is sufficient.⁸ Whereas customers do not internalize the externality (or externalities) above, two-sided platforms do internalize it (them) when deciding their optimal pricing strategies. As a result, the profit-maximizing prices by two-sided platforms maybe very different from those charged by firms in one-sided markets.

As pointed out by [Rochet and Tirole \(2006\)](#), in a two-sided market, where two products or services are sold to two groups of customers, one can distinguish a price level and a price structure. The price level is the sum of the two prices, while the price structure is the ratio of the two prices. When the unit of measurement of the goods or services sold on the two-sides are different and the matching of customers on the two sides is not one to one, the price level is not simply the sum of the two prices, but rather the sum of the two prices expressed in the same unit of measurement. In the case of newspapers the price level is the sum of the cover price and the per-copy advertising revenues.⁹ Similarly, the price structure is the ratio of the two¹⁰. In two-sided markets not only the price level but also the price structure determines firms' profits.

[Parker and van Alstyne \(2005\)](#) were the first ones to highlight that in two-sided markets pricing below marginal cost on one side may be a (nonstrategic) profit maximising strategy. Indeed, by pricing below marginal cost on one side of the market a firm increases sales on that side, thus boosting demand and profits on the other side. [Wright \(2004\)](#) enumerates the claim that “price below marginal cost on one side of the market is a sign of predation” among the eight fallacies which derive from applying a one-sided logic to two-sided markets.

Despite the warnings of the economics literature, competition authorities and courts tend to analyse

price of the latter.

⁷In fact, empirical evidence so far seems to suggest that on average readers of daily newspapers are either indifferent to or slightly like advertising (which is usually not targeted but avoidable). See [Argentesi and Filistrucchi \(2007\)](#)(finding no effect of advertising on the number of readers of daily newspapers in Italy); [Fan \(2013\)](#) (finding no effect of advertising on the number of readers of daily newspapers in Belgium and in the United States). But see [Filistrucchi et al. \(2012a\)](#); [Filistrucchi et al. \(2012b\)](#) (finding a small positive effect for Dutch newspapers). Readers of magazines seem instead to value positively advertising (which in that case is avoidable and more targeted). Indeed, [Kaiser and Wright \(2006\)](#) and [Kaiser and Song \(2009\)](#) find that advertising increases readers' demand for magazines in Germany. Using the same dataset, [Sokollu \(2010\)](#) shows that the effect of an additional advertisement is, in fact, positive for small levels of advertising and negative above a given threshold level. With regard to radio (where advertising is not targeted and is unavoidable), [Jeziorski, 2014](#) finds instead a significant and substantial negative impact of the quantity of advertising on the utility of listeners. Similarly, on TV, viewers seem to dislike advertising (which is also not targeted and is unavoidable). See [Wilbur \(2008\)](#). The latter finding is confirmed in a number of communication surveys asking directly what viewers think about TV advertising. See [CENSIS \(2002\)](#).

⁸See [Filistrucchi et al. \(2013\)](#).

⁹One can also express the price level in terms of advertising pages. In that case it is the sum of the advertising price and the circulation revenues per-advertising-page.

¹⁰Note that such a ratio is equivalent to the ratio between the revenues from the two sides. In the newspapers' business the ratio of circulation revenues to advertising revenues (or viceversa) is sometimes called the “financing mix”.

predatory claims with a one-sided logic. In the recent case *Bottin Cartographes vs Google*¹¹, for instance, the Commercial Court of Paris found Google guilty of abuse of dominant position in the market for online maps allowing stores geolocation.¹² The Court reached its decision by simply considering that the price of Google Maps API, being equal to 0 €, was necessarily lower than the production costs of the service. Interestingly, the Court stopped just short of recognizing the implications for competition policy of the two-sided business strategy of Google, as it recognized that Google, according to the contracts, would be able to insert advertising in its Google Maps API service and therefore sell targeted advertising.

Judgements like the one above may partly be due to the fact that most policy contributions so far, such as *Wright (2004)*, have criticized the application of the one-sided Areeda-Turner rule to two-sided markets without suggesting an alternative. In practice, they argued against existing practice rather than providing new methods to practitioners.¹³ For instance, when Google appealed the decision of the Commercial Court of Paris, the Court of Appeal of Paris¹⁴, after reminding the criteria recognized by the settled EU case-law for establishing a predation case, decided to suspend the proceeding and ask the French Competition Authority to deliver an opinion on whether Google conduct had to be considered anticompetitive. The request of the Court of Appeal highlights the uncertainty among practitioners re-

¹¹*Bottin Cartographes v. Google Inc. and Google France Srl*, Commercial Court of Paris, 15th chamber, 31 January 2012, available at http://www.legalis.net/spip.php?page=jurisprudence-decision&id_article=3327. In July 2009 Bottin Cartographes SAS (hereafter “Bottin”) filed a lawsuit before the Commercial Court of Paris (Paris Tribunal de Commerce) against Google Inc. and Google France Srl (hereinafter collectively “Google”) for alleged abuse of dominant position in the market of online mapping services allowing stores geolocation on firms’ websites. Bottin is a multimedia mapping company providing, among others, online map applications allowing users to locate addresses and create itineraries online, which compete in France with the equivalent service Google Maps API (Application Programming Interface) provided by Google. While Bottin offers its service in exchange of an annual fee and an ex post compensation based on actual consumption, the ordinary version of Google Maps API is provided to the customers on a free basis. Bottin claimed that this had to be considered a predatory pricing and that by doing so Google aimed at extending its dominant position on the market of online search to the connected relevant market.

¹²More precisely, with its decision of 31 January 2012 the Commercial Court of Paris found Google guilty of abuse of dominant position pursuant to Article L-420-2 paragraph 1 of the French Commercial Code and, as a consequence, awarded Bottin 500,000 € damages and interests, in addition to ordering Google to publish the judgment at its expense in several French and international newspapers.

¹³Also *Evans (2003)*, *Fletcher (2007)* and *Evans and Noel (2008)* recognize the issue. *Evans (2003)* suggests as a test for predation in a two-sided market to compare the overall price level with the joint marginal cost of the two-sides of the market, but provides no guidance on how to implement the test in two-sided non-transaction markets, i.e. in those two-sided markets such as the media ones where a transaction among end-users does not exist or is not observable (see *Filistrucchi et al. (2013)* for the role the presence of a transaction plays in two-sided markets). *Fletcher (2007)* suggests instead to draw from the finding in *Rochet and Tirole (2003)* that the markup on each side of a two-sided market can be calculated as in a one-sided market, with the caveat that from the marginal cost one needs to subtract any extra revenue that that side of the market generate on the other side of the market. However, the author does not explain how to measure this extra term in practice and whether a negative value for such mark-up on only one side of the market is to be presumed predatory. Moreover, the mark-up formulas proposed by *Rochet and Tirole (2003)* are derived from a monopoly model better suited for two-sided transaction markets. We thus prefer here to follow *Armstrong (2006)* in our monopoly model, making use of the results in *Filistrucchi et al. (2013)*. Our formulas apply to two-sided non-transaction markets, such as the market for newspapers we consider in section 2, but similar conditions can be found also for two-sided transaction markets. For a distinction between two-sided transaction and non-transaction markets, see *Filistrucchi et al. (2013)*.

¹⁴*Bottin Cartographes v. Google France and Google Inc.* Court of Appeal of Paris, 5th Pole, 5th Chamber, 20 November 2013, available on http://www.legalis.net/spip.php?page=jurisprudence-decision&id_article=3942

garding criteria to establish predatory pricing in two-sided markets.

We fill this gap by explaining how one should modify the Areeda-Turner rule to account for the two-sidedness of the market. Testing for predatory pricing in a two-sided market cannot but take into account the presence of the indirect network effects between the two sides of the market. Hence, it cannot recognize that price-cost margins on the two sides of the market are interrelated. We thus show that one needs to compare the overall price level with the joint marginal cost of the two-sides of the market. Since, as already noted by [Areeda and Turner \(1975\)](#), marginal cost data are difficult to obtain, one should compare the overall price level with the overall average variable cost.

We finally apply the proposed methodology to identify predatory pricing in a two-sided market to three cases in the newspaper industry.

We first look at the price war in the UK quality daily newspapers in the '90s and test whether the pricing strategy of The Times from September 1993 to December 1995 was an example of predatory pricing, as claimed by its competitors, particularly by the Independent. The case was investigated by the Office of Fair Trading (OFT) that concluded against the existence of predatory behaviour. It enjoyed considerable publicity at the time for its political implications and has not ceased to be debated, not only because the OFT decision, whether right or wrong, did not include much empirical investigation but also because, looking at it today in light of the theory of two-sided markets, it is striking that the OFT did not carry out any analysis of the advertising market. We show that, had it done so, it would have found that the pricing strategy of the Times was probably not predatory, even taking for granted the estimates of The Independent, according to which the Times was sold to readers at a price below average variable cost.

We then discuss the case of Aberdeen Journals, whose pricing strategies between 1996 and 2000 were investigated by the OFT. It was a case of alleged predation involving free newspapers in Scotland. The OFT and the Competition Appeal Tribunal (CAT) calculated price cost margins and concluded that advertising prices set by Aberdeen journals in response to the entry of Aberdeen & District Independent were below average variables costs and, therefore, predatory. We argue that the OFT took the right approach.

Finally, we discuss the recent case concerning the French sport newspapers 10Sport.com and Aujourd'hui Sport, in which the French Competition Authority (FCA) felt the intent to predate was so clear that it did not need to assess whether prices were predatory. This case shows that predation may not take place through prices only but in a two-sided market it is always a two-sided strategy. Assessing the predator's behaviour on both sides of the market is thus crucial.

The paper is organised as follows: Section 2 compares monopoly pricing in two-sided markets to monopoly pricing in one-sided markets and extends the one-sided Areeda-Turner rule to two-sided markets. In Section (3) we analyse the three cases of alleged predatory behaviour in the market for daily newspapers, namely the Times vs. Independent war, the Aberdeen journals case and the recent case Éditions Philippe Amaury vs Le Journal du Sport. Section 4 concludes.

2 Areeda-Turner from one to two sides

2.1 One-sided versus two-sided monopoly pricing

We here show the difference between monopoly pricing in one-sided and two-sided markets.

A monopolist in a one-sided market sets price P so as to maximize profits

$$\pi = PQ(P) - C(Q(P))$$

where $Q(\cdot)$ is the market demand function and $C(\cdot)$ is the monopolist cost function.

Assuming demand is well-behaved, the profit-maximizing price P solves the first order condition

$$Q + \left(P - \frac{\partial C}{\partial Q}\right) \frac{\partial Q}{\partial P} = 0. \quad (1)$$

From this, one can obtain the monopolist's mark-up

$$\frac{\left(P - \frac{\partial C}{\partial Q}\right)}{P} = -\frac{\partial Q / \partial P}{Q/P} = \frac{1}{\left|\eta_P^Q\right|} \quad (2)$$

where η_P^Q is the elasticity of market demand with respect to price.

Hence, a short-run profits maximizing monopolist in a one-sided market will set a price above marginal cost.

We now turn to monopoly pricing in a two-sided market. Our empirical examples below are for the daily newspaper market. Hence, we denote the two sides of the market with A (for advertisers) and R (for readers).

A monopolist in a two-sided market, such as the one for newspapers, sets instead P^A on the advertisers' market and P^R on the readers' market so as to maximizes profits

$$\pi = P^A Q^A + P^R Q^R - C(Q^A, Q^R)$$

subject to the constraints

$$Q^R = Q^R(P^R, Q^A)$$

$$Q^A = Q^A(P^A, Q^R)$$

Indeed, in two-sided markets, quantities on one market side are functions of prices on that same market side and quantities on the other market side. In the context of the newspaper industry, this means that the amount of advertising demanded is a function of the advertising price and the number of readers, while the number of readers is a function of the cover price and the quantity of advertising.

Filistrucchi and Klein (2013) show that, if the product of the indirect network effects is not too large (i.e. $\left| \frac{\partial Q^A}{\partial Q^R} \frac{\partial Q^R}{\partial Q^A} \right| < 1 \forall P^A, P^R$), the consumers' coordination game, identified by Armstrong (2006) and further discussed by Weyl (2010), has a unique solution and the set of constraints can be rewritten as

$$Q^R = \hat{Q}^R(P^R, P^A)$$

$$Q^A = \hat{Q}^A(P^A, P^R)$$

In other words, if the condition above holds, although customers do not internalize the link between demands, there exist reduced form demands which depend on prices on the two sides of the market. In the context of the newspaper market, it implies that it is possible to express both advertising demand and readership demands as functions of the advertising price and the newspaper price.¹⁵

Substituting these into the profit function above, one obtains

$$\pi = P^A \hat{Q}^A(P^A, P^R) + P^R \hat{Q}^R(P^R, P^A) - C(\hat{Q}^A(P^A, P^R), \hat{Q}^R(P^R, P^A))$$

Then, the monopolist's profit maximizing prices solve the first order conditions

$$\hat{Q}^A + \left(P^A - \frac{\partial C^A}{\partial \hat{Q}^A} \right) \frac{\partial \hat{Q}^A}{\partial P^A} + \left(P^R - \frac{\partial C^R}{\partial \hat{Q}^R} \right) \frac{\partial \hat{Q}^R}{\partial P^A} = 0, \quad (3)$$

¹⁵This result is used in Affeldt et al. (2013) to derive formulas for Upward Pricing Pressure in a two-sided market. An equivalent condition for two-sided markets is assumed to hold in Kaiser and Wright (2006) who bring to the data the Hotelling model of Armstrong (2006).

$$\hat{Q}^R + \left(P^A - \frac{\partial C^A}{\partial \hat{Q}^A} \right) \frac{\partial \hat{Q}^A}{\partial P^R} + \left(P^R - \frac{\partial C^R}{\partial \hat{Q}^R} \right) \frac{\partial \hat{Q}^R}{\partial P^R} = 0 \quad (4)$$

Filistrucchi and Klein (2013) show that one can obtain the derivatives of the reduced form demands from the derivatives of the original demands using the implicit function theorem¹⁶ :

$$\begin{pmatrix} \frac{\partial \hat{Q}^A}{\partial P^A} & \frac{\partial \hat{Q}^A}{\partial P^R} \\ \frac{\partial \hat{Q}^R}{\partial P^A} & \frac{\partial \hat{Q}^R}{\partial P^R} \end{pmatrix} = \frac{1}{d} \begin{pmatrix} \frac{\partial Q^A}{\partial P^A} & \frac{\partial Q^A}{\partial Q^R} \frac{\partial Q^R}{\partial P^R} \\ \frac{\partial Q^R}{\partial Q^A} \frac{\partial Q^A}{\partial P^A} & \frac{\partial Q^R}{\partial P^R} \end{pmatrix} \quad (5)$$

where $d = 1 - \frac{\partial Q^A}{\partial Q^R} \frac{\partial Q^R}{\partial Q^A} > 0$ (because of the assumption that $\left| \frac{\partial Q^A}{\partial Q^R} \frac{\partial Q^R}{\partial Q^A} \right| < 1 \forall P^A, P^R$). Note that the sign of the cross-price derivatives depends on the sign of the network effects: if the network effect is positive the cross-price derivative is negative, if the network effect is negative the cross-price derivative is positive.

From the first order conditions in (2) and (3), one can obtain the monopolist's mark-up on each side of the market

$$\left(\frac{P^A - \frac{\partial C}{\partial \hat{Q}^A}}{P^A} \right) = \frac{1}{\left| \eta_{P^A}^{\hat{Q}^A} \right|} + \left(\frac{P^R - \frac{\partial C}{\partial \hat{Q}^R}}{P^R} \right) \frac{R^R}{R^A} \frac{\eta_{P^A}^{\hat{Q}^R}}{\left| \eta_{P^A}^{\hat{Q}^A} \right|} \quad (6)$$

$$\left(\frac{P^R - \frac{\partial C}{\partial \hat{Q}^R}}{P^R} \right) = \frac{1}{\left| \eta_{P^R}^{\hat{Q}^R} \right|} + \left(\frac{P^A - \frac{\partial C}{\partial \hat{Q}^A}}{P^A} \right) \frac{R^A}{R^R} \frac{\eta_{P^R}^{\hat{Q}^A}}{\left| \eta_{P^R}^{\hat{Q}^R} \right|} \quad (7)$$

where $R^R = P^R \hat{Q}^R$ are revenues from readers, $R^A = P^A \hat{Q}^A$ are revenues from advertisers, $\eta_{P^A}^{\hat{Q}^A} = \frac{\partial \hat{Q}^A}{\partial P^A} \frac{P^A}{\hat{Q}^A}$ is the total own-price elasticity on the advertisers' side, $\eta_{P^R}^{\hat{Q}^R} = \frac{\partial \hat{Q}^R}{\partial P^R} \frac{P^R}{\hat{Q}^R}$ is the total own-price elasticity on the readers' side, while $\eta_{P^R}^{\hat{Q}^A} = \frac{\partial \hat{Q}^A}{\partial P^R} \frac{P^R}{\hat{Q}^A}$ and $\eta_{P^A}^{\hat{Q}^R} = \frac{\partial \hat{Q}^R}{\partial P^A} \frac{P^A}{\hat{Q}^R}$ are the total cross-price elasticities.¹⁷

To understand these total elasticities, suppose the monopolist increases the price to the readers P^R

¹⁶This is done also in Affeldt et al. (2013) to estimate the diversion ratios necessary to apply UPP in a two-sided market.

¹⁷A special case is the one in which there is only one externality between the two-sides of the market, e.g. if advertisers care about readers but readers are indifferent to advertisers. In such a case, there is no issue of consumers' coordination, monopoly profits are

$$\pi = P^A \hat{Q}^A(P^A, Q^R(P^R)) + P^R \hat{Q}^R(P^R) - C(\hat{Q}^A(P^A, Q^R(P^R)), \hat{Q}^R(P^R))$$

and the f.o.c.s become

$$\left(\frac{P^A - \frac{\partial C}{\partial \hat{Q}^A}}{P^A} \right) = \frac{1}{\left| \eta_{P^A}^{\hat{Q}^A} \right|}$$

$$\left(\frac{P^R - \frac{\partial C}{\partial \hat{Q}^R}}{P^R} \right) = \frac{1}{\left| \eta_{P^R}^{\hat{Q}^R} \right|} - \left(\frac{P^A - \frac{\partial C}{\partial \hat{Q}^A}}{P^A} \right) \frac{R^A}{R^R} \frac{\eta_{Q^R}^{\hat{Q}^A} \left| \eta_{P^R}^{\hat{Q}^R} \right|}{\left| \eta_{P^R}^{\hat{Q}^R} \right|}$$

where $\eta_{P^A}^{\hat{Q}^A}$ is the direct own-price elasticity on the advertisers' side, $\eta_{P^R}^{\hat{Q}^R}$ is the own-price elasticity on the readers' side, while $\eta_{Q^R}^{\hat{Q}^A}$ are the elasticity measuring the network effect from readers to advertisers. Since there is no feedback loop anymore, $\eta_{Q^R}^{\hat{Q}^A} \left| \eta_{P^R}^{\hat{Q}^R} \right|$ takes the place of $\eta_{P^R}^{\hat{Q}^A}$ and $\left| \eta_{P^R}^{\hat{Q}^R} \right|$ substitutes for $\left| \eta_{P^R}^{\hat{Q}^R} \right|$.

while keeping the price to the advertisers P^A unchanged; as a result the quantity of readers Q^R decreases: this effect would be captured by a direct (or partial) elasticity $\eta_{P^R}^{Q^R} = \frac{\partial Q^R}{\partial P^R} \frac{P^R}{Q^R}$. However, the decrease in the number of readers Q^R also decreases the quantity of advertising sold Q^A (as advertisers willingness to pay for an advertising slot in a newspaper increases with the number of readers). In turn, the decrease in advertising sold Q^A increases the quantity of readers Q^R (if readers of newspapers are annoyed by advertising), and so on and so forth... The total elasticity $\eta_{P^R}^{\hat{Q}^R}$ includes, in addition to the changes in Q^R directly due to the change in P^R , also the additional changes in Q^R due to the indirect network effects. A similar reasoning applies to the effects of an increase in P^R on Q^A and of P^A on Q^R and on Q^A .

From 5 one can check that the total own-price elasticities are negative when the condition for the existence of the reduced form demand functions is satisfied (i.e. when $\left| \frac{\partial Q^A}{\partial Q^R} \frac{\partial Q^R}{\partial Q^A} \right| < 1$). Hence, total own-price elasticities enter the two-sided mark-ups equations above in absolute value. As a result, the first term on the right hand side, in both equation (6) and equation (7), is positive. In both cases it resembles the term on the right hand side in the equation (2), but for the fact that the elasticities in (6) and (7) include the indirect network effects.

The existence of a second term on the right hand side, in both equation (6) and equation (7), is due to the presence of the indirect network effects. Their sign depends on the sign of total cross-price elasticities with respect to the readers' price and the advertisers' price ($\eta_{P^R}^{\hat{Q}^A}$ and $\eta_{P^A}^{\hat{Q}^R}$ respectively) and on sign of the markup on the other side of the market ($\left(\frac{P^R - \frac{\partial C}{\partial Q^R}}{P^R} \right)$ and $\left(\frac{P^A - \frac{\partial C}{\partial Q^A}}{P^A} \right)$). Hence, the mark-ups on the two-sides of the market are interrelated.

Turning to total cross-price elasticities $\eta_{P^R}^{\hat{Q}^A}$ and $\eta_{P^A}^{\hat{Q}^R}$, they can be positive or negative, depending on the sign of the total derivatives $\frac{\partial \hat{Q}^A}{\partial P^R}$ and $\frac{\partial \hat{Q}^R}{\partial P^A}$ respectively, which in turn depend on the signs of the indirect network effects $\frac{\partial Q^A}{\partial Q^R}$ and $\frac{\partial Q^R}{\partial Q^A}$.

Let us therefore consider the markup on the readers' side given by equation (7). Suppose the markup on the advertisers' side $\left(\frac{P^A - \frac{\partial C}{\partial Q^A}}{P^A} \right)$ is positive. Then the sign of the second term corresponds to the sign of $\eta_{P^R}^{\hat{Q}^A}$. Since $\frac{\partial Q^R}{\partial P^R} < 0$ and $\frac{\partial Q^A}{\partial Q^R} > 0$ (because advertisers attach a positive value to a higher number of readers), then $\eta_{P^R}^{\hat{Q}^A} < 0$. Hence, the markup on the readers' side $\left(\frac{P^R - \frac{\partial C}{\partial Q^R}}{P^R} \right)$ is equal to the sum of a positive term and a negative term. There is no guarantee that such a markup is positive. Indeed, if advertisers react a lot to an increase in the number of readers (i.e. if $\left| \eta_{P^R}^{\hat{Q}^A} \right|$ is high) and if the gain from one additional advertiser on the advertising market is high (i.e. if $\left(\frac{P^A - \frac{\partial C}{\partial Q^A}}{P^A} \right)$ is high), then the markup on the readers' side may be negative. ¹⁸

¹⁸Similarly for the markup on the advertising side. But if the markup on the readers' side is negative, then the one on the advertisers' side will be positive.

We have thus shown that depending on the sign and size of the own-price effects and the indirect network effects, it may be a short-run profit maximizing strategy for a monopolist in a two-sided market to set a price below marginal cost on one side of the market. In the context of newspapers, it may be the case that a monopolist publisher finds it privately optimal to distribute its newspaper for free to readers while selling advertising slots to advertisers.

2.2 A two-sided Areeda-Turner rule

Given that a monopolist might find it profit maximizing in the short-run to set a price below marginal cost on one side of a two-sided market, setting a price below marginal cost on one side only cannot be considered a sign of predation. Hence, as claimed also by [Evans \(2003\)](#) and [Wright \(2004\)](#) the Areeda-Turner rule cannot be applied to only one side of a two-sided market. One needs to extend the logic of [Areeda and Turner \(1975\)](#) to two-sided markets.

Clearly a possibility for a two-sided Areeda-Turner rule would be to require the price to be below marginal cost on each side of the market for the pricing strategy of a dominant firm to be presumed predatory. However, this would restrict the set of predatory prices more than the Areeda-Turner rule does in one-sided markets. In such markets, the benchmark is a price equal to marginal cost: any lower price implies not only that the monopolist is making a loss at the margin but also that it is making negative variable profits. In fact, starting from

$$\left(P - \frac{\partial C}{\partial Q}\right) < 0 \tag{8}$$

and integrating over the produced quantity Q , one obtains

$$\int_0^{Q^*} \left(P - \frac{\partial C(Q)}{\partial Q}\right) = PQ^* - C(Q^*) = \Pi(Q^*) < 0$$

The benchmark should be the same in two-sided markets: all prices such that a monopolist is making negative variable profits should be considered predatory. Instead, choosing price below marginal cost on each side of a two-sided market, would consider non-predatory a substantial set of prices at which a monopolist would incur negative variable profits: all those prices for which the monopolist makes a gain on one side and a loss on the other side but the latter does not compensate for the former.

To see this, consider the case in which the monopolist is making a loss on the readers' side, i.e. $P^R - \frac{\partial C}{\partial Q^R} < 0$. Then, for the monopolist to make a loss overall, it is not necessary that it also makes

a loss at the margin on the advertisers' side, i.e. it is not necessary that $P^A - \frac{\partial C}{\partial \hat{Q}^A} < 0$. Instead it is necessary that the gain on the advertising side is not enough to offset the marginal loss (and the loss in variable profits) on the readers' side.

In other words, an Areeda-Turner rule in two-sided markets should require the price level to be below the marginal cost level rather than simply price below marginal cost on one or two-sides of the market. Hence, expressing both in terms of copies of newspapers sold¹⁹, prices should be considered predatory if

$$P^R + \frac{\partial Q^A}{\partial Q^R} P^A - \frac{\partial C}{\partial \hat{Q}^R} - \frac{\partial Q^A}{\partial Q^R} \frac{\partial C}{\partial \hat{Q}^A} = \left(P^R - \frac{\partial C}{\partial \hat{Q}^R} \right) + \frac{\partial Q^A}{\partial Q^R} \left(P^A - \frac{\partial C}{\partial \hat{Q}^A} \right) < 0 \quad (9)$$

This condition²⁰ implies that not only the profit margin on one side should be negative but the weighted average of the profit margins on both sides should be negative.²¹ It also ensures that predatory prices are such that variable profits are negative. In fact, integrating 9 over the produced quantity of newspapers²² Q^{R*} , one obtains

$$\int_0^{Q^{R*}} \left(P^R + P^A \frac{\partial Q^A}{\partial Q^R} - \frac{\partial C}{\partial \hat{Q}^R} - \frac{\partial C}{\partial \hat{Q}^A} \frac{\partial Q^A}{\partial Q^R} \right) \partial Q^R = P^R Q^{R*} + P^A Q^{A*} - C(Q^{A*}, Q^{R*}) = \Pi(Q^{A*}, Q^{R*}) < 0$$

Furthermore, note that using 9 preserves also an additional property of the one-sided Areeda-Turner rule: in the same way as price is above marginal cost for a one-sided monopolist, the price level is above the cost level, as defined in 9, in a two-sided market. In fact, from 1, one obtains

$$\left(P - \frac{\partial C}{\partial Q} \right) = -Q \frac{\partial Q}{\partial P} > 0$$

while, from 4 and 5, one obtains²³

¹⁹As mentioned above, one can express the price level (and the cost level) also in terms of pages of advertising sold. In such a case the condition becomes

$$P^R \frac{\partial Q^R}{\partial Q^A} + P^A - \frac{\partial C}{\partial \hat{Q}^R} \frac{\partial Q^R}{\partial Q^A} - \frac{\partial C}{\partial \hat{Q}^A} = \left(P^R - \frac{\partial C}{\partial \hat{Q}^R} \right) \frac{\partial Q^R}{\partial Q^A} + \left(P^A - \frac{\partial C}{\partial \hat{Q}^A} \right) < 0$$

Importantly, if this condition holds, condition(9) also holds and viceversa.

²⁰Note that this conditions gives practical content to the suggestion of Fletcher (2007) we mentioned above.

²¹Similarly, Argentesi and Filistrucchi (2007) argue that in order to measure market power one needs to measure the per copy profit margin from both sides of the market rather than the profit margin on one side of the market only.

²²Clearly, if one expresses condition 9 in terms of quantity of advertising sold, then one needs to integrate over Q^{A*} .

²³From 4, rearranging terms, one obtains

$$\left(P^A - \frac{\partial C^A}{\partial \hat{Q}^A} \right) \frac{\partial \hat{Q}^A}{\partial P^R} / \frac{\partial \hat{Q}^R}{\partial P^R} + \left(P^R - \frac{\partial C^R}{\partial \hat{Q}^R} \right) = -\hat{Q}^R \frac{\partial \hat{Q}^R}{\partial P^R}$$

From 5, $\frac{\partial \hat{Q}^A}{\partial P^R} = \frac{1}{d} \frac{\partial Q^A}{\partial Q^R} \frac{\partial Q^R}{\partial P^R}$ and $\frac{\partial \hat{Q}^R}{\partial P^R} = \frac{1}{d} \frac{\partial Q^R}{\partial P^R}$. Hence, $\frac{\partial \hat{Q}^A}{\partial P^R} / \frac{\partial \hat{Q}^R}{\partial P^R} = \frac{\partial Q^A}{\partial Q^R}$.

$$\left(P^A - \frac{\partial C^A}{\partial \hat{Q}^A}\right) \frac{\partial Q^A}{\partial Q^R} + \left(P^R - \frac{\partial C^R}{\partial \hat{Q}^R}\right) = -\hat{Q}^R \frac{\partial \hat{Q}^R}{\partial P^R}$$

Finally, recognizing, as [Areeda and Turner \(1975\)](#), that marginal cost data are typically unavailable, prices should be presumed predatory if

$$P^R + \frac{Q^A}{Q^R} P^A - AVC^R - \frac{Q^A}{Q^R} AVC^A = (P^R - AVC^R) + \frac{Q^A}{Q^R} (P^A - AVC^A) < 0 \quad (10)$$

Note that this condition preserves the properties that: a) the left-hand side is positive for a profit maximizing monopolist b) if a set of prices satisfy it, variable profits are negative²⁴.

Hence, for all practical purposes, for a two-sided market one can then reformulate the Areeda-Turner rule as follows:

a price level below the average variable cost level should be presumed predatory.

In the context of newspapers, prices should be deemed predatory if the sum of the cover price and the per-copy advertising revenues are below the per-copy average variable cost (including advertising costs).

In the next section we discuss three alleged cases of predatory pricing in the newspaper industry, a typical two-sided industry.

3 An application to Daily Newspapers

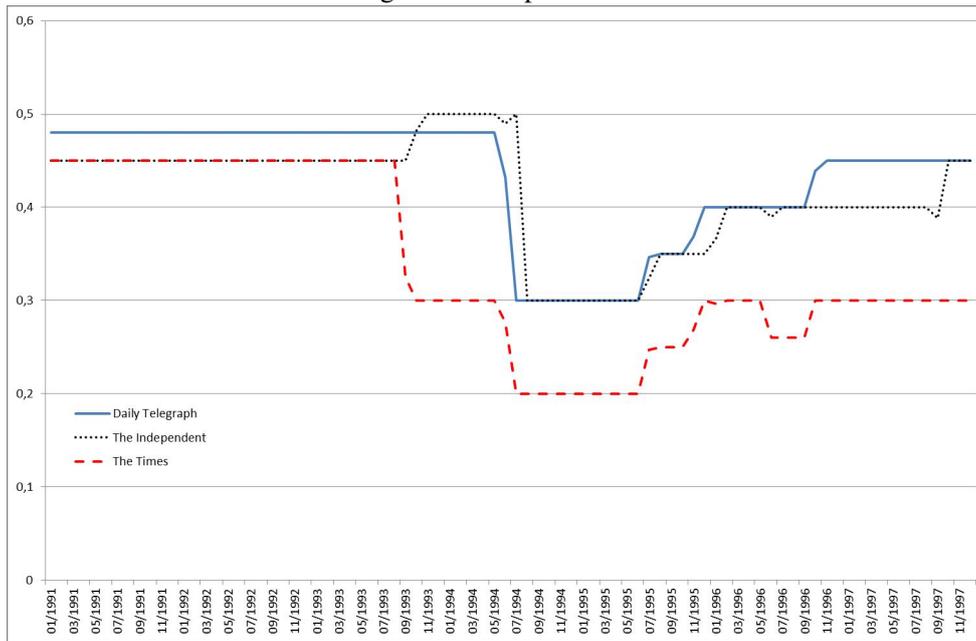
To better illustrate the results derived in the previous section, we now analyse three alleged cases of predatory pricing in the newspaper industry. The first, the Times-Independent price war, highlights the importance of using the correct Areeda-Turner rule for two-sided markets rather than the one-sided rule. The second, the Aberdeen journals case, illustrates how one should deal with those two-sided markets in which one side of the market does not pay. In the third, the recent case *Éditions Philippe Amaury vs Le Journal du Sport*, we argue that, even when predation does not take place through prices only, two-sidedness still plays a role.

3.1 The Times - Independent price war

During the early 1990s the UK market for quality broadsheet newspapers had experienced stable cover prices. In fact, on the 1st September 1993, The Times, The Independent and The Guardian were priced

²⁴The same happens in a one-sided market when one uses $(P - AVC) < 0$ instead of 8.

Figure 1: The price war



at 45p and the Daily Telegraph at 48p.

On 6. September 1993 The Times lowered its price by 33%, from 45p to 30p. As its circulation revenues came into pressure, on 12 October 1993 The Independent raised its price from 45p to 50p. On 23 June 1994, while the Daily Telegraph matched the new price of The Times lowering its price by 37.5% , the Independent was offered on a one-day sale for 20p, with the following announcement appearing on its first page: “We remain dedicated to journalism of the highest quality and integrity. Readers will understand that this can never be cheap”. On 24 June 1994 The Times lowered its price by another 33%, from 30p to 20p, bringing the overall price cut to 55%. Finally, on 1 August 1994 The Independent was also forced to lower its price by 40%, from 50p to 30p. Figure 1 shows depicts graphically this price war.

The Independent claimed to be the target of an attempt to predate by the Times. It claimed that the prices of 30p and 20p per copy of The Times amounted respectively to a „£18m a year “ and a „£30m a year “ subsidy. It filed a complaint to the OFT. A “deep pocket” predator story was put forward.

The OFT investigations on the price cuts of September 1993 and June 2004 led to the conclusion that The Times was not dominant in the readers’ market for national daily newspapers and The Independent was just one of its competitors. Hence The Times could not reasonably expect that the losses it would incur in the predatory campaign would be recouped by a higher price after The Independent would have exited the market. As a result the OFT dismissed the claims of predation.

The price war influenced the public discussion on the adoption of the new competition act in 1998:

the House of Lords sought, without success, to introduce an amendment to the bill that would specifically prohibit predatory prices, even in the absence of a dominant position by the predator, in circumstances which might reduce the diversity of the press.

As also shown in Figure 1, from July 1995 cover prices of The Times, the Daily telegraph and The Independent started to rise and from January 1996 they stabilized again.

However in 1998, following another complaint by The Daily Telegraph, The Guardian and The Independent, the OFT investigated The Times' behavior during the period between June 1996 and January 1998 when the Monday edition was sold for 10p, and concluded that such prices were predatory.²⁵

Interestingly, in all its investigations, the OFT failed to recognize the two-sidedness of the market and the fact that the losses from the readers' market might be covered by gains on the advertising market.

We draw on the data in [Behringer and Filistrucchi \(2011\)](#) to show that despite the huge cut in prices, the pricing strategy of The Times in 1993 and 1994 could not be presumed predatory according an Areeda-Turner rule properly modified to take into account two-sidedness of the market.²⁶

In particular, on the readers' side of the market, we use monthly observations of circulation and cover prices.²⁷ On the advertising side of the market we use monthly observations on advertising quantity and revenues of The Times.²⁸ We recover advertising prices dividing revenues by quantity. Our sample covers the period 1991-1997.

According to The Independent the average variable cost of the Times was 32.5p (17.5p went to the distribution and the cost of printing a copy was 15p). Since this was reported by the complainant, if anything the estimate should be biased upward and the resulting price-cost margins should be biased towards predation. We thus use this estimate (adjusting it by the monthly CPI) to estimate the overall markups of the Times from 1990 to 2000 per copy sold, taking into account both the cover price and the revenues from advertising as suggested by the two-sided Areeda-Tuner rule in (10).²⁹ Figure 2 show that, although the overall per copy mark-up of The Times dropped substantially during the price war, it always remained above zero. Clearly, with a marginal cost of 32.5 at a price of 30p or 20p, the price cost margin on the readers' side was instead negative. Applying the Areeda-Turner rule to the readers'

²⁵ Since, this behavior had ended 16 months before the end of the investigation, the OFT decided not to refer News International (publisher of The Times) to the Competition Commission for charges and accepted assurances given by the publisher that it would notify and provide detailed justification for any future reductions of its cover price.

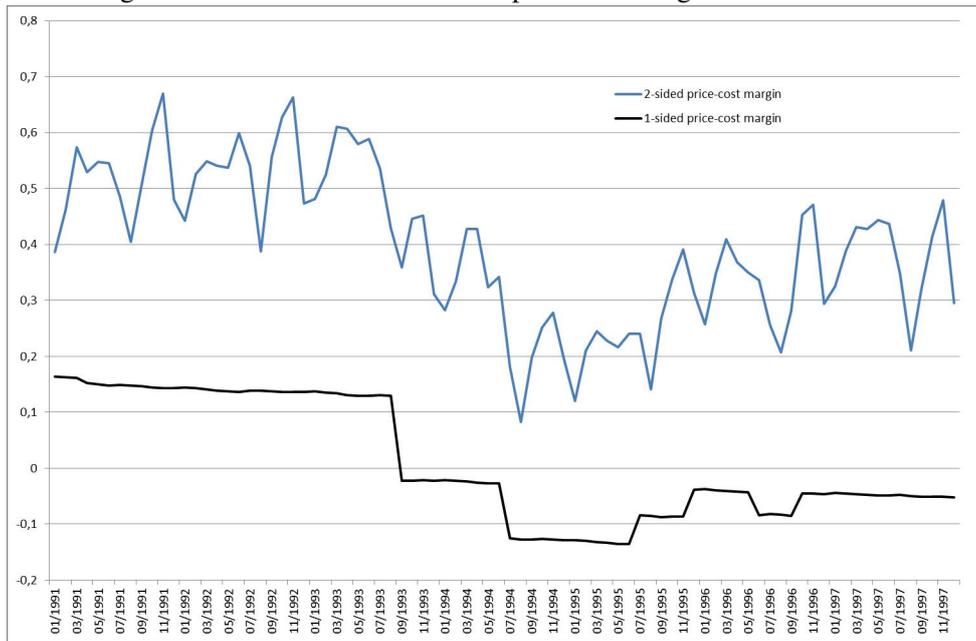
²⁶ [Behringer and Filistrucchi \(2011\)](#) investigate in more detail the claim of predation and two other possible reasons behind the observed price war: a new collusive agreement and an expansion in the advertising market.

²⁷ Data on circulation come from those collected by the Audit Bureau of Circulation (ABC). Data on prices were collected from newspaper publishers themselves.

²⁸ These data were acquired from Nielsen Media Research UK.

²⁹ Note that we consider all advertising costs to be fixed in the short-run. This assumption is in line with the outcome of the discussion, by market participants and the OFT, of newspaper costs in the case Aberdeen journals. The rationale is that advertising staff is fixed in the short-run and printing one page of content or one page of advertising has the same cost.

Figure 2: Two-sided and one-sided price cost margins for The Times



side of the market only would lead to the conclusion that prices are predatory.

However, as shown by Figure 3, the cut in prices led to a substantial increase in circulation. Figure 4 shows that the higher circulation led to an increase in advertising revenues. The latter effect is taken into account by a two-sided Areeda-Turner rule, but not by a one-sided Areeda-Turner rule. This explains why they lead to different conclusions.

3.2 The Aberdeen journals' case

While the war *The Times* vs. *Independent* concerned an alleged case of predation on the cover price in the market for national newspapers, the case of Aberdeen journals concerned an alleged case of predation on the advertising price in the market for local newspapers.

Following the introduction of the UK Competition Act, which made the abuse of a dominant position illegal, *Aberdeen & District Independent* complained that Aberdeen Journals Limited was engaging in predatory pricing of advertising space in its free newspaper *Herald & Post*. On 16 July 2001, and again on 29 September 2002³⁰, the OFT issued its decision against Aberdeen Journals, owned by Northcliffe Newspapers Group Ltd. The OFT found that Aberdeen Journals was dominant in the market for the supply of advertising space in local newspapers (paid-for and free) within the Aberdeen area. The OFT

³⁰The OFT decision of 16 July 2001 was appealed to the Competition Commission Appeal Tribunal (CCAT), which set it aside on the basis that the market definition on which the decision had been made was inadequate. The OFT issued a new decision on 29 September 2002 confirming the original findings. The decision covers a period of infringement from the introduction of the Competition Act on 1 March 2000, which makes the abuse of a dominant position illegal, to 29 March 2000.

Figure 3: Cover price and circulation of The Times

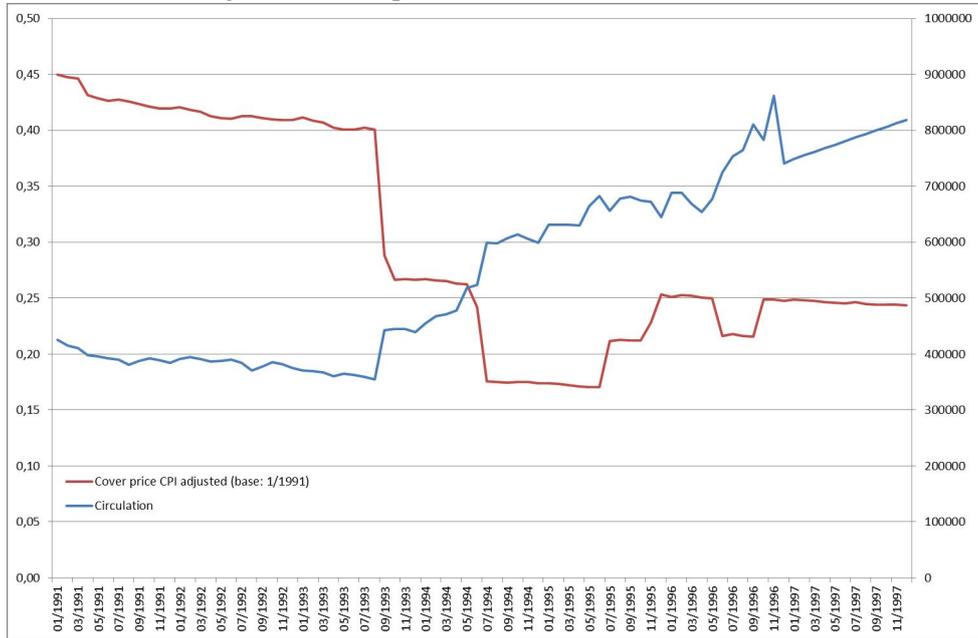
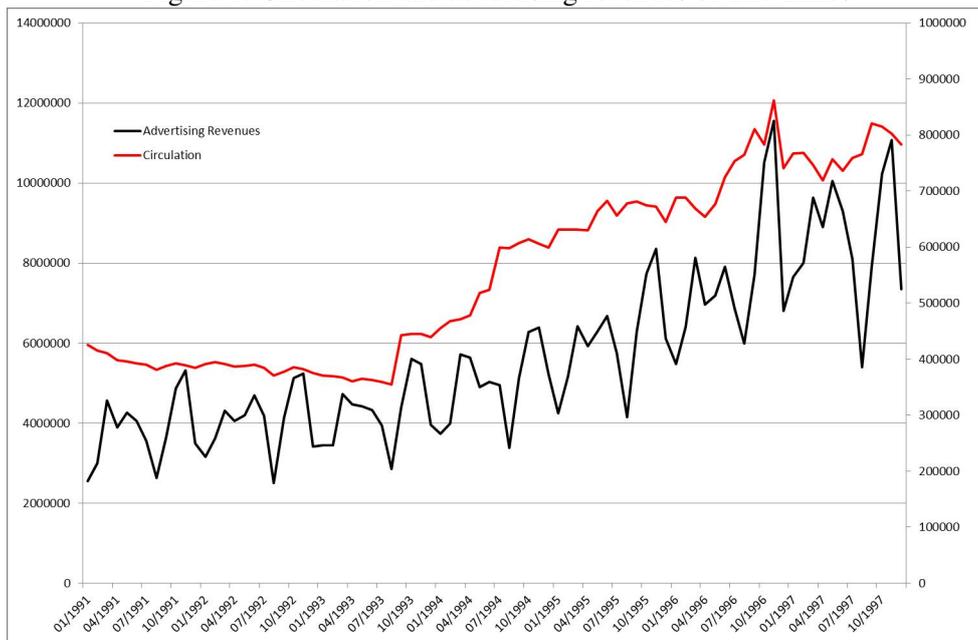


Figure 4: Circulation and advertising revenues of The Times



also concluded that Aberdeen Journals had engaged in predation against its only rival in the relevant market, the Aberdeen & District Independent: it deliberately incurred losses on its free newspaper, the Herald & Post, by pricing advertising space at below average variable cost in an attempt to exclude the Aberdeen & District Independent. According to the OFT, predatory pricing started in response to the launch of the Aberdeen & District Independent in 1996 and continued until 29 March 2000, four weeks after the Competition Act came into force.

In order to assess predation, the OFT conducted an empirical analysis aimed at establishing whether advertising revenues were higher than average variable costs³¹. While the Herald & Post did not incur losses prior to the entry of the Independent, it started to make losses in March 1996 after it heavily decreased advertising rates, increased pagination and increased circulation. The average advertising rate was cut drastically shortly after the launch of the Aberdeen & District Independent in April 2006. It was significantly cut again in October 1998 and the price remained below that level until July 1999. A significant rise took place only in April 2000. Also, the pagination, i.e. the number of pages per month, of the Herald & Post was significantly increased following the launch of the Independent from under 100 pages per month in the period October 1995 to April 1996 to 148 pages in May 1996 and peaking between September 1998 and October 1999 when it was in the range of 350 to 480 pages a month. Lastly, the distribution of the Herald & Post significantly rose after the entry of the Independent from below 100 000 to as much as 126 000 in 1999.

Since whether costs are fixed or variable depends also on the time frame, the OFT first carried out its analysis with reference to both a smaller time frame (the month) and a larger time frame (the alleged predation period). Clearly considering a larger time frame would imply considering more costs as variable and would be more likely to imply a finding of predation. When taking the larger time horizon, the OFT included among variable costs the costs of printing, distribution, editorial staff and advertising staff. It thus estimated that The Herald & Post was selling below average variable costs at least until March 2000 included. Furthermore, treating editorial staff and the advertising team as fixed and the cost of printing and distribution as variable, the OFT estimated that the Herald & Post's revenues exceeded variable costs only on five occasions between July 1996 and March 2000.

Even without access to the data, which were confidential and thus not reported, the OFT approach appears correct. In fact, even if on one-side of the market the platform gives away the product for free, as it is the case with free newspapers, then one still needs to apply the two-sided Areeda-Turner rule given

³¹Internal memoranda also showed that the conduct was intentional and that the Herald & Post was subsidized by its parent company Northcliffe Newspapers Group Ltd in order to drive the *Aberdeen & District Independent* out of the market

by equation 10. However, since on the readers' side of the market the newspaper was given away for free, equation 10 reduces to $P^A - AVC^A - \frac{Q^R}{Q^A}AVC^R < 0$ when the OFT takes as a reference the larger time frame and to $P^A - \frac{Q^R}{Q^A}AVC^R < 0$ when it chooses the shorter time horizon.³² In other words, although one side of the market does not pay for the product it receives (e.g. here readers do not pay for a copy of the newspaper), still the average variable costs to serve that side of the market need to be taken into account to assess predation³³.

3.3 L'Equipe versus Journal du Sport

In February 2014 the French Competition Authority (FCA) fined the Amaury Group³⁴, which publishes in France, among others, the sport newspaper L'Equipe and the magazine France Football, for an abuse of dominant position in the market for readers of national daily sport newspapers. More in detail, the Amaury Group was found guilty of having put in place an exclusionary conduct aimed at eliminating from the market a new low-cost daily sport newspaper, 10Sport.com, by launching a new newspaper, Aujourd'hui Sport, having the same characteristics (in terms of price, number of pages, format and content) of 10Sport.com. However, 10Sport.com also complained that the Amaury Group had lowered substantially the advertising prices on the L'Équipe and by bundling advertising slots on its newspapers it had offered advertising slots on Aujourd'hui Sport almost for free. According to the FCA, the strategy followed by the Amaury Group was loss making, due to the costs of the new newspaper and the cannibalisation effect on the sales of its incumbent newspaper L'Equipe (and, to a lower extent, of France Football). The FCA, with the aid of the evidence collected in the course of the inspections conducted at the premises of the Amaury Group, concluded that the strategy pursued by the company was only justified by the purposes of eliminating 10Sport.com from the market and in this way defending its monopoly, through L'Equipe, on the relevant market. Such a conclusion was furthermore confirmed by the temporary nature of Aujourd'hui Sport, whose activity ceased right after the end of the publication of 10Sport.com. In the case at stake, the French Competition Authority solely based its decision on the evidence showing the intent by the Amaury Group to evict 10Sport.com from the market: therefore it did not consider necessary to assess if the price applied by Amaury Group – both with regard to the cover

³²This is also because, according to the OFT, in the shorter time frame all advertising costs were fixed (as they were mostly related to advertising staff).

³³Logically, recognizing that free newspapers also (bear a cost to) serve readers should imply the definition of a relevant market on the readers' side. Interestingly, as shown in Filistrucchi et al. (2014), competition authorities generally fail to define a second relevant market on the side where the product is given away for free. The OFT in Aberdeen journals makes no exception.

³⁴Decision by the French Competition Authority no. 14-D-02 of 20 February 2014, available on <http://www.autoritedelaconurrence.fr/pdf/avis/14d02.pdf>

price of Aujourd'hui Sport and to its advertising tariffs- was predatory. While the terms for the appeal are still pending and further rulings may still require to establish the predatory nature of the prices, this case shows that, even when predation does not take place through prices only, two-sidedness still plays a role in the definition of the predatory strategy. Hence, had the French Competition Authority decided to assess the predatory nature of Aujourd'hui Sport, it could have had to use the two-sided Areeda-Turner rule we propose in equation (10).

4 Conclusion

In their seminal paper, [Areeda and Turner \(1975\)](#) argued that a price below marginal cost should be considered a sign of predation. Recognizing that marginal cost data were typically unavailable, the authors suggested to presume unlawful a price below average variable cost. This so-called Areeda-Turner rule has become the conceptual reference to assess claims of predation. Different authors have highlighted possible short-comings of the rule³⁵, while different jurisdictions have adopted different variations of it (e.g. ECJ in the AKSO case).

In our paper, we abstracted from the debate on the limits and merits of the Areeda-Turner rule. We simply recognise its importance in the debate on predatory pricing and focus instead on the extension of the rule to two-sided markets.

We first showed that a monopolist's price cost margins in a two-sided market are interrelated. Furthermore, for such a monopolist, even in the absence of actual or potential competition, it may be profit maximizing to charge a price below marginal cost on one side of the market. As a result, the Areeda-Turner rule that the price is below average variable cost or marginal cost on one side of the market cannot be considered as a sign of predation in such markets.

We then followed the Areeda-Turner logic to derive a corresponding rule for two-sided markets. We argued that one should apply the rule by taking into account revenues and costs from both sides of the market. Hence, in a two-sided market the rule should be rephrased as requiring that a price level below the average variable cost or the marginal cost level should be presumed unlawful.

As applications, we analysed three alleged cases of predatory behaviour in the market for daily newspapers. The first case, the Times-Independent price war, concerns a two-sided market where customers on both sides pay for the product or service they receive. The Independent claimed that the cover prices of The Times were predatory because they were lower than the average variable cost of a copy of the

³⁵See, for instance, Ordover and Saloner (1989).

newspaper. We showed that if one took into account the revenues from advertising, as suggested by a 2-sided Areeda-Turner rule, the prices could not be presumed predatory. The Aberdeen journals case illustrates instead how one should deal with those two-sided markets in which one side of the market does not pay. In fact the case concerned predation by a free daily newspaper. Correctly, the OFT took into account costs from both sides of the market (in addition to the price of advertising) when calculating profit margins. In discussing the case *Éditions Philippe Amaury vs Le Journal du Sport* we argued that, even when predation does not take place through prices only³⁶, two-sidedness still plays a role in the design of the predation strategy, as the predator would typically adjust behaviour on both sides of the market. Overall, the discussion of these cases highlights the importance of using the correct Areeda-Turner rule for two-sided markets, given by equation (10), rather than the one-sided rule.

³⁶For a discussion of the possible instruments a firm has to predate, see [Gual \(2005\)](#). For an example of predation through product differentiation, see [Behringer \(2007\)](#).

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