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**Media Bias, News Customization
and Competition**

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Abstract

The media bias literature has focused its attention on single-ideology media firms. We analyze the incentives for media firms to adopt a multi-ideology strategy. A multi-ideology strategy occurs when a media firm adapts news to consumers' political preferences. In this sense, news customization can reduce media bias, since media firms can cover a larger variety of political opinions. We show that although the incentives to customize are larger under duopoly than under monopoly, a monopolist might also end up offering customized news to consumers. In this sense, we argue that the competition policy for the media sector should take into consideration not only media concentration issues, but also the plurality of political opinions embraced inside a media firm.

Keywords: Media Bias, Customization, Media Firms.

JEL Classification: L13, L82.

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1 Introduction

The market for news is central for political and economic outcomes. It is acknowledged that the media industry has an important weight in the political process, due to the considerable influence on the public opinion (Stromberg, 2001, 2004a, 2004b; Besley and Burgess, 2002; Eissensee and Stromberg, 2007). In a similar fashion, freedom of the press impacts economic performance through a variety of channels, corruption being the most obvious one (Mauro, 1995; Svensson, 2005; Svensson and Reinikka, 2005).

The economics literature, however, shows that media bias is a pervasive characteristic of media markets (see Baron, 2006; Besley and Prat, 2006; Gabszewicz et al., 2001; Gentzkow and Shapiro, 2006a; Mullainathan and Shleifer, 2005)[1]. In particular, Gentzkow and Shapiro (2008) argue that media bias results from either supply side or demand side forces. Accordingly, supply side driven media bias can be the outcome of journalists' private information (Baron, 2006), media capture by interest groups (Besley and Prat, 2006) or advertisers' pressure (Gabszewicz et al., 2001)[2]. In turn, demand side driven media bias can emerge as a consequence of consumers' prior beliefs (Mullainathan and Shleifer, 2005).

Given the tendency of media markets to bias news (either because of supply or demand side forces), the main question in the literature has been if competition can reduce the media bias. Gentzkow and Shapiro (2008) give an excellent review on the topic. They argue that competition can in principle restrain supply side driven media bias but not necessarily demand side driven media bias.

We start with the supply side driven media bias. First, competition can ensure greater independence of the media agencies from interest groups, given that it is more difficult for a single interest group to control all media firms (see Besley and Prat, 2006). Second, competition augments the number of the media sources that consumers may have access to, and this can allow

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[1] For empirical studies see Gentzkow and Shapiro (2006b) on the war in Iraq; DellaVigna and Kaplan (2007), Gentzkow, (2006) and Larcinese et al. (2007) on the 2002 US election; Gentzkow and Shapiro (2004) on the satellite network Al Jazeera; Groseclose and Milyo (2005) on the dispute in the US over the liberal *versus* conservative lean of the US media industry; and Durante and Knight (2009) on the intermingling between politicians and media groups in countries like Italy.

[2] On the influence of interest groups on media firms see also Noam (1987); Schulz and Weimann (1989); Baron (2005) and Bovitz et al. (2002).

consumers to form more accurate beliefs, once they can combine information from several sources (Mullainathan and Shleifer, 2005)[3]. Third, competition can conduce to more investment by media agencies in quality and information gathering (Gentzkow and Shapiro, 2008), in order to beat up competition.

When the media bias is demand side driven, however, the case for more competitive markets is not so clear: competition can either increase or decrease media bias (Gentzkow and Shapiro, 2008). Competition might increase media bias mainly due to two channels. First, under competition media firms might have stronger incentives to satisfy consumers' political preferences than under monopoly (see Mullainathan and Shleifer, 2005), given that they do not wish to lose market share to competitors. Second, competition can provoke a race to the bottom in terms of the relation between hard and soft news, i.e.: media firms might increase the quantity of soft news and reduce the quantity and quality of hard news (Gentzkow and Shapiro, 2008)[4]. However, competition may also help to reduce demand side driven media bias via the reputation channel (Gentzkow and Shapiro, 2006a). Accordingly, only with competition can consumers have access to independent sources of information that provide ex-post verification of the reported news by rival media agencies. In this sense, reputation can be a stimulus to reduce the media bias, because deterioration of a media firm's reputation decreases sales.

Given the discussion above, it might be argued that there is some room for media regulation, especially when in the presence of demand side driven media bias. The case to restrict competition through regulation or state ownership of the media, however, finds little support in the data. In fact, Djankov et al. (2003) show evidence that the media bias problem is more severe when the media outlets are publicly owned[5]. The question is then if the media market will generate a type of competition that reduces bias. In this sense, as defended by Gentzkow and Shapiro (2008), the relevant definition of competition in the media markets differs from that in standard consumer markets. While for the latter the definition rests on competition in the consumer market (i.e.: concentration issues), for the former this definition

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[3]The problem with this argument is the rational ignorance model of Downs (1957). In particular, it might be too expensive for consumers to collect information on all relevant issues, given the small payoff they receive in return (see also Coase, 1974).

[4]Hard news refers to political informative news (like the construction of a new airport) and soft news to entertainment news (like the life of celebrities).

[5]There are, however, some important exceptions such as the British public television BBC (see Prat and Stromberg, 2005).

has to be complemented with competition in the information market, i.e.: if different political views find voice in the media market.

Our paper starts from Gentzkow and Shapiro's (2008) definition of competition in media markets and focus on demand side driven media bias, since this is more sensible to competition issues. In particular, we examine the role of competition when media firms can customize news to readers' political preferences. News customization materializes when a media firm simultaneously covers different political views. The main idea in the paper is, then, that news customization can reduce the media bias because, independently of competition in the market, if a firm customizes news it covers a broader political spectrum.

The motivation to analyze the effects of news customization in media bias comes from recent competitive trends in media markets, especially the Internet. Some media experts defend that the Internet has boosted media firms' capacity to customize news (see Sunstein, 2006, and Gentzkow, 2007). First, as highlighted by the business and marketing literature (see Balasubramanian, 1998; Bernhardt et al., 2006; Chen, 2006; Dewan et al., 2000, 2003; Gal-Or and Gal-Or, 2005; Jiang et al., 2006 and Syam et al., 2005), the new communication and information technologies (such as the Internet) has allowed firms to "hyper-target" and tailor products to consumers more efficiently by reducing the costs to screen consumers' preferences. In fact, competition in media markets has started to migrate from traditional mediums (such as paper print or TV) to the Internet (see Gentzkow, 2007).

At the same time, the Internet has increased not only media firms' capacity to customize news products, but also media firms' ability to price discrimination (see Anderson, 2009). First, as noted above, the Internet reduces the costs of gathering information and of targeting products directed to consumers' preferences. In this way, price discrimination is becoming an important tool for media firms which operate on the Internet. Take the example of the online editions of newspapers. The online editions of the most internationally known newspapers (such as The Economist, The Financial Times, The Guardian, Le Monde, The New York Times, Newsweek, The Times, USA Today, The Wall Street Journal) have a non-premium version (that can be accessed free of charge) and a premium version (where readers pay a fee). In the non-premium version, consumers only have access to a very limited range of services (for example, consumers can only read the news headlines). On the contrary, in the premium version readers have access to a larger range of services and news (like opinion articles, the complete version

of the printed edition, the back catalogue and other services)[6].

Following the literature on media bias, we then model consumers' political preferences on the Hotelling (1929) line (see Mullainathan and Shleifer, 2005). Consumers have an ideal-political ideology and they experience disutility when they consume news that does not conform to their views. The Hotelling line, therefore, introduces a demand side driven media bias through consumers' preferences. We allow for supply side driven media bias by assuming that firms' location on the Hotelling line is fixed. Accordingly, media firms will always report biased news according to their fixed political location.

At this point enters customization of political news by media firms. In particular, media firms can choose between a single-ideology strategy (i.e.: a point on the Hotelling line), or a multi-ideology strategy by adapting news to consumer's preferences (i.e.: a line segment on the Hotelling line). We then ask the following question, given that media firms will always report news that conform with their political orientation (which is fixed on the Hotelling line, i.e.: supply side driven media bias), what occurs if the media firms can choose to report more than the single opinion to which they subscribe?

In order to study these issues, we follow Dewan et al.'s (2003) modeling framework of customization in consumer markets. In particular, when a firm decides to customize it has to weight the costs of customization (i.e.: adapting news products to consumers' political preferences) with the benefits of customization (i.e.: price discrimination). Price discrimination opens up the possibility for media firms to extract the full surplus from consumers, and therefore it can also make it more profitable for them to cover different opinions in the market (i.e.: reduce the media bias)[7]. We differ from Dewan et al. (2000, 2003), given that they use the Salop (1979) model while we use the Hotelling one. In our context, the Hotelling model has the advantage of having a straightforward political ideology interpretation in terms of left and right politics.

Our objective is to analyze the effects of competition and news customization on media bias and media provision. In this sense, we analyze whether the incentives to news customization differ under the duopoly and the monopoly market structures. We show that although the incentives to news customiza-

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[6]The other advantage of this strategy, besides price discrimination, is obviously advertisement revenues (see Anderson, 2009).

[7]Our paper is different from the spatial price discrimination literature (see for example Thisse and Vives, 1988; Eber, 1997 and Braid, 2008), where firms offer only one product but price discriminate between consumers at different locations.

tion are stronger under the duopoly case, a monopolist might also end up offering customized news to consumers. We then argue that the competition policy for the media sector should take into consideration not only media concentration issues but also the plurality of political opinions embraced inside a media firm.

The rest of the paper is organized as follows. In the next section, we introduce the basic model of editorial political orientation and define news customization. In the third and fourth sections, we study the monopoly and duopoly cases, respectively. We conclude by discussing our results.

2   The Model

We adopt the demand side driven media bias modeling strategy of Gabszewicz et al. (2001) and Mullainathan and Shleifer (2005), by assuming that political preferences are distributed on the Hotelling (1929) line[8].

We differ from the standard media bias approach of Gabszewicz et al. (2001) and Mullainathan and Shleifer (2005) in two ways. First, in order to introduce supply driven media bias, we assume that media firms' political location on the line is fixed (i.e.: media firms have a fixed political leaning). Second, with the aim of studying the effects of news customization on media bias, we depart from the single-ideology media firms' framework, by considering multi-ideology media firms. Accordingly, single-ideology firms only cover a point on the line, while multi-ideology firms cover a line segment (i.e.: under customization, media firms can choose to offer customized news in terms of political orientation to consumers on the customized line segment)[9].

We then follow Dewan et al.'s (2003) customization set-up for conventional consumer markets and adapt it to media markets. The difference relatively to Dewan et al. (2003) is that while they use the Salop (1979) circle, we use the Hotelling (2009) line. This allows us to give a political interpretation to our media bias model in terms of right and left wing politics.

To assess the effects of competition on media bias, we analyze two market structure cases: monopoly and duopoly.

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[8]Mullainathan and Shleifer (2005), contrary to our paper, add a behavioral framework to the Hotelling model.

[9]The idea to model customization in a continuous spectrum is usually attributed to Mussa and Rosen (1978). However they analyze vertical product differentiation and not horizontal product differentiation as we do.

Consumers' Preferences. As in Hotelling (1929), we assume that consumers are uniformly distributed on a line of length one: $[0, 1]$. The line represents readers' preferences in terms of political opinion. Political orientation is ordered from left to right: 0 far left and 1 far right. We define t as the intensity of the readers' political preferences (i.e.: transport costs in Hotelling). Readers patronize only one media outlet (i.e.: consumers have unit demands). In this way, we introduce demand side driven media bias since readers have an ideal-political opinion and they incur a disutility from buying a newspaper with a different political orientation from their ideal one.

The location of a media firm on the line is interpreted as the newspaper's editorial political orientation. In the duopoly cases, the two editorial firms are labeled as $i = L, R$. We assume that newspaper L is left oriented and newspaper R is right oriented and that the two media firms are located at the opposite extremes of the line: firm L is located at point $x_L = 0$ and firm R is located at point $1 - x_R = 1$ (see figure 1). In the monopoly case, we fix the location of the monopolist at $x = 0$ (figure 1 can then be directly applied to the monopoly cases by disregarding firm R)[10].

With the purpose of considering supply side driven media bias, the political locations of the media firms are exogenously fixed on the line. This case can be seen as a situation where journalists, owners or interest groups determine the political orientation of the media outlet. The objective of this set-up is to analyze if news customization can reduce media bias even when media firms cannot choose political orientation.

To our knowledge, most models that use the Hotelling framework to study media bias assume that media firms can only supply the media market with one political opinion (x_L and x_R, for firm L and firm R, respectively), i.e.: single-ideology media firms. We differ from this approach by opening up for media firms to customize news to consumers' political preferences. Accordingly, in our model firms can become multi-ideology firms by covering different political locations.

We then denote by k_i the media firm's customization scope, which equals the length of the Hotelling line chosen to be customized, i.e.: $0 \leq k_i \leq 1$, with $i = L, R$ under duopoly (or $0 \leq k \leq 1$ under monopoly). Media firms can then decide to adopt a single-ideology strategy or a multi-ideology

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[10]The equilibrium of the game is not qualitatively changed if we assume that the monopolist is exogenously located at any point on the line. The same occurs in the duopoly case if the duopolists are symmetrically located on the line.

strategy. A single-ideology strategy corresponds to a single point on the line (duopoly: $x_L = x_R = 0$; monopoly: $x = 0$), while a multi-ideology orientation corresponds to a line segment (duopoly: $[0, k_L]$ and $[1 - k_R, 1]$; monopoly: $[0, k]$).

With a single-ideology strategy, a media firm only subscribes to one political orientation, i.e.: a media firm offers a standard news product to consumers with different political orientations. In turn, with a multi-ideology strategy, a media firm covers different political ideologies. Accordingly, with this business strategy, a media firm offers customized news to consumers in the customized segment and standardized news to consumers in the standard segment (see figure 1). In other words, consumers in the customized segment pay for news that mirror exactly the political orientation that they subscribe to, while in the standard segment, readers pay for news that are closest to the ideal-opinion to which they subscribe. Below we present the specific customization technology available to media firms.

Denoting a reader's political opinion location on the line as $\bar{x}$, the utility from a reader can then be measured as:

$$U = v - p_i - t\left(\bar{x} - k_i\right), \; i, j = L, R \text{ and } i \neq j \tag{1}$$

Where v is a positive constant and p_i is the price of newspaper i (with $i = L, R$). Given that location is exogenous, in order to simplify the calculations we assume linear transport costs[11]. Furthermore, in the duopoly case, we assume that the parameter v is sufficiently large to ensure complete market coverage. Since in the monopoly case there is only one firm, the utility expression for the monopoly market structure case is obtained by just dropping subscripts.

Technology: News Customization. Media firms produce at constant marginal costs (zero without loss of generality). In spite of being restricted in terms of political orientation, media firms are profit maximizing organizations[12]. In this paper, we are in particular interested in firms' incentives to customize news to consumers' political preferences. When deciding on the news customization efforts, firms face a trade-off between the costs and the

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[11] As shown by D'Aspremont et al. (1979), if location is endogenous, a location equilibrium only exists with quadratic transport costs.

[12] Gentzkow and Shapiro (2006b), provide evidence that at least for the US media market, media firms maximize profits.

benefits of customization. The costs arise through the adaptation of news to different consumers' political preferences and the benefits accrue through the possibility to price discriminate amongst the customized consumers.

Like in Dewan (2003), we assume that in order to customize, firms have to incur a customization cost (C) that equals:

$$C_i = \frac{\gamma k_i^2}{2}, \; i, j = L, R \text{ and } i \neq j \tag{2}$$

Where γ represents the informational and flexibility costs to adapt to the readers' political preferences. In this sense, the customization costs can be seen as diseconomies of scope, given that costs increase with the number of customized products offered[13].

For a better understanding of the customization formalization in the model, some remarks should be made. First, since firm L and firm R are located at 0 or 1, respectively, the media firm L can only customize to the right of 0 and the media firm R can only customize to the left of 1 (see figure 1).

Second, as shown in figure 1, a media firm can have at most two political orientations that are consumed in the standard segment: the duopolist location, $x_L = 0$ and $x_R = 0$ (and $x = 0$ in the monopoly case); and, in the case of news customization, the end point of the customization scope, k_L and $1 - k_R$ (and k in the monopoly case). Accordingly, the location of the firm always represents a standard product since a media firm, independently of news customization, will always deliver the political view mirrored by its location on the line[14].

Third, we assume that the political location of a media firm also determines where on the line it can customize. Accordingly, a newspaper's customization segment is contiguous to the firm's political location (see figure 1). In this sense, the left leaning newspaper (L) cannot customize separately from point $x_L = 0$ (and the same holds for firm R). The reasons for this to occur might be related with either: (1) the political preferences of owners,

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[13]Besides the quadratic costs of customization, Dewan et al. (2003) also have a linear cost of customization. The inclusion of a linear cost of customization in our model does not change our results, and therefore, for simplification we eliminate it from the analysis.

[14]In other words, if a firm customizes, the end point of the customized segment is in practice the only news product that the firm sells to the standard segment. However, since we do not know *a priori* if a firm is going to customize or not, the location of the firm is always considered to be a standard news product, even if *a posteriori* it ends up not being consumed by any consumer as a standard news product.

journalists or interest groups; or (2) technological restrictions, in particular diseconomies of scope. In the first case, owners, journalists or interest groups might not be willing to publish away from their political area. In the second case, it might be too expensive to offer news products that are distant from the firm's ideological location[15].

Finally, given that consumers buy at most one product, in the duopoly cases we need to restrict the customization scopes of the two firms to not overlap. In the monopoly cases such a problem does not arise, since there is only one firm in the market.

The advantage of customization, following Dewan et al. (2003), is the ability to price discriminate. In particular, if firms do not customize news (as in the standard segment), media firms cannot price discriminate between different readers, because consumers' ideal political orientation is not offered. As a result, media firms can only charge the standard product's price p_i, with $i = L, R$.

On the contrary, under customization the media firms can price discriminate, since they offer political news tailored to the consumers' political preferences. Accordingly, in the customized segment the firm can charge the customized consumer the standard product's price (p_i, with $i = L, R$) plus the fit cost of adapting the customized product from the closest standard product. The fit cost equals the distance to the closest standard product times transport costs (t), since firms under customization are able to extract the full surplus from the customized consumer.

Consider the example of firm L (see figures 1 and 2). As we have seen above, firm L can have at most two standardized political opinions (points 0 and k_L) and a series of customized political opinions on the line segment $[0, k_L]$. Suppose that consumer $\bar{x}$ is located in the customized segment $[0, k_L]$ and that the closest standard political opinion is the location of firm L, $x_L = 0$. We then have that $p_L + t\bar{x}$ is the price charged by the news firm L to consumer $\bar{x}$. More generally, under the duopoly game we have[16]:

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[15]For example, to customize away from the newspaper's political core, the media firm might need to hire a complete new journalist staff with knowledge of the opposite political area (conversely, when customization is contiguous to the newspaper's political core, the media firm might be able to continue to use the same staff).

[16]In the case that a firm customizes, it could be argued that the price discrimination scheme should be made in relation to the end point of the customized segment (k_L or $1 - k_R$). Accordingly, a firm could extract higher surplus from the consumers located at the extremes of the line. If we do this however, the duopoly game is not well behaved

$$\text{If } 0 < \bar{x} < \tfrac{k_L}{2} \Rightarrow p_L + t\bar{x}$$
$$\text{If } \tfrac{k_L}{2} < \bar{x} < k_L \Rightarrow p_L + t\left(k_L - \bar{x}\right)$$
$$\text{If } 1 - k_R < \bar{x} < 1 - \tfrac{k_R}{2} \Rightarrow p_R + t\left(\bar{x} - (1 - k_R)\right)$$
$$\text{If } 1 - \tfrac{k_R}{2} < \bar{x} < 1 \Rightarrow p_R + t\left(1 - \bar{x}\right) \tag{3}$$

The price discrimination scheme for the monopoly case is basically the same as for the duopoly case, except for the fact that there is only one firm in the market.

Note that the computation of the revenues from the customized segment can be extremely simplified with the aid of symmetry. Accordingly, as we have seen, if firm L customizes news it has two standard products. Therefore, the customized segment can be divided into two equally sized line segments $\left(\left[0, \tfrac{k_L}{2}\right] \text{ and } \left[\tfrac{k_L}{2}, k_L\right]\right)$. In this sense, in the customized segment, we have two symmetric consumers in terms of distance to the closest standardized news product offered. To see this more clearly, take again the example above. However, suppose now that the closest standard product is k_L (instead of 0). The price of the customized political opinion for this consumer is then $p_L + t\left(k_L - \bar{x}\right)$. However, given the symmetry, for two different readers in the customized segment of firm L, but located at an equal distance from the two standardized political orientations of firm L (0 and k_L), the price is the same; i.e.: if $\bar{x} = k_L - \bar{x}$, then $p_L + t\bar{x} = p_L + t\left(k_L - \bar{x}\right)$.

We can then show that profits in the customized segment for firm L equal (and symmetrically for firm R):

$$\int_0^{\frac{k_L}{2}} \left(p_L + t\bar{x}\right) d\bar{x} + \int_{\frac{k_L}{2}}^{k_L} \left(p_L + t\left(k_L - \bar{x}\right)\right) d\bar{x} = 2\int_0^{\frac{k_L}{2}} \left(p_L + t\bar{x}\right) d\bar{x} \tag{4}$$

Profits for firm L and firm R are then equal to:

$$\Pi_i = p_i\left(D_i - k_i\right) + 2\int_0^{\frac{k_i}{2}} \left(p_i + t\bar{x}\right) d\bar{x} - C_i, \ i, j = L, R \text{ and } i \neq j \tag{5}$$

Where D_i is the demand for newspaper i, with $i, j = L, R$. Accordingly, $D_L = x^*$ and $D_R = 1 - x^*$, where x^* is the reader who is indifferent between

since the SOC for customization is not satisfied.
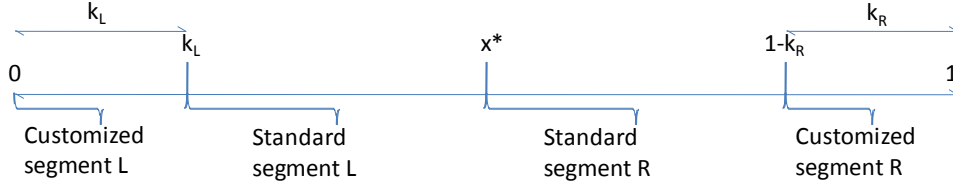
Note: L and R are located at point 0 and 1, respectively. Consumer x* is indifferent between buying from L or R. Point k_L is the end point of the customization scope of firm L. Point 0 and k_L are the standard news of firm L. If k_L=0, L only offers the standard news 0. If k_L>0, L offers customized news to consumers located between [0, k_L] and offers the standard news k_L to buyers in the standard segment [k_L,x*] . Similar interpretation holds for R.
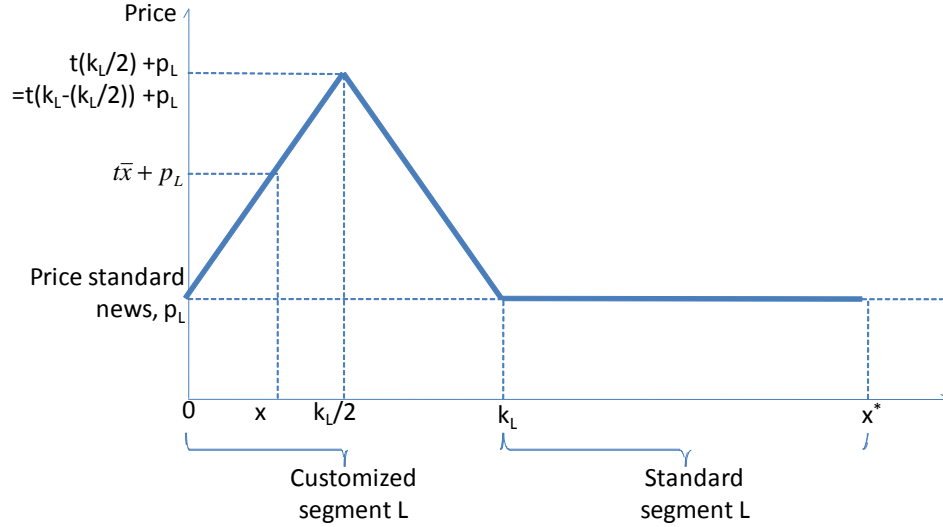
Figure 1: Customization: L located at 0 and R at 1

buying news from firm L or firm R ($D = x^*$ for the monopoly case). The first term in the profit expressions above refers to the revenues from the standard segment, while the second term represents the revenues from the customized segment (see figures 1 and 2).

Timing of the Games. We exemplify the timing of the games by the duopoly case, since the timing in the monopoly case follow directly by ignoring one of the firms. In the first stage, firms choose customization levels (k_i, with $i = L, R$). In the second stage, firms choose prices (p_i, with $i = L, R$)[17]. In this sense, the customization stage is a kind of pre-market stage (like investment in R&D or capacity).

Truth. The central question in the media bias literature is to analyze whether firms have incentives to not report news accurately. In this sense, "truth" can be any point on the line $T \in [0, 1]$. Therefore, media bias in our model arises if the reported news (for firm L point 0, and for firm R point 1) differ from the "true" news, i.e.: if $T \neq 0$ and $T \neq 1$. Given that locations are fixed, there are very high chances that this happens very frequently, unless firms customize news.

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[17]As discussed above the price of the customized product equals the price of the standardized product plus the fit cost.

Figure 2: Price Discrimination: L located at 0

The main idea in the paper is then that news customization can increase the chances of reporting the "truth", because firms report a segment of the line and not only one point on the line. In the next sections we analyze the validity of this claim. We start with the monopoly case and then move on to the duopoly case.

3   Monopoly Market Structure

In the monopoly case, we drop subscripts for firm identity, since there is only one firm. As usual, the model is solved by backward induction, starting by computing the equilibrium price (p) and then the customization level (k).

First, however, we need to find the consumer that is indifferent between buying and not buying the newspaper. The indifferent consumer x^* is the one that makes $v - p - t\left(x^* - k\right) = 0$:

$$D = x^* = \frac{v-p+tk}{t} \qquad (6)$$

Profits for the monopolist are then:

$$\Pi = p\left(\tfrac{v-p+tk}{t} - k\right) + 2\int_0^{\frac{k}{2}} \left(p + t\bar{x}\right)d\bar{x} - C \tag{7}$$

As mentioned above, the first term in the profit expression refers to the revenues from the standard segment, while the second term represents the revenues from the customized segment (see figure 1).

Stage 2: Price. In the second stage, the monopolist chooses the price of the standard news product (p). The monopolist price can be found by maximizing the profit expression (equation 7) in relation to p. The first order condition (FOC) for prices simplifies to:

$$\tfrac{\partial\Pi}{\partial p} = \tfrac{tk-2p+v}{t} \tag{8}$$

Solving the previous equation for p, we obtain the equilibrium price:

$$p = \tfrac{(v+kt)}{2} \tag{9}$$

Note that the second order condition for prices (SOC) is always satisfied since $\tfrac{d^2\Pi}{dp^2} = -\tfrac{2}{t} < 0$.

Stage 1: News Customization. In the first stage, the monopolist chooses the customization level (k). The monopolist customization effort can be found by maximizing the profit expression (equation 7) with respect to k. The FOC for customization, after substituting for p (from equation 9), equals:

$$\tfrac{\partial\Pi}{\partial k} = \tfrac{(v+2k(t-\gamma))}{2} \tag{10}$$

Note that for the SOC for customization to hold we need that $\tfrac{d^2\Pi}{dk^2} = -\tfrac{(2\gamma-t)}{2} < 0$. This is so if $\gamma > \tfrac{t}{2}$.

The monopolist customization level can be found by solving the previous equation for k:

$$k = \tfrac{v}{2(\gamma-t)} \tag{11}$$

It can be easily seen that news customization increases with the intensity of the readers' political preferences (t), but decreases with the informational and flexibility costs to adapt to the readers' political preferences (γ). In addition, $k > 0$ if and only if $\gamma > t$. Therefore for $\tfrac{t}{2} < \gamma < t$, $k = 0$. In this

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sense, when the costs of customization (γ) are lower than the intensity of the readers' political preferences (t), a monopolist does not always customize. Then we have:

$$\text{If } \gamma > t \rightarrow k = \frac{v}{2(\gamma-t)} > 0$$
$$\text{If } \frac{t}{2} < \gamma < t \rightarrow k = 0 \tag{12}$$

Substituting for k from equation 12 in equation 9, we can derive the equilibrium price:

$$\text{If } k = \frac{v}{2(\gamma-t)} \text{ and } \gamma > t \rightarrow p = \frac{(2\gamma-t)v}{4(\gamma-t)}$$
$$\text{If } k = 0 \text{ and } \frac{t}{2} < \gamma < t \rightarrow p = \frac{v}{2} \tag{13}$$

The following proposition summarizes the results for the monopoly game.

Proposition 1 *In a monopolist media market, a monopolist customizes (i.e.: $k > 0$) if $\gamma > t$. However, if $\frac{t}{2} < \gamma < t$ a monopolist does not customize (i.e.: $k = 0$).*

In this sense, if the information and the flexibility costs of customization (γ) are larger than the intensity of the readers' political preferences (t), the monopolist customizes news. When this occurs, media bias is reduced since a larger spectrum of political ideas is covered in the media market. When the reverse arises (i.e.: the information and the flexibility costs of customization are smaller than the intensity of the readers' political preferences), the monopolist tends to not customize. As such media bias is not reduced once only one political opinion finds voice in the media market.

4 Duopoly Market Structure

We now analyze the case of two editorial outlets, $i = L, R$, which are located at point 0 and point 1, respectively.

The consumer who is indifferent between buying from firm L and firm R, x^*, is the one that makes:

$$v - p_L - t\left(x^* - k_L\right) = v - p_R - t\left(1 - k_R - x^*\right) \tag{14}$$

Solving for x^* we obtain:

$$D_L = x^* = \frac{p_R - p_L + t(1 - k_R + k_L)}{2t} \tag{15}$$

Remember from above that $D_L = x^*$ and $D_R = 1 - x^*$.
Profits for firm L and firm R are then, respectively:

$$\Pi_L = p_L \left(\frac{p_R - p_L + t(1 - k_R + k_L)}{2t} - k_L \right) + 2 \int_0^{\frac{k_L}{2}} (p_L + t\bar{x}) \, d\bar{x} - C_L$$

$$\Pi_R = p_R \left(1 - \frac{p_R - p_L + t(1 - k_R + k_L)}{2t} - k_R \right) + 2 \int_0^{\frac{k_R}{2}} (p_R + t\bar{x}) \, d\bar{x} - C_R \tag{16}$$

As in the previous section for the monopoly case, the first term of the profit expressions equals the revenues from the standard segment, and the second term is the revenues from the customized segment (see figure 1).

Stage 2: Prices. In the second stage, firms choose the prices of the standard news product (p_L and p_R). Prices are found by maximizing the profit expressions (equation 16) with respect to p_L and p_R, respectively. The FOC for prices then equals:

$$\frac{\partial \Pi_i}{\partial p_i} = \frac{(t(k_i - k_j + 1) + (p_j - 2p_i))}{2t}, \, i, j = L, R \text{ and } i \neq j \tag{17}$$

Solving $\frac{d\Pi_i}{dp_i}$ and $\frac{d\Pi_j}{dp_j}$ for p_i and p_j (with $i, j = L, R$ and $i \neq j$), we obtain the equilibrium prices:

$$p_i = \frac{t(k_i - k_j + 3)}{3}, \, i, j = L, R \text{ and } i \neq j \tag{18}$$

Again, as for the monopoly case, the SOC is always satisfied since $\frac{d^2 \Pi_i}{dp_i^2} = -\frac{1}{t} < 0$, $i = L, R$.

Stage 1: News Customization. In the first stage, firms choose customization levels (k_L and k_R). The FOC for customization can be shown to equal:

$$\frac{\partial \Pi_i}{\partial k_i} = p_i \left(\frac{\partial D_i}{\partial k_i} + \frac{\partial D_i}{\partial p_j} \frac{dp_j}{dk_i} \right) + \frac{k_i(t - 2\gamma)}{2}, \, i, j = L, R \text{ and } i \neq j \tag{19}$$

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We can see that customization choices are affected by a direct $\left(\frac{\partial D_i}{\partial k_i}\right)$ and a strategic effect $\left(\frac{\partial D_i}{\partial p_j}\frac{dp_j}{dk_i}\right)$. These terms equal:

$$
\begin{aligned}
\frac{\partial D_i}{\partial k_i} &= \tfrac{1}{2} > 0 \\
\frac{\partial D_i}{\partial p_j} &= \tfrac{1}{2t} > 0 \\
\frac{dp_j}{dk_i} &= -\tfrac{t}{3} < 0,\ i,j = L, R \text{ and } i \neq j
\end{aligned}
\tag{20}
$$

While the direct effect of news customization is positive, the indirect effect is negative. The direct effect is positive, since news customization increases profits via price discrimination. In turn, the indirect effect is negative because news customization increases price competition in the standard segment and consequently reduces the profits from price discrimination in the customized segment. Remember that the price on the customized segment equals the price on the standard segment plus the customization cost: if the price of the standard segment is reduced the total price charged in the customized segment is also reduced.

It can be easily seen that the direct effect dominates the indirect effect given that:

$$
\left(\frac{\partial D_i}{\partial k_i} + \frac{\partial D_i}{\partial p_j}\frac{dp_j}{dk_i}\right) = \tfrac{1}{3} > 0,\ i,j = L, R \text{ and } i \neq j
\tag{21}
$$

We can then simplify the FOC for customization (equation 19) by substituting for p_i and p_j from equation 18:

$$
\frac{d\Pi_i}{dk_i} = \frac{t(3 - k_j + k_i)}{9} + \frac{k_i(t - 2\gamma)}{2},\ i,j = L, R \text{ and } i \neq j
\tag{22}
$$

In turn the SOC for customization equals:

$$
\frac{d^2\Pi_i}{dk_i^2} = -\frac{(2\gamma - t)}{2} < 0,\ i = L, R
\tag{23}
$$

Like for the monopoly case, the SOC for customization in the duopoly market structure is satisfied for $\gamma > \frac{t}{2}$.

Solving $\frac{d\Pi_i}{dk_i}$ and $\frac{d\Pi_j}{dk_j}$ for k_i and k_j (with $i,j = L, R$ and $i \neq j$), we obtain the equilibrium customization levels:

$$
k_i = \frac{2t}{3(2\gamma - t)} > 0,\ i = L, R
\tag{24}
$$

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As long as the SOC for customization is satisfied, the duopolists always choose positive levels of customization. Furthermore, as for the monopoly case, news customization increases with the intensity of the readers' political preferences (t); but decreases with the informational and flexibility costs to adapt to the readers' political preferences (γ).

In the duopoly cases, however, we have to assure that the customization scopes do not overlap. It can be shown that $k_i < \frac{1}{2}$ ($i = L, R$) for $\gamma > \frac{7t}{6}$.

Equilibrium prices can be derived by substituting for k_i ($i = L, R$) from equation 24 in equation 18:

$$p_i = t, \, i = L, R \tag{25}$$

The price of the standard product in a duopoly with exogenous choice of location equals then the transport costs.

The following proposition summarizes the results for the duopoly game.

Proposition 2 *In a duopolist media market with exogenous choice of location, the duopolists have symmetric incentives to customize. In particular, a duopolist customizes and its customization segment does not overlap with the rival's customization segment if $\gamma > \frac{7t}{6}$.*

As such, duopolists have stronger incentives to customize than monopolists, given that the latter only customize for $\gamma > t$, while the former always customize. In this sense, a duopoly market structure can reduce the extent of media bias.

5   Discussion

In this paper, we have analyzed the effects of competition on news customization and media bias. We show that, independently of competition, when media firms tailor news to consumers' political preferences, the extent of the media bias can be reduced, since firms cover a larger variety of political opinions. In this sense, competition policy for the media sector should take into consideration not only media concentration issues, but also the scope of the political orientations followed by a media firm.

The scope of the political orientations followed by a media firm can be accessed in two ways. First, competition authorities can analyze the different media products offered by a media group (newspapers, magazines, radio,

television and Internet websites) and their respective political leaning (see Chan-Olmsted and Chang, 2003). A media group would be considered less biased if the different media outlets owned by the media group covered different political areas. Second, a media bias scrutiny can be done on the coverage of political sensible news (see Gentzkow and Shapiro, 2006b). Accordingly, a media outlet that gives different political views on the same piece of news would be labeled as less biased. In this way, competition authorities would be able to evaluate the level of news customization and media bias in a media firm or a media group.

The results obtained here raise some important questions, and therefore their robustness should be checked. In particular, it would be interesting to investigate how news customization interacts with a non-uniform distribution of readers (as for example in Dyck et al., 2008); the quality of the news (see Gentzkow and Shapiro, 2008); and a vertical integration of information providers and information distributors (as in Chipty, 2001).

When consumers' political preferences are non-uniformly distributed, media firms' incentives to customize will depend heavily on the political lean of the majority of the readers. Accordingly, if the majority of the readers are left oriented, firms will have very little incentive to customize political offers on the right-leaning segment of the market (and *vice-versa*). Also when the news can be vertically differentiated in terms of quality (for example soft *versus* hard news) and consumers have higher costs in processing the information related with higher quality hard news, then media firms may be biased to offer lower quality soft news. Similarly, if downstream information providers have no free access to information, upstream information distributors might control what information is passed firstly to downstream information providers and ultimately to the consumers. In our view, given the tendency for media firms to conglomerate in media groups, this might become a problematic issue for media bias and media provision in the near future.

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