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Media Plurality, News Customization and the Intensity of Readers' Political Preferences

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Abstract

In this paper, we study the role of the intensity of readers' political preferences on media plurality and the customization of news. Media plurality refers to the diversity of political opinions with voice in the news market. Customization occurs when firms tailor news to fit consumers' political leanings. We analyze two cases concerning the intensity of readers' political preferences: linear and quadratic disutility costs. These costs reflect the level of disutility a reader experiences when consuming news that do not conform to his/her political views. The difference between linear and quadratic costs is that with the former the intensity of political preferences is stronger than with the latter. We show that the nature of the intensity of consumers' political preferences affects profoundly the firms' incentives to customize news and therefore media plurality. In particular, while under linear disutility costs media firms always customize news; under quadratic disutility costs media firms never customize.

Keywords: Media Bias, Customization, Media Firms, Intensity of Political Preferences.

JEL Classification: L13, L82.

1 Introduction

Media plurality refers to the diversity of political ideas with voice in the news market. When media plurality is limited, we talk about media uniformity. Gabszewicz et al. (2001) refers to media uniformity as *pensée unique* (French for "single thought") and they define it as a "social context in which discrepancies among citizens' political opinions are almost wiped out"¹. Given that the media industry has an important weight in the political process, due to the considerable influence on the public opinion (for evidence see Stromberg, 2001, 2004a, 2004b, Besley and Burgess, 2002 and Eissensee and Stromberg, 2007), in modern democratic societies the consensus is that the plurality of political opinions in the news market is essential for democracy, freedom and free enterprise (see amongst others Mill, 1859 and Hayek, 1945).

The economics literature however shows that media plurality is not as pervasive as we would like to (see Baron, 2006, Besley and Prat, 2006, Gabszewicz et al., 2001, Gentzkow and Shapiro, 2006a and Mullainathan and Shleifer, 2005)². In particular, Gentzkow and Shapiro (2008) argue that there are supply and demand side forces that push against media plurality³. Supply side forces 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)⁴. Demand side forces can emerge as a consequence of consumers' prior beliefs (Mullainathan and Shleifer, 2005)⁵.

³The discussion in Gentzkow and Shapiro (2008) refers not only to media plurality but also to media bias. Media bias can be defined as the bias of the press in the selection of which events are reported and how they are covered. The two concepts, however different, are related. The reason for this is that with higher media plurality, there are more chances that the "truth" finds way in the news market.

⁴Journalists' private information contributes to a problem of asymmetric information. In this sense, journalists can for instance manipulate the privileged information they have to sell more newspapers or for career promotion objectives. Interest groups can use the media firms they control for propaganda and electoral aims. In turn, advertisement mirrors the two-sided nature of the news sector. From one side, advertisers prefer newspapers that sell more and that do not give them "bad" publicity. From the other side, news firms need the ad revenues, which are maximized when they cover a larger audience and they do not hurt the sensibility of advertisers.

⁵The idea is that, since consumers' incur in a disutility cost in reading news that go against their prior beliefs, news firms have incentives to slant news to consumers' political

¹Pensée unique is usually associated with the supremacy of neo-liberalism as an ideology. This is for example expressed by Margaret Thatcher's TINA argument ("There Is No Alternative") or Francis Fukuyama's (1992) thesis on the end of history.

²For 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.

Given the different threats to media plurality in the news market (either because of supply or demand side forces), the main question in the literature has been if competition can increase media plurality. Gentzkow and Shapiro (2008) give an excellent review on the topic. They argue that competition can in principle restrain the supply side forces that push against media plurality. However the same might not be the case for demand side forces.

We start with the supply side forces. 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)⁶. Second, competition augments the number of the media sources that consumers may have access to, and this can allow them to form more accurate beliefs through a combination of information from several sources (Mullainathan and Shleifer, 2005)⁷. Third, competition can conduce to more investment by media agencies in quality and information gathering, in order to beat up competition (Gentzkow and Shapiro, 2008).

When media plurality is weakened by demand side forces, though, the case for more competitive markets is not so clear, since competition can either increase or decrease media plurality (Gentzkow and Shapiro, 2008). In theory, competition might reduce media plurality mainly due to two channels. First, with fierce competition, media firms might have stronger incentives to satisfy generalist consumers' political preferences than under monopoly, given that they do not wish to lose market share to competitors (see Mullainathan and Shleifer, 2005). 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)⁸. Competition, however, may also help to reduce the strength of the demand side forces that push against media plurality. This can occur for instance via the reputation channel (Gentzkow and

preferences in order to maximize sales.

⁶On the influence of interest groups on media firms see also Noam (1987), Schulz and Weimann (1989), Baron (2005) and Bovitz et al. (2002).

⁷The 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).

⁸Hard news refers to political informative news (like the construction of a new airport) and soft news to entertainment news (like the life of celebrities). The idea is that consumers incur in higher costs in processing hard news than soft news (i.e.: soft news are more entertaining than hard news). As a result, media firms find it more attractive to provide soft than hard news, because the former have higher demand than the latter.

Shapiro, 2006a). Accordingly, only competition can provide consumers with 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 increase media plurality, because if a media firm's reputation deteriorates, sales decrease.

The question is then, when in the presence of either supply or demand side forces that push against media plurality, the media market will generate a type of competition that increases the diversity of political opinions. In this sense, we look at an alternative route from competition to reduce media bias: customization of news. Customization of news occurs when firms adapt news to consumers' political preferences.

The motivation to analyze the effects of news customization in media plurality comes from recent competitive trends in the media market, especially the Internet. In fact, competition in the news market has started to migrate from traditional media (such as paper print or TV) to the Internet (see Gentzkow, 2007). As defended by some media experts, similar to what is occurring for other consumer markets, the Internet is changing the way of doing business in the news market, since amongst other things it is boosting media firms' capacity to customize news and to price discriminate (Sunstein, 2006, and Gentzkow, 2007). This is so for two reasons (which apply not only to the media market but also to other consumer markets).

First, as highlighted by the business and the marketing literature, the Internet allows firms to tailor products more efficiently by reducing the costs to screen consumers' preferences (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). In other words, with the Internet it is easier to follow a multi-product strategy that covers different niche segments. At the same time, the Internet increases the firms' ability to price discriminate (Anderson, 2009), since as just noted, the Internet reduces the costs of gathering information and of targeting products to consumers' preferences.

Two important examples of customization in the news market are Google News and the so-called "content farms", such as Associated Content and Demand Media. Google News is an automated news aggregator. With Google News, clients have the option to tailor the issues or newspapers sources that are present to them by creating a personalized page. In addition, e-mails can be sent to subscribers whenever new articles matching their keyword topics' requests come online. In turn, content farms can be defined as websites that produce a large number of specialized news. The content farms chose the news to be created according to an algorithm that tries to predict which news appeal more to readers and advertisers. The contents developed are target to specialized audiences with the intent to capture search traffic that drives ad revenue.

In terms of price discrimination, we have that the online editions of many internationally known newspapers (such as The Economist, The Financial Times, Le Monde, Newsweek, The Times, The Wall Street Journal), typically have a non-premium version that can be viewed free of charge and a premium version where readers pay a fee. In the non-premium version, consumers tend to only have available a very limited range of services (for example, with just the news headlines). In the premium version, readers usually 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).

With the aim to study these issues, we adapt the standard modeling strategy of the media plurality literature, the Hotelling (1929) model, and add the possibility of firms to customize news to consumers' political preferences. In this sense, news firms' political orientation and consumers' political preferences are represented on the Hotelling line (see Gabszewicz et al., 2001). In addition, in order to introduce supply side forces that push against media plurality, we assume that the media firms' political location on the line is fixed. In fact, with this assumption, not only (and independently of customization) a news firm always reports the political opinion mirrored by its fixed political location, but also in the absence of customization this is the only political view that the news firm subscribes to, i.e.: fixed political locations contribute to media uniformity. In turn, consumers are uniformly distributed in the Hotelling line. Each consumer subscribes to an ideal-political ideology and they experience disutility when consuming news, which do not conform to their views.

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). We then ask the following question, given that media firms will always report news that conform with their political orientation (since their location is fixed on the line, i.e.: a supply side force that pushes against media plurality), what occurs if the media firms can choose to report more than the single opinion to which they subscribe to?

In order to model this, we follow the customization set-up for consumer

markets by Dewan et al. (2003). In particular, when a firm decides to customize it has to weight the costs of customization (i.e.: adapting news 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 to cover different opinions in the market (i.e.: increase media plurality). We differ from Dewan et al. (2000, 2003), given that they use the Salop (1979) model, while we rely on the Hotelling one. In our context, the Hotelling framework has the advantage of a straightforward political ideology interpretation in terms of left- and right-wing politics.

With this framework, we intend to complement the dominant interpretation on the role of consumers' preferences on media plurality. In the media plurality literature, consumers' ideological preferences emerge as a force for media uniformity, since it can encourage media firms to reduce their political offer in order to capture more demand (Gabszewicz et al., $2001)^9$. This is only the case, though, since media firms by being single-ideology media firms, they can only supply the market with one political opinion. Things can however be different with multi-ideology media firms. In fact, as discussed above, in the business and marketing literature it is very common the argument that consumers' preferences conduce to multi-product targeting, i.e.: increase in product variety. In other words, with the possibility of multi-ideology media firms, consumers' preferences might be both a force in favor and against media plurality. This can occur because consumers' political preferences can give incentives to media firms not only to cater to a generalist audience (generalist-scale strategy) but also to customize news to satisfy the different political leanings in the market (niche-premium strategy). In fact, we observe in the media market these two tendencies (see The Economist, 2010).

One important issue, however, that has been neglected in both the customization and media plurality literatures is the effects of the intensity of readers' political preferences (i.e.: transport-disutility costs in Hotelling, 1929) on customization and media plurality. It is well established that transport costs are central for having a location equilibrium in the standard Hotelling (1929) model. In particular, a location equilibrium can only arise with quadratic transport costs, but not with linear transport costs (see

⁹In Gabszewicz et al. (2001) firms have incentives to cater to a generalist audience (i.e.: higher demand) since it maximizes advertising revenues.

D'Aspremont, et al. 1979). Similarly, we should expect that the type of the intensity of readers' political preferences (i.e.: quadratic versus linear) will affect firms' incentives to customize¹⁰. This is an important issue because different media markets might have different levels of media plurality, depending on the intensity of readers' political preferences.

The objective of this paper is then to study effect of customization and of the intensity of readers' political preferences (linear *versus* quadratic transport costs) on media plurality. In particular, we are interested in knowing which media strategy emerges in the news market: generalist-scale versus niche-premium. We find that under linear transport costs the niche-premium strategy always dominates the generalist-scale one. However, the contrary occurs under the quadratic transport costs, where the scale strategy always emerges in equilibrium. In this sense, the intensity of consumers' political preferences has an important saying on customization and media plurality.

The reason for this difference results from the economic characteristics of linear and quadratic transports-disutility costs. First, under linear costs, readers have a higher disutility from being exposed to news that differs from their ideal ones than under quadratic costs. Second, the marginal effect of customization on the readers' political preferences disutility function increases faster with quadratic than with linear costs. Third, under linear costs, readers have higher revenues from price discrimination than under quadratic costs. Fourth, the marginal effect of customization on the revenues from price discrimination increases faster with linear costs than with quadratic costs. In other words, linear costs describe consumer markets where the preference for the ideal variety is stronger. As a result, in these markets it is more likely that customization arises in equilibrium. In this sense, the nature of consumers' preferences is a central issue on media plurality.

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 linear and quadratic transport costs cases, respectively. We conclude by discussing our results.

 $^{^{10}}$ We are able to analyze this since we consider that location is fixed, and therefore the equilibrium problem identified by D'Aspremont, et al. (1979) does not arise.

2 The Model

We follow the literature on media plurality, such as Gabszewicz et al. (2001), by adopting the Hotelling $(1929) \mod e^{11}$. In this sense, consumers' political preferences are distributed on the Hotelling line (see figure 1). We differ from the standard media plurality approach of Gabszewicz et al. (2001) in three ways. First, in order to introduce a supply side force that pushes against media plurality, 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 plurality, we depart from the single-ideology media firms' framework, by considering multi-ideology media firms. Accordingly, media firms can choose between a single-ideology and a multi-ideology strategy. Single-ideology firms only cover a point on the line, while multi-ideology firms cover a line segment, i.e.: under customization, media firms offer customized news in terms of political orientation to consumers on the customized segment (see figure 1)¹². Third, we analyze not only the case of quadratic transport-disutility costs but also the linear one, in order to see if firms' customization incentives change with alternative formalization of the intensity of readers' political preferences.

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

Consumers' Preferences. As in Hotelling (1929), consumers are uniformly distributed on a line of length one: [0, 1]. The line represents readers' political preferences (see figure 1). Political orientation is ordered from left to right: 0 equals far left and 1 represents far right. We define t as the intensity of readers' political preferences (i.e.: transport-disutility costs in Hotelling). Readers patronize only one media outlet (i.e.: consumers have unit demands). In this way, readers have an ideal-political opinion and they

 $^{^{11}}$ See also Kaitatzi-Whitlock (1996), Gabszewicz et al. (2006), Ellman and Germano (2009) and Roger (2009).

¹²The 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 here.

incur a disutility cost 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 its 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).

The reason why we fix exogenously the political locations of the media firms on the line is in order to introduce supply side forces that push against media plurality. As discussed in the introduction, this case can arise when journalists, owners, interest groups or advertisers determine the political orientation of the media outlet. The objective of this set-up is to analyze if news customization can increase media plurality, even when media firms cannot choose political orientation.

To our knowledge, the models that use the Hotelling framework to study media plurality assume that media firms can only supply the media market with one political opinion $(x_i, \text{ with } i = L, R)$, i.e.: single-ideology media firms. In this sense, media firms can only follow a generalist-scale strategy, since they will have to sell the same political view to different consumers. We differ from this approach by opening up for media firms to customize news to consumers' political preferences, i.e.: in our set-up firms can become multi-ideology firms by covering different political locations. Then, if firms choose to customize news they pursue a niche-premium strategy.

The introduction of multiple-ideology media firms is interesting, since it allows us to analyze if consumers' preferences pull for media plurality or not. In the standard approach with single politically oriented media firms, consumers' preferences tend to push against media plurality, since it increases the news firms' incentives to cater to a generalist audience in order to capture more demand (see Gabszewicz et al., 2001)¹³.

¹³In the standard framework of the media plurality literature (i.e.: with two singleideology media firms), only the case of minimum and maximum differentiation can be analyzed. In this sense, media uniformity is more extreme under minimum differentiation than under maximum differentiation, since in the former only one political opinion finds voice in the news market, against two in the latter. Note however that even when maximum differentiation emerges, news firms are following a generalist strategy since they supply the whole market with one political opinion. One of the messages in our paper is that it is possible the emergence of stronger scenarios of media plurality than with maximum

In reality, though, consumers' preferences can go either in favor or against media plurality. For instance, media firms might wish to cover different market niches with a multi-product strategy. As mentioned in the introduction, the multi-product targeting is a central issue in the business and marketing literature (see Dewan et al., 2003, Gal-Or and Gal- Or, 2005, Syam et al., 2005, Bernhardt et al. 2006 and Jiang et al., 2006). Supplying different niches segments is however not possible when firms are single product firms. With multiple politically oriented media firms, on the contrary, media firms can supply the market with different political opinions. In this sense, consumers' political preferences can also give incentives to media firms to increase the variety of political opinions with voice in the news market.

To model multi-ideology media firms, we follow the approach by Dewan et al. (2003). In particular, we denote by k_i the media firm's customization scope, which equals the length of the Hotelling line chosen to be customized, i.e.: $0 \le k_i \le 1$, with i = L, R under duopoly. Media firms can then decide to adopt a single-ideology strategy or a multi-ideology strategy. A singleideology strategy corresponds to a single point on the line ($x_L = x_R = 0$), while a multi-ideology orientation corresponds to a line segment ($[0, k_L]$ and $[1 - k_R, 1]$).

With a single-ideology strategy, a media firm only subscribes to one political orientation and therefore it offers standard news to consumers with different political orientations, i.e.: generalist-scale strategy. In turn, with a multi-ideology strategy, a media firm covers different political ideologies and as such it offers customized news to consumers in the customized segment and a standard news to consumers in the standard segment (see figure 1), i.e.: niche-premium strategy. In other words, readers in the customized segment consume news that reflects exactly the political orientation that they subscribe to, while in the standard segment, readers consume news that is closest to their ideal-opinion. Below we present the specific customization technology available to media firms.

In this sense, if a reader x is not located inside the customized segment (i.e.: his/her ideal-opinion is not offered), his/her utility can be measured as:

$$U = v - p_i - \Upsilon(t), \quad i = L, R, \tag{1}$$

where v is a positive constant (which can be seen as the reader reservation price) and p_i is the price of newspaper i. We assume that the parameter v

differentiation, if firms choose to customize news.

is sufficiently large to ensure complete market coverage. In turn, $\Upsilon(t)$ is the readers' political preferences disutility function, which depends in the parameter t. We consider two cases for this function: linear and quadratic transport-disutility costs. In particular, we have:

$$\Upsilon(t) = t \left(x - k_i \right)^{\tau}, \ \tau = 1, 2 \text{ and } i = L, R,$$
(2)

where x is the reader's political opinion location on the line. Obviously, $\tau = 1$ corresponds to the case with linear costs and $\tau = 2$ corresponds to the case with quadratic costs. Independently of τ , however, if a consumer is located inside the customized segment his/her utility is therefore: $U = v - p_i$, since $\Upsilon(t) = 0$ (i.e.: his/her ideal-opinion is offered).

In terms of the differences between the linear and the quadratic case on the utility of consumers located outside the customized segment, we have two patterns. First, we can see that the difference between the readers' political preferences disutility function $(\Upsilon(t))$ under the linear and the quadratic formalization equals:

$$t(x - k_i) - t(x - k_i)^2 = t(x - k_i)(k_i - x + 1) > 0$$
(3)

In other words, under linear transport costs, readers have a higher disutility from being exposed to news that differs from their ideal ones than under quadratic transport costs.

Second, the marginal effect of customization on the readers' political preferences disutility function under linear and quadratic costs is:

$$\frac{\frac{d(t(x-k_i))}{dk_i}}{\frac{d(t(x-k_i)^2)}{dk_i}} = -t < 0$$
(4)

In this sense, customization decreases the disutility of a reader, since by increasing media plurality, it reduces the political distance to the closest political opinion in the news market. However, since $-t - (-2t (x - k_i)) = -t (1 - 2 (x - k_i)) \leq 0$, the marginal effect of customization on the readers' utility function increases faster with linear than with quadratic transport costs (see also the discussion in Neven, 1985)¹⁴. Both types of transport

¹⁴Note that due to the assumption that consumers buy only one newspaper, then in equilibrium the customization scopes of the duopolists can not overlap (more on this

costs, however, convey the idea that consumers have costs of moving in the product-political space.

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 organizations¹⁵. In this paper, we are 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 benefits of customization. The costs arise through the adaptation of news to the diverse political preferences of the consumers. In turn, the benefits accrue through the possibility to price discriminate amongst customized consumers.

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

$$C_i = \frac{\gamma k_i^2}{2}, \ i = L, R,\tag{5}$$

where γ represents the informational and flexibility costs to adapt to the readers' political preferences. In this sense, the customization costs increase with the number of customized products offered¹⁶.

For a better understanding of the customization formalization, 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, in the case of news customization, the end point of the customization scope, k_L and $1 - k_R$. 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

below). In this sense, and given the symmetry in our model, $k_i \leq \frac{1}{2}$. Then the result above follows.

¹⁵Gentzkow and Shapiro (2006b) provide evidence that, at least for the US media market, media firms maximize profits.

 $^{^{16}}$ The customization costs in Dewan et al. (2003) include, besides the quadratic element, a linear part. The addition in our model of a linear element to the cost of customization does not change the results, and therefore, for simplification we eliminate it from the analysis.

by its location on the $line^{17}$.

Third, for simplicity we assume that a newspaper's customization segment has to be contiguous to the firm's political location (see figure 1). In this sense, in the duopoly case the left leaning newspaper (L) cannot customize separately from point $x_L = 0$ and the same for firm R from point $x_R = 0$. The reason for this to occur can for example be due to diseconomies of scope. For instance, by moving contiguously along the line, the firm only needs to incur in the customization costs expressed in equation 5. However, if a firm customizes discontinuously along the line, it has to incur in an extra sunk cost for each new additional location and associated customized segment. This sunk cost might be tough as prohibitive¹⁸.

Fourth, 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 order to guarantee this, we introduce a consumer x^* that is the indifferent between buying news from L or R (see figure 1).

The advantage of customization, following Dewan et al. (2003), is price discrimination. In the standard Hotelling (1929) set-up, the duopolist does not know where consumers are located, and therefore price discrimination is not possible. However, in our model, news firms incur in customization costs to know exactly where consumers are located and their respective political preferences. This is what allows news firms to price discriminate¹⁹.

In particular, if a consumer is not offered a customized news product (as it is the case for all consumers when a firm does not customize or for consumers in the standardized segment when a firm customizes), a news firm

 $^{^{17}}$ 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 in 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.

¹⁸For example, to customize away from the newspaper's political core, the media firm might need to hire a complete new journalist staff and respective administrative structure. Conversely, when customization is contiguous to the newspaper's political core, the media firm might be able to continue to use the same staff and structure.

¹⁹Our paper then differs from the spatial price discrimination literature of Beckman (1976) and Thisse and Vives (1988). In this literature, customization involves a basic product that satisfies consumers' diverse tastes, with the marginal cost of redesign increasing with the distance between the basic product and the buyer's ideal taste. According to Dewan et al. (2003), this modeling strategy is not very suitable to analyze customization in the context of the Internet, where "the notion of a basic product becomes ill-defined and all the planned varieties can be produced equally efficiently".

cannot price discriminate between him/her and the other consumers, because the consumer's ideal variety is not offered. As a result, news firms can only charge to this consumer the standard news' price p_i . On the contrary, if a consumer is offered a customized news product (as it is the case for consumers in the customized segment when a firm customizes), a news firm can price discriminate between him/her and the remaining consumers, since the consumer's ideal variety is offered. Accordingly, in the customized segment the news firm can charge the customized consumer with the standard news's price (p_i) plus the fit cost of adapting the customized news. The fit cost equals the distance to the closest standard product times transport costs (t), once news 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)²⁰. As we have discussed 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 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 $p_L + tx^{\tau}$ is the price charged by the news firm L to consumer x. More generally, we have:

If
$$0 < x < \frac{k_L}{2} \Rightarrow p_L + tx^{\tau}$$

If $\frac{k_L}{2} < x < k_L \Rightarrow p_L + t (k_L - x)^{\tau}$
If $1 - k_R < x < 1 - \frac{k_R}{2} \Rightarrow p_R + t (x - (1 - k_R))^{\tau}$
If $1 - \frac{k_R}{2} < x < 1 \Rightarrow p_R + t (1 - x)^{\tau}, \tau = 1, 2.$ (6)

Note that the computation of the revenues from the customized segment can be extremely simplified with the aid of symmetry. To show this, we continue with the example of firm L. In case of customization, as we have seen, L has two standard products (0 and k_L). Therefore, the customized segment can be divided into two equally sized line segments ($\begin{bmatrix} 0, \frac{k_L}{2} \end{bmatrix}$ and $\begin{bmatrix} \frac{k_L}{2}, k_L \end{bmatrix}$). In this sense, in the customized segment, we have two symmetric consumers in terms of distance to the closest standardized news product

²⁰Note that for illustrative purposes, in figure 2 the curves of the price discrimination scheme in the customized segment are only depicted for the linear case, although in the legend of the figure we consider the general case with $\tau = 1, 2$. In the quadratic case, the curves in the customized segment are obviously not linear but convex.

offered²¹. In fact, suppose that now the closest standard product is k_L , instead of 0 as before. The price of the customized political opinion for this consumer is then $p_L + t (k_L - x)^{\tau}$. 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 $x = k_L - x$, then $p_L + tx^{\tau} = p_L + t (k_L - x)^{\tau}$.

Furthermore, as argued by Dewan et al. (2003), the above pricing scheme is optimal. To show this, suppose again that the consumer x is located in the customized segment $[0, k_L]$ and that the closest standard orientation is 0 (the location of L). Note then that if L charges a price higher than $p_L + tx^{\tau}$, the customization scheme simply collapses. In turn, if the price is lower than $p_L + tx^{\tau}$, L is not extracting the full rent from consumers. If however the price equals $p_L + tx^{\tau}$, readers in the standard segment $k_L < x < x^*$ will choose the standard product k_L , while readers in the customized segment will buy the customized product tailored exactly for them. In this sense, the pricing scheme above is optimal and prevents arbitrage among buyers.

Revenues in the customized segment for firm L then equal (and symmetrically for firm R):

$$\int_{0}^{\frac{k_{L}}{2}} \left(p_{L} + tx^{\tau}\right) dx + \int_{\frac{k_{L}}{2}}^{k_{L}} \left(p_{L} + t\left(k_{L} - x\right)^{\tau}\right) dx = 2 \int_{0}^{\frac{k_{L}}{2}} \left(p_{L} + tx^{\tau}\right) dx, \ \tau = 1, 2$$
(7)

Profits for firm i = L, R are then:

$$\Pi_{i} = p_{i} \left(D_{i} - k_{i} \right) + 2 \int_{0}^{\frac{k_{i}}{2}} \left(p_{i} + tx^{\tau} \right) dx - C_{i}, \ \tau = 1, 2 \text{ and } i = L, R.$$
 (8)

where D_i is the demand for newspaper *i*. Accordingly, $D_L = x^*$ and $D_R = 1 - x^*$. Remember that x^* is the indifferent consumer. The first

²¹When a firm customizes, it could be argued that price discrimination should be made in relation to the end point of the customized segment $(k_L \text{ or } 1 - k_R)$. Accordingly with this, a firm would be able to extract higher surplus from the consumers located at the extremes of the line. Under this set-up, however, the duopoly game is not well behaved since the second-order condition (SOC) for customization is not satisfied. The rationale for this result is that consumers located closer to one extremes of the line could have incentives to buy the closest product from the firm located at the opposite extreme of the line, breaking as a consequence the stability of the equilibrium.

term in equation 8 refers to the revenues from the standard segment, while the second term represents the revenues from the customized segment (see figures 1 and 2).

In terms of the differences between the linear and the quadratic case on the revenues from price discrimination in the customized segment, we have two patterns. First, we can see that the difference between the revenues from price discrimination under the linear and the quadratic formalization equals:

$$2\int_{0}^{\frac{k_{i}}{2}} (p_{i} + tx) \, dx - 2\int_{0}^{\frac{k_{i}}{2}} \left(p_{i} + tx^{2}\right) \, dx = \frac{k_{i}^{2}t(3-k_{i})}{12} > 0 \tag{9}$$

In other words, under linear costs, media firms have higher revenues from price discrimination than under quadratic costs.

Second, the marginal effect of customization on price discrimination under linear and quadratic costs is:

$$\frac{d\left(2\int_{0}^{\frac{k_{i}}{2}}(p_{i}+tx)dx\right)}{dk_{i}} = \frac{2p_{i}+tk_{i}}{2} > 0$$
$$\frac{d\left(2\int_{0}^{\frac{k_{i}}{2}}(p_{i}+tx^{2})dx\right)}{dk_{i}} = \frac{4p_{i}+tk_{i}^{2}}{4} > 0$$
(10)

In this sense, under both linear and quadratic costs, customization increases firms' revenues from price discrimination. Furthermore, since $\frac{2p_i+tk_i}{2} - \frac{4p_i+tk_i^2}{4} = \frac{k_it(2-k_i)}{4} > 0$, the marginal effect of customization on the revenues from price discrimination increases faster with linear than with quadratic costs. As we will see below the previous results have important consequences on the customization patterns of media firms under linear and quadratic costs.

Timing of the Games. In the first stage, firms choose customization levels k_i and in the second stage, firms choose prices p_i , with i = L, R. As discussed above, the price of the customized product is going to equal the price of the standard product plus the fit cost.

Media Plurality. Following Gabszewicz et al. (2001), we interpret media plurality as the diversity of political opinions with voice in the news market. In this sense, the greater the number of political opinions that find expression



Note: L and R are located at points 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 L. Points 0 and k_L are the standard news of L. If $k_L=0$, L only offers the standard news 0. If $k_L>0$, L sells customized news to consumers located between [0, k_L] and standardized 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

in the news sold to consumers, the higher the media plurality. The main idea in this paper is then that news customization can increase media plurality, because when news firms customize, they report a segment of the line and not only one point on the line. In other words, with customization news firms increase the extent of political opinions covered in the news market.

3 Linear Transport-Disutility Costs

In this section, we analyze the production and the customization equilibrium of the linear transport-disutility costs game, i.e.: with $\tau = 1$. As usual, the model is solved by backward induction. Accordingly, we start by solving for prices p_i and after for customization k_i , with i = L, R. The consumer who is indifferent between buying from firm L and firm R, x^* , is the one that makes:

$$v - p_L - t (x^* - k_L) = v - p_R - t (1 - k_R - x^*)$$
(11)

Solving for x^* , and noting that $D_L = x^*$ and $D_R = 1 - x^*$, we get that the demand for firm $i(D_i)$ equals:

$$D_i = \frac{p_j - p_i + t(1 - k_j + k_i)}{2t}, i, j = L, R \text{ and } i \neq j$$
 (12)



Figure 2: Price Discrimination: L located at 0

Profits for firm i are then:

$$\Pi_{i} = p_{i} \left(\frac{p_{j} - p_{i} + t(1 - k_{j} + k_{i})}{2t} - k_{i} \right) + 2 \int_{0}^{\frac{k_{i}}{2}} (p_{i} + tx) \, dx - C_{i}, \, i, j = L, R \text{ and } i \neq j$$
(13)

The first term in equation 13 refers to the revenues from the standard segment, while the second term represents the revenues from the customized segment (see figures 1 and 2).

Stage 2: Prices. In the second stage, firms choose prices p_i , with i = L, R. Prices are found by maximizing the profit expressions (equation 13) with respect to p_i . The FOC for prices equals:

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

$$(14)$$

The second-order condition (SOC) for prices is always satisfied since $\frac{d^2 \Pi_i}{dp_i^2} = -\frac{1}{t} < 0, \ i = L, R$ (all SOCs are in appendix).

Solving $\frac{d\Pi_i}{dp_i}$ and $\frac{d\Pi_j}{dp_j}$ simultaneously for p_i and p_j , we obtain:

$$p_i = \frac{t(k_i - k_j + 3)}{3}, i, j = L, R \text{ and } i \neq j.$$
 (15)

Stage 1: News' Customization. In the first stage, firms choose customization levels k_i , with i = L, R. The FOC for customization equals:

$$\frac{\partial \Pi_i}{\partial k_i} = p_i \left(\frac{\partial D_i}{\partial k_i} + \frac{\partial D_i}{\partial p_j} \frac{dp_j}{dk_i} \right) + \frac{tk_i}{2} - \gamma k_i, \ i, j = L, R \text{ and } i \neq j.$$
(16)

In equation 16, the first term is the effect of customization on the news firm's demand, the second term is the effect of customization on price discrimination and the third term is the effect of customization on costs. Note also that, the effects of customization on the firm's demand (the first term in equation 16) can be divided into a direct effect $\left(\frac{\partial D_i}{\partial k_i}\right)$ and an indirect effect $\left(\frac{\partial D_i}{\partial p_j}\frac{dp_j}{dk_i}\right)$. The term $\frac{\partial D_i}{\partial k_i}$ captures the direct effect of firm *i*'s customization (k_i) on its own demand (D_i) . The term $\frac{\partial D_i}{\partial p_j}\frac{dp_j}{dk_i}$ refers to the indirect effect of firm *i*'s customization (k_i) on its own demand (D_i) , via the impact on the price of the rival firm (p_j) . Therefore, when a firm chooses customization it has to consider the effects of customization on price competition, and not only on demand. It can be demonstrated that the elements of the first term in equation 16 equal:

$$\frac{\partial D_i}{\partial k_i} = \frac{1}{2} > 0$$

$$\frac{\partial D_i}{\partial p_j} = \frac{1}{2t} > 0$$

$$\frac{dp_j}{dk_i} = -\frac{t}{3} < 0, \, i, j = L, R \text{ and } i \neq j.$$
(17)

While the direct effect of customization on profits is positive, the strategic effect is negative. The direct effect is positive, since with customization firms move in the direction of the center of the line, increasing therefore demand for news. In turn, the indirect effect is negative, because customization increases price competition and consequently it also reduces the profits from price discrimination in the customized segment. Remember that the price in the customized segment equals the price of the standard segment plus the customization costs. Therefore if the price of the standard segment is low, the total price charged in the customized segment is also low.

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

$$\left(\frac{\partial D_i}{\partial k_i} + \frac{\partial D_i}{\partial p_j}\frac{dp_j}{dk_i}\right) = \frac{1}{3} > 0, \ i, j = L, R \text{ and } i \neq j.$$
(18)

The FOC for customization therefore simplifies to:

$$\frac{\partial \Pi_i}{\partial k_i} = \frac{1}{3}p_i + \frac{tk_i}{2} - \gamma k_i, i, j = L, R \text{ and } i \neq j.$$
(19)

From here we can derive the SOC for customization: $\frac{d^2\Pi_i}{dk_i^2} = -\frac{(2\gamma-t)}{2} < 0$, i = L, R. Hence, the SOC for customization is satisfied for $\gamma > \frac{t}{2}$. We can then simplify the FOC for customization (equation 16) by substituting for p_i from equation 15:

$$\frac{d\Pi_i}{dk_i} = \frac{t(3-k_j+k_i)}{9} + \frac{1}{2}tk_i - \gamma k_i, \ i, j = L, R \text{ and } i \neq j.$$
(20)

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

$$k_i = \frac{2t}{3(2\gamma - t)} > 0, \ i = L, R.$$
 (21)

Equilibrium prices can be derived by substituting for k_i (i = L, R) from equation 21 in equation 15:

$$p_i = t, \, i = L, R. \tag{22}$$

The price of the standard news in a duopoly with exogenous choice of location and linear transport-disutility costs, then, equals the rate of transportation-disutility, t. More interesting, as long as the SOC for customization is satisfied, the duopolists always choose positive levels of customization (see equation 21). Furthermore, news customization increases with the intensity of readers' political preferences (t), but decreases with the informational and flexibility costs to adapt to the readers' political preferences (γ) .

We have however to assure that the customization segments do not overlap. It can be shown that $k_i \leq \frac{1}{2}$ (i = L, R) for $\gamma \geq \frac{7t}{6}$. In this sense, for $\gamma = \frac{7t}{6}$ the whole political spectrum is cover, since $k_i = \frac{1}{2}$ (i = L, R). This is especially the case when the costs of customization are not too large relatively to the intensity of readers' political preferences. Hence, under certain conditions the news market can give voice to all political opinions. The following proposition summarizes the results for the linear costs case. **Proposition 1** In a duopolist media market with exogenous choice of location and linear transport-disutility costs, the duopolists always customizes and the customization segments never intercept if $\gamma \geq \frac{7t}{6}$.

In this sense, a duopoly market structure with linear transport costs can increase the extent of media plurality. Since customization increases the spectrum of political opinions with voice in the market.

4 Quadratic Transport-Disutility Costs

In this section, we analyze the production and the customization equilibrium of the quadratic transport-disutility costs game, i.e.: with $\tau = 2$. As usual, the model is solved by backward induction. Accordingly, we start by solving for prices p_i and after for customization k_i , with i = L, R. The consumer who is indifferent between buying from firm L and firm R, x^* , is the one that makes:

$$p_L + t \left(x^* - k_L\right)^2 = p_R + t \left(1 - x^* - k_R\right)^2.$$
(23)

Solving for x^* , and noting that $D_L = x^*$ and $D_R = 1 - x^*$, we get that D_i equals:

$$D_i = \frac{p_j - p_i - tk_i^2 + t(1 - k_j)^2}{2t(1 - (k_i + k_j))}, \ i, j = L, R \text{ and } i \neq j.$$
(24)

Profits for firm i are then:

$$\Pi_{i} = p_{i} \left(\frac{p_{j} - p_{i} - tk_{i}^{2} + t(1 - k_{j})^{2}}{2t(1 - (k_{i} + k_{j}))} - k_{i} \right) + 2 \int_{0}^{\frac{k_{i}}{2}} \left(p_{i} + tx^{2} \right) dx - C_{i}, \ i, j = L, R \text{ and } i \neq j$$
(25)

The first term in equation 25 refers to the revenues from the standard segment, while the second term represents the revenues from the customized segment (see figures 1 and 2).

Stage 2: Prices. In the second stage, firms choose prices p_i , with i = L, R. Prices are found by maximizing the profit expressions (equation 25) with respect to p_i . The FOC for prices equals:

$$\frac{\partial \Pi_i}{\partial p_i} = \frac{p_j - 2p_i + t(1 - (k_i + k_j))(k_i - k_j + 1)}{2(1 - (k_i + k_j))t}, \ i, j = L, R \text{ and } i \neq j.$$
(26)

Note that the second order condition (SOC) for prices demands that $(1 - (x_i + x_j + k_i + k_j)) > 0$ (all SOCs are in the appendix). This is a very intuitive SOC, since it simply implies that $(x_i + x_j + k_i + k_j) < 1$, i.e.: the sum of the firms' location and customization levels cannot be bigger than the size of the line segment (of length one) where they compete.

Solving $\frac{\partial \Pi_i}{\partial p_i} = 0$ and $\frac{\partial \Pi_j}{\partial p_j} = 0$ simultaneously for p_i and p_j , we obtain the equilibrium price:

$$p_i = \frac{t(1-(k_i+k_j))(3+k_i-k_j)}{3}, i, j = L, R \text{ and } i \neq j.$$
 (27)

Stage 1: News' Customization. We turn now to the customization levels. To find the equilibrium k_i , we solve the FOC for customization $\left(\frac{d\Pi_i}{dk_i}\right)$. We have that the FOC for customization equal:

$$\frac{\partial \Pi_i}{\partial k_i} = p_i \left(\frac{\partial D_i}{\partial k_i} + \frac{\partial D_i}{\partial p_j} \frac{dp_j}{dk_i} \right) + \frac{tk_i^2}{4} - \gamma k_i, \ i, j = L, R \text{ and } i \neq j.$$
(28)

In equation 28, the first term is the effect of customization on the news firm's demand, the second term is the effect of customization on price discrimination and the third term is the effect of customization on costs. Note that, as for the linear costs case, in the quadratic costs case the effects of customization on the firm's demand (the first term in equation 28) can be divided into a direct effect $\left(\frac{\partial D_i}{\partial k_i}\right)$ and an indirect effect $\left(\frac{\partial D_i}{\partial p_j}\frac{dp_j}{dk_i}\right)$. The term $\frac{\partial D_i}{\partial k_i}$ captures the direct effect of firm *i*'s customization (k_i) on its own demand (D_i) . The term $\frac{\partial D_i}{\partial p_j}\frac{dp_j}{dk_i}$ refers to the indirect effect of firm *i*'s customization (k_i) on its own demand (D_i) , via the impact on the price of the rival firm (p_j) . Therefore, as with the linear costs, with quadratic costs when a firm chooses customization it has to consider the effects of customization on price competition, and not only on demand. It can be demonstrated that the elements of the first term in equation 28 equal:

$$\frac{\partial D_{i}}{\partial k_{i}} = \frac{p_{j} - p_{i} + t(1 - (k_{i} + k_{j}))^{2}}{2t(1 - (k_{i} + k_{j}))^{2}}$$

$$\frac{\partial D_{i}}{\partial p_{j}} = \frac{1}{2t(1 - (k_{i} + k_{j}))} > 0$$

$$\frac{dp_{j}}{dk_{i}} = -\frac{2t(2 - k_{i})}{3} < 0, \ i, j = L, R \text{ and } i \neq j.$$
(29)

Substitute for p_i and p_j from equation 27 in $\frac{\partial D_i}{\partial k_i}$ to obtain:

$$\frac{\partial D_i}{\partial k_i} = \frac{(3-(5k_i+k_j))}{6(1-(k_i+k_j))}, \ i, j = L, R \text{ and } i \neq j.$$

$$(30)$$

At the symmetric equilibrium (i.e.: $x_i = x_j$ and $k_i = k_j$), we have that $\left(\frac{\partial D_i}{\partial k_i}\right)_{Sym} = \frac{1}{2} > 0$. Then like for the linear transport costs case, while the direct effect of news customization on profits is positive, the strategic effect is negative. The direct effect is positive, since with news customization firms move in the direction of the center of the line, increasing therefore demand for news. In turn, the indirect effect is negative, because news customization increases price competition and consequently it also reduces the profits from price discrimination in the customized segment. Remember that the price in the customized segment equals the price of the standard segment plus the customization cost. Therefore if the price of the standard segment is low, the total price charged in the customized segment is also low.

We can show that, contrary to the linear transport costs case, the strategic effect dominates the direct effect given that the first term inside brackets in equation 28 simplifies to:

$$\left(\frac{\partial D_i}{\partial k_i} + \frac{\partial D_i}{\partial p_j}\frac{dp_j}{dk_i}\right) = -\frac{(1+3k_i+k_j)}{6(1-(k_i+k_j))} < 0, \ i, j = L, R \text{ and } i \neq j.$$
(31)

Substituting the previous equation and p_i from equation 27 in equation 28, we obtain the following FOC for customization:

$$\frac{\partial \Pi_i}{\partial k_i} = -\frac{(1+3k_i+k_j)(3-k_j+k_i)t}{18} + \frac{tk_i^2}{4} - \gamma k_i, \, i, j = L, R \text{ and } i \neq j.$$
(32)

News' customization then depresses profits through the decrease in the revenues from the standard segment and through the costs of customization (first and third terms in equation 32, respectively), but increases profits through price discrimination in the customized segment (second term in equation 32). Next, we investigate which effect dominates.

Solution of the Model. The solution of the model is found by solving $\frac{\partial \Pi_i}{\partial k_i}$ and $\frac{\partial \Pi_j}{\partial k_j}$ simultaneously for k_i and k_j , i, j = L, R and $i \neq j$ (equation 32). We obtain four solutions (see appendix). However, only the following one satisfies all SOCs:

$$k_i = \frac{2(2t+3\gamma) - \sqrt{2}\sqrt{6\gamma(4t+3\gamma) + 11t^2}}{3t}, \ i = L, R.$$
 (33)

Given that t > 0 and $\gamma > 0$, then $k_L = k_R < 0$. As a consequence, we have:

$$k_i = 0, i = L, R.$$
 (34)

From equation 34, we can solve for prices to obtain:

$$p_i = t, \, i = L, R. \tag{35}$$

In this sense, in the quadratic transport costs case firms charge the same price as in the linear case. However, contrary to the linear costs case, in the quadratic costs case the possibility to price discriminate via customization does not make it possible to increase media plurality. The following proposition summarizes the results from the duopoly game with quadratic costs.

Proposition 2 In a duopolist media market with exogenous choice of location and quadratic transport costs, the duopolists never customize.

5 Discussion

In this paper, we have analyzed the role of the intensity of readers' political preferences on media plurality and the customization of news. We have studied the cases where consumers face linear and quadratic transport-disutility costs of reading news that do not conform to their political preferences. We have shown that the nature of the intensity of consumers' political preferences affects firms' incentives to customize news and therefore media plurality. In particular, while under linear costs media firms always customize news; under quadratic costs media firms never customize news. These results indicate that the diversity of political opinions in the news market is determined as much as by supply driven media plurality forces (like interest groups, advertising pressures or journalists' private information) as by demand driven media plurality forces (like the intensity of consumers' political preferences).

The rationale for the above result is that the choice to customize news is based on a trade-off between the benefits and the costs of customization (i.e.: price discrimination *versus* the costs of customization). In particular, when media firms decide to customize news, price competition increase, given that media firms compete closer to the political camp of the rival. This in turn, reduces the benefits of price discrimination, since price discrimination depends on the price on non-customized segments, i.e.: the lower the price on non-customized segments, the lower the price on customized segments where price discrimination is in place. It comes out that when the disutility costs are linear, the advantages of price discrimination still compensate for the increased price competition. However the opposite is true under quadratic disutility costs. This is so, since the intensity of readers' political preferences is stronger under linear costs than under quadratic costs.

It is then important to understand the real world behavior of the intensity of consumers' political preferences, given that these are determinant for customization of news and media plurality. Future work should then focus in measuring empirically the intensity of consumers' political preferences and in testing how this interacts with the diversity of political opinions with voice in the news market. This issue is obvious relevant not only for the media market but also for other consumer markets. Therefore, extensions of the analysis carried out here can be applied to other sectors of the economy. However, while diversity in standard consumer markets is mostly in the interest of consumers welfare (given that consumers express preference for variety); diversity in media markets can also be central for the political process and democracy. Accordingly, as discussed in the introduction, diversity of political opinions in the news media is a starting point for diversity of political opinions on the political arena. In addition, we must not forget that freedom of thought is one of the pillars of the capitalism system itself. In other words, in the absence of political diversity, economic diversity (the DNA of the capitalism system) can also be at risk.

A Appendix

Second Order Conditions: Linear Transport-Disutility Costs. The second-order condition (SOC) for prices simplifies to:

$$\frac{d^2 \Pi_i}{d p_i^2} = -\frac{1}{t} < 0, \ i = L, R.$$
(36)

In turn, the SOC for customization equals:

$$\frac{d^2 \Pi_i}{dk_i^2} = -\frac{(2\gamma - t)}{2} < 0, \ i = L, R.$$
(37)

The SOC for customization is then satisfied for $\gamma > \frac{t}{2}$.

Second Order Conditions: Quadratic Transport-Disutility Costs. The SOC for prices simplifies to:

$$\frac{\partial^2 \Pi_i}{\partial p_i^2} = -\frac{1}{t(1 - (k_i + k_j))} < 0, \, i, j = L, R \text{ and } i \neq j.$$
(38)

In turn, the SOC for customization equals:

$$\frac{\partial^2 \Pi_i}{\partial k_i^2} = -\frac{(1-k_j+2k_i)t(3-k_j+k_i)}{9(1-(k_i+k_j))} + \frac{tk_i-2\gamma}{2} < 0, \ i,j = L, R \text{ and } i \neq j.$$
(39)

Solution: Quadratic Transport-Disutility Costs. The quadratic transportdisutility costs game has four solutions:

(1)
$$k_i = \frac{3\left(2t\left(3\gamma + \frac{4}{3}t\right) + \sqrt{2}\sqrt{-t^2\left(2\gamma(52t+63\gamma)+21t^2\right)}\right)}{t^2}$$

 $k_j = \frac{2t(9\gamma+4t) - 3\sqrt{2}\sqrt{-t^2\left(2\gamma(52t+63\gamma)+21t^2\right)}}{t^2}, i, j = L, R \text{ and } i \neq j$

(2)
$$k_i = \frac{3\left(2t\left(3\gamma + \frac{4}{3}t\right) - \sqrt{2}\sqrt{-t^2\left(2\gamma(52t+63\gamma)+21t^2\right)}\right)}{t^2}$$

 $k_j = \frac{2t(9\gamma+4t) + 3\sqrt{2}\sqrt{-t^2\left(2\gamma(52t+63\gamma)+21t^2\right)}}{t^2}, i, j = L, R \text{ and } i \neq j,$

(3)
$$k_i = k_j = \frac{2(2t+3\gamma)+\sqrt{2}\sqrt{6\gamma(4t+3\gamma)+11t^2}}{3t}, i = L, R,$$

(4) $k_i = k_j = \frac{2(2t+3\gamma)-\sqrt{2}\sqrt{6\gamma(4t+3\gamma)+11t^2}}{3t}, i = L, R.$ (40)

The asymmetric solutions (1) and (2) are not possible, since the expressions inside the square root in the numerator are all negative. The symmetric solution (3) does not satisfy the SOC for prices and customization. Only solution (4) satisfies all SOCs (i.e.: $\frac{\partial^2 \Pi_i}{\partial p_i^2} < 0$ and $\frac{\partial^2 \Pi_i}{\partial k_i^2} < 0$).

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