DIGITAL PLATFORMS: DOES PROMOTING COMPETITORS
PROMOTE COMPETITION?
Preliminary, comments welcome

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Abstract

Two-sided markets with multi-homing typically exhibit features of “competitive bottlenecks” whereby platforms compete hard for single-homers while exploiting the multi-homing side. This paper shows that mutual diversion of the single-homing side to competitors can alleviate this bottleneck effect, thereby increasing platform profits. In the online newspaper business these transfers can take the form of mutual promotion of competitors’ content in one’s own articles. In this way, readers of a given newspaper can be partially reached by the advertisement displayed in competing news outlets. On the one hand, this inter-newspaper promotion increases the diversity of content made available to readers. On the other hand and perhaps counter-intuitively, it may soften competition for readers, leading to a decrease in content quality. This may harm readers welfare in the long-run, especially if promotion fees are low. We also show that exchanges may mitigate incumbency advantages and allow entry of more efficient competitors. A large original data set of promoted contents collected on French online newspapers, allows to describe what type of articles are promoted.

Keywords- Two-sided markets, Advertising, Newspapers, Quality, Tacit collusion, Networks, Content discovery platforms

JEL Classification: D21, D43, L13, L82, L86

Novelties:

• Readers single-home, but some “controlled” multi-homing may be allowed by news outlets.

• Inter-newspapers promotion weakens the access bottleneck to readers attention. If promotion fees are low, reader surplus decreases in the long-run.

• Newspapers may preferably allow less-than-average-quality articles from competitors. It limits the pro-competitive effect of information.

1 Introduction

Millions of viewers visit online newspapers every day, making them a major component of the internet business. Such websites typically generate revenue through advertising or sales referral. Consequently, their success depends crucially on the amount and quality of traffic they can attract on their own platform. A rather intriguing fact is that despite intense competition, newspaper sometimes refer to each other. Indeed, readers of online newspapers probably noticed that some content from other information providers were displayed at the end or on the sides of their articles (see illustration in figures 1 and 2). The frame that displays them is often named “content you may like”, “you may be
interested by” or “also on the web”. This content is provided by an intermediary, the Content Discovery Platform (CDP). Careful readers also probably noticed that some of the promoted content, comes from direct competitors of the initial newspaper. This practice is very widespread, as Appendix A.1 shows.

Referrals to competitors are not a new phenomenon in the media industry. In reality, media were born with such referrals. Le Guellec (2016) is very instructive on this point. The author notices that back in the 18th century, freshly-born literary journals would persistently refer to one another in their publication. It could take the form of what we would today call “referee reports” on competitors articles, replication of content, but also outright publicity for other journals. At a period when the press was highly specialized, and only a limited group of rich people could access such information, this was seen as a way to increase own quality, and overall readership, without risking to lose readers. These inter-newspaper references have largely persisted over time. Cagé et al. (2016) estimates that 70% of the documents in their sample of French news media collected in 2013 present at least some external copy. Closer to our precise application, the New York Times published in 2006 an article named “Newspapers to Use Links to Rivals on Web Sites”. They noted that providing news from competitors was a new phenomenon, meant to be a response to the competitive pressure induced by new aggregators. The article also stressed it helps provide diversity to readers, keeping them connected for a longer period. It also notes that “these deals are but one indication that newspapers may be reconsidering long-held beliefs about how to compete, and cooperate, with other publishers”.

It may be surprising at first sight that newspapers let competitors advertise “foreign” content on their own (“local”) platform. Indeed, providing readers with information on the quality of other platforms may be pro-competitive, inasmuch as it may reveal to readers that a competitor provides a service that fits better their preferences. However, we argue that –perhaps against intuition– such inter-newspaper promotion may soften competition, leading to a decrease in content quality and increased newspaper profits. Despite increased diversity, reader surplus may be reduced. We recommend that promotion fees be set at a relatively high level, even though the marginal costs of inter-newspaper promotion may be close to zero.

Some illustrative screen captures of Outbrain in Le Monde and Libération.

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1 popular CDPs include Outbrain, Taboola, Ligatus, Contenza, Informs.
2 see http://www.nytimes.com/2006/07/31/technology/31ecom.html
This paper considers the case of online medias that provide access to information for free and monetize their products (articles) through advertisement. They collect two streams of revenues. First, commercial advertisement—simply referred to as “advertisement” hereafter—corresponds to links or frames embedded in the article webpage, that encourage the purchase of some good. Second, news outlets may display content from other information outlets—and charge them if a reader clicks on these links. We refer to such links as “promoted” links. The promotion business is far from being negligible. The two leading CDPs claim they reach more than 500 million people each month and generate over 200 million dollars of revenues per year\(^3\).

In our model, readers have an intrinsic preference for a given news outlet, which they elect as their “anchor” newspaper. A possible motivation for this, it that readers seek news outlets that conform to their own political inclination. The anchor newspaper of a reader, is the information source that he uses the most. News outlets therefore constitute a competitive bottleneck with respect to advertisers: the former are very valuable to the latter, from whom surplus can extracted. Therefore, it makes sense to subsidize readers (e.g. by providing free high-quality articles) to attract them to a given newspaper and then extract value from advertisers.

This paper shows that by promoting the content of competitors, newspapers can alleviate (to their benefit) the “competitive bottleneck” effect. The basic intuition is that thanks to these transfers, newspapers will have to compete less hard for anchored readers. Indeed, if a reader chooses to change anchor newspaper, e.g. because the quality of its current anchorage newspaper is too low, the latter can still get her to visit his website from time to time, through promoted links. This means advertisers still have access to this reader, despite her having changed anchor site. In other words, with promoted links readers become less precious in the eyes of newspapers who get a “second chance” to reach readers they have lost in the competition phase, that aimed at getting readers to elect one’s own newspaper as their anchor newspaper. Thus, newspaper can afford to put less effort in attracting them—i.e. they can lower quality at less cost.

The remainder of the paper is organized as follows. Section 2 reviews the literature relevant to the present analysis. Section 3 provides a simple model with specialized advertising, showing that complementarity between contents may trigger inter-newspaper promotion. We also show this promotion may discourage newspapers to produce content quality, resulting in a potential loss of reader surplus, especially for those with strong preferences. To have a more complete picture of the effects of such interactions, Section 4 shows exchanges make entry more efficient. Section 5 provides an empirical analysis of these inter-newspaper promotions, based on a unique set of data covering the articles and promoted contents of 40 french newspapers. After a presentation of our extensions and a discussion of our results in Section 6 , Section 7 concludes.

### 2 Literature review

This article relates to at least three streams of literature.

First, its formalism is one of two-sided markets. The topic has gained much interest since the early 2000s and the progresses in information and communication technologies. Seminal papers include Rochet and Tirole (2003), Caillaud and Jullien (2003a), Parker and Van Alstyne (2005), Armstrong (2006), or Hagiu (2006). Of this large literature, the discussion on multi-homing is particularly relevant to the present paper. A key distinction, often taken as an assumption, is whether consumers single home (i.e. they participate at most to one platform), or may multi-home. The present paper takes a somewhat intermediary stance. Albeit allowed to multi-home, in equilibrium readers single-home when it comes to choosing their anchor site, which is their main source of information. Then, inter-newspaper promotion allows them to sometimes roam to a competing news outlet, meaning they effectively become multi-homers. However, this multi-homing remains controlled and agreed by all parties: the newspapers (whether they publish the links, or submit them) and the readers. Arm-

strong and Wright (2007) exposes how multi-homing may arise, and shows that platforms would have an incentive to sign exclusive contracts with multi-homers. Our conclusions differ, in the sense that newspaper strive to enforce multi-homing. Multi-homing is shown to increase price to multi-homers in Armstrong and Wright (2007). This is coherent with the effect we describe here, but with a very different motivation: in Armstrong and Wright (2007), prices increase because platforms no longer compete directly, but against the outside opportunity of consumers (which is to stop using the platform). In the present paper, they still compete head-to-head for anchored readers, but share part of their viewership. In the advertisement literature, Ambrus et al. (2016) and Athey et al. (2012) show that competition for attention means multi-homing readers may be less valuable to advertisers. Including this effect may dampen the magnitude of our results – without invalidating them.

The paper also connects to network formation in media. Ma (2010) and Kozinets (2008) explain network formation by a motivation to create “virtual shopping malls” whereby readers are guided in a net of outlets. Ma (2010) empirical work describes how developers link to one another. He finds that, rather surprisingly, limiting links may increase overall viewership substantially. Links are however motivated by a “promote-the-promoter” effect, whereby content producers strive to secure a central part of the network readers are navigating. In the present paper, links are prompted by a need to provide diversity of content, and the appeal a remuneration per click. Ma (2010) finds that incoming links have a positive effect on content production. The present research challenges this finding by introducing a form of multi-homing. Katona and Sarvary (2008) is among the first to analyse network formation on the web as directed graphs. However, there is no consumer heterogeneity and links are established without considerations on whether it directs to competitors or not, which is a key element of the present paper. No analysis of the impact of links on quality or vice-versa is carried out. Mayzlin and Yogyanrsimman (2012) study a blogger’s strategic decision to link or not link to a competitors blog. Their work is focused on capturing a blogger’s local link formation decision and does not attempt to analyze the system-level consequences of such decisions on network structure, content quality, and systemic outcomes. Notably, Dellarocas et al. (2013) examines interdependent content and link formation decisions between blogs. They find that in the case of homogeneous costs, the only pure equilibrium result is either no linking, or blogs separating into two groups. One creates quality content, and the other one creates no quality but merely directs his readers to blogs of the first group, taking advantage of “shallow” readers only interested in the summary provided by the inefficient outlets they have been randomly assigned to. This assumption is realistic in the case of blogs, but much less so in the case of general news outlets, where one can assume readers are reasonably well informed about the variety of news outlets at their disposal, and their associated quality. In the present paper, readers have an intrinsic interest for each type of newspapers, meaning each outlets caters at least to its “natural” readership. Links are reciprocal and quality is symmetric, an insight we may argue is closer to observations, in the case of national newspapers. Ellman (2016) shows inter-newspaper promotion can be used to signal the quality of peers. They argue that the online environment reduces the pressure to group up along with entry costs, meaning less quality signalling is available to reader. The present paper also shows that promotion may induce a network effect, whereby readers evolve in a net of news outlets. However, and conversely to Ellman (2016), we find that the matching may not be assortative, which mitigates the substitution effect of such promotion.

We also address the crucial question of entry in platform markets, first tackled by and Katz and Shapiro (1985). Farrell and Klemperer (2007) notes that “consumers’ expectations may naturally focus on established firms, so entry with network effects [is] hard”. In particular, Eisenmann et al. (2011) note that in markets with network effects entrants “generally must offer revolutionary functionality to win substantial market share”. The authors suggest an alternative entry path independent from Schumpeterian innovation, whereby a new platform would bundle the network good with another one in order to “envelop” an incumbent’s consumer base. This concept is developed and formally analysed in Llanes et al. (2016). We propose another path of entry that exploits the fact information is non-rival and can therefore be replicated and exchanged at no cost. We find exchanges may render a divide-and-conquer strategy realisable. Halaburda and Jullien (2016) analyses entry in
a game with repeated interaction. In finite-horizon, they show that a unique equilibrium exist and is efficient if platforms are sufficiently patient. We also find that patience helps reaching efficiency. However we abstract away from repeated interaction to focus on the dynamics of a divide-and-conquer strategy when quality is also a decision variable. Biglaiser and Crémer (2016) observe inefficient entry in a framework with heterogeneity in consumers’ ability to switch platform.

Finally, the present paper is related to the advertisement literature. While the above-mentioned papers technically assume all views yield the same value to the news outlet, effectively making views a numéraire, George and Hogendorn (2012) explicitly include heterogeneous advertisers and model their behaviour. Similarly to our setting, advertisers may be interested in reaching the audience of a specific news outlet. The authors assess the impact of news aggregators and search engines on advertisers strategies. A common result with our findings is that aggregators may decrease the value of targeting. However, readers don’t endure any disutility from advertisement, a feature at odds with most of the literature. Also, the number of single homers is assumed to be exogenous and fixed, as is the quality of content. Even though we don’t model aggregators per se, inter-newspaper promotion shows similarity with aggregators, in that it helps provide diversity of content to readers. Contrary to aggregators, the suggestions are imbedded in the newspapers’ articles, and the latter have a veto right on what to suggest. Some literature (Dellarocas et al. (2013); George and Hogendorn (2012); Jeon and Nasr (2016); and Calzada and Ordóñez (2012)) address the trade-off between the substitution and market expansion effect of aggregators. Several empirical studies show aggregators do increase traffic to news outlet (Chiou and Tucker (2011)), and benefits in particular the specialized outlets (Calzada and Gil (2016)). Our findings provide support for this hypothesis. Similarly to our paper, Ambrus et al. (2014) endogenize multi-homing decisions, in a setting where outlets care not only about the quantity of views, but also about the composition of the viewership. A duplication effect means multi-homers are less valuable to advertisers and in turn to outlets. They also highlight a pernicious effect of business sharing: competing outlets become less wary of increases in advertising levels when readers multi-home, since marginal consumers are less valuable. The present paper adds to the burden, by putting in light a different issue brought about by business sharing: readers become less precious, since a lost consumer can be partially recovered through inter-newspaper promotion.

A key addition to the previous literature, is that inter-newspaper promotion is not free. The CDP charges a fee to promoters, a portion of which is returned to the publisher. These fees, and the level at which they are set, will have important implications for the quality outcome in equilibrium.

3 Impact of inter-platform exchanges on equilibrium quality and surplus

Throughout this paper, we examine the case of two differentiated online newspapers 1 and 2, competing for readers. Readers are uniformly distributed on a unit Hotelling line of parameter $t$. Each newspaper is located at one extremity, and $x$ represents the distance of a reader to newspaper 1. The lower $x$, the closer newspaper 1 is to the preferences of the reader. The parameter for taste heterogeneity $t$ may for example represent how similar the newspaper and readers’ political inclination are. Both newspapers offer only free content, meaning the two newspapers compete in quality. For simplicity, we assume that each newspaper has exactly one advertising slot, which he allocates to advertisers in exchange for a payment. Doing so, the news outlets aim at maximizing revenues, while making sure the nuisance of advertisement is not so large as to discourage readers from choosing it as their “anchor” newspaper. The anchor newspaper of a reader, is the newspaper she starts reading news with. It is her main source of information, but she may from time to time “roam” to other news sites, clicking through links suggested in the anchor website by the CDP.
3.1 Base model

The four paragraphs below explain in more detail the role of each of the four stakeholders, respectively the advertisers, the CDP, the readers and the newspapers.

Advertisers: In the base model, we assume the willingness to pay is modelled in the simplest possible way. The willingness to pay of advertisers in news outlet 1 and 2 to reach a reader located in \( x \), denoted \( WTP_1(x) \) and \( WTP_2(x) \) respectively are constant, set at a positive level \( V \):\[
WTP_1(x) = WTP_2(x) = V
\]

We assume that news outlet have full bargaining power over advertisers, meaning each impression is worth \( V \) to them, independently of the readers location on the hotelling line. Section ?? relaxes this assumption by allowing advertisers to value readers depending on their distance to the news outlet.

Content Discovery Platform: The CDP acts as a go-between relating an anchor news outlet (say newspaper \( i \)) with a promoting news outlet (newspaper \( j \)). The CDP is remunerated on a per-click basis. If an reader anchored in \( i \) clicks on some content of outlet \( j \) promoted in outlet \( i \), the outlet \( j \) pays \( F \) to the CDP, and the CDP pays back \( f \) to the anchor website \( i \). \( F - f \) is the remuneration of the CDP. To keep the model simple, the CDP is not assumed to follow any specific strategies. Instead, \( F \) and \( f \) are considered exogenous, with the only constraint that the CDP must make non-negative profits: \( F \geq f \). We will discuss how \( F \) and \( f \) affect the outcome of the model. While our model does not require a more precise modelling of the CDP the interested reader will find a more detailed description of CDPs in Appendix A.2. The pricing strategy of the CDP is analysed in more details in section E.

Readers: Readers are looking for interesting stories to read, preferably from the “closest” newspaper – i.e. the one that fits their type best. Each newspaper produces in expectation \( K \) interesting stories. There are \( k \) interesting stories that have been missed by a given newspaper, but have been captured by the other one. This means there are in total \( K + k \) stories, of which each newspaper found only \( K \), of which \( K - k \) is common to both newspapers and \( k \) is original. In the present paper, \( K \) and \( k \) are exogenous and will be used as a measure of the extent of roaming (measured by \( k \)) relative to anchored readership (measured by \( K \)).

A reading session unravels as follows. Readers first choose their “anchor” newspaper, which is the platform they start with. If the topic is indeed new to the reader – which happens with probability 1 in the anchor site since this is the places readers start from– readers read it. Doing so, they enjoy quality \( q_i \) for each article they read on platform \( i \). This surplus is discounted by a transport cost \( t \) by unit distance to the newspaper, meant to reflect each readers’ intrinsic preference for specific platforms. For simplicity of the base model, we assume readers endure a constant dis-utility of advertisement, normalized to zero.

The role of CDPs is to provide anchored readers with the \( k \) interesting stories the anchor newspaper has missed, but that were captured by the other newspaper. For simplicity, we assume that the CDP’s algorithm is able to provide stories that are not mere duplicates of what the readers have already read in the anchor newspaper. This means only new content is provided. If the reader were to ignore the CDP and directly visit the other newspaper home page to find new content (thereby becoming a multi-homer), he would have to screen content in order to identify the \( k \) topics he has not read about yet. Indeed, the home page of the foreign news outlet would show not only the \( K - k \) stories the reader has already read in her anchor newspaper. The CDP allows to do the screening in a costless manner for readers. In this section we assume \( s \) is so large that readers would not roam absent a CDP. This assumption is relaxed in Appendix C. Keeping it positive ensures that multi-homing, albeit allowed, does not arise in equilibrium: readers select one and only one anchor newspaper, and use the CDP to save the duplicated selection costs incurred if they visit the home
pages of both newspapers. This feature is coherent with observations that readers often use only a very limited number of information sources\(^4\).

The utility of a reader located at distance \(x\) of platform 1 and \(1-x\) of platform 2 is:

If the reader anchors in 1:

\[
U^1 = \bar{U}_r + (q_1 - tx)K + (q_2 - t(1-x))k
\]  

(1)

Symmetrically, if the reader anchors in 2:

\[
U^2 = \bar{U}_r + (q_2 - t(1-x))K + (q_1 - tx)k
\]  

(2)

We take \(\bar{U}_r\) large enough so every reader wants to read news and the market is covered with \(n^2 = 1 - n^1\). In each utility function, the second term corresponds to surplus generated by reading news in the anchor website. The last term, corresponds to surplus created by roaming. We also assume that that all readers get positive surplus from reading any article, even from the newspaper least close to their preferences. This requires that the transport costs is not too high: \(t < \sqrt{\frac{KV}{4c}}\). This assumption will be maintained throughout the paper for simplicity, but assuming it away wouldn’t alter any of the insights of the paper. With these utility functions, the number of readers anchored in 1 is:

\[
n^1 = \frac{1}{2} + \frac{q_1 - q_2}{2t}
\]

Note that this corresponds to the results of a standard Hotelling model.

**Newspapers:** The newspapers invest in quality \(q_i\), at increasing marginal costs \(cq_i\). For simplicity, we assume newspapers extract all surplus from advertisers. It is easy to show that in equilibrium each advertiser \(i\) will be advertising in its core newspaper \(i\). Newspapers aim at maximising profits:

\[
\Pi^1(q_i, q_j) = K \int_0^{n^1} WTP_1(x)dx + n^1fk + n^1(\int_1^{n^1} WTP_1(x)dx - (1 - n^1)Fk - cq_i^2)
\]

(3)

The profits of newspaper 2 are symmetric. The first term corresponds to revenues derived from anchored readers: the advertising revenues, and the reward \(f\) paid by the CDP if readers click through a promoted link. The second term represents the advertising revenues extracted from roaming readers, minus the promotion fee \(F\) that was paid in order to attract them. The third term is the cost of providing quality.

### 3.2 Quality in equilibrium

After some calculations, we find that the unique symmetric equilibrium quality is:

\[
q(K, k) = \frac{VK + (F + f - V)k}{4ct}
\]

\(^4\)Ofcom notes that 60% of news consumers in the UK use only one or two information sources: \url{https://www.ofcom.org.uk/__data/assets/pdf_file/0020/77222/News-2015-report.pdf}
Denoting \( q^* \) the equilibrium quality when there is no inter-newspaper promotion:

\[
q^* = q(K, k = 0) = \frac{VK}{4ct}
\]  

(4)

The equilibrium quality can be expressed as:

\[
q(K, k) = q^* - \frac{(V - F - f)k}{4ct}
\]  

(5)

Thus, if \( f \) and \( F \) are small, competition for readers is softened and quality decreases. Indeed, even if a reader switches anchor newspaper, the losing newspaper can still recover some viewership through promoted links. This effect is mitigated by the fee \( F \) he has to pay to the CDP per click. Then, inter-newspapers promotion constitutes an incremental source of revenues, meaning the value of an anchored reader increases from \( V \) when there is no inter-newspaper promotion to \( V + fk \), when there is. This effect is pro-competitive, in the sense that anchored readers become more valuable to newspapers who in turn will increase their efforts to attract them.

Technically \( F \) can lie between 0 and \( \bar{F} \equiv V \): below 0, the CDP would be enduring losses. \( \bar{F} \) is the expected value of a roaming reader: above \( \bar{F} \), no newspaper would be willing to promote his content since promotion costs would exceed expected advertising profits. \( f \) can lie anywhere in \([f = 0, F]\). Outside these boundaries either the publishers or the CDP would be making losses. Note however that these boundaries hold if the newspapers are somewhat myopic and ignore the longer-run effect of promoting links in rivals articles in terms of increased or decreased anchored readership. Indeed, in the long-run, providing content in a rivals’ articles increases the incentives fringe readers may have to anchor in the rival website via the roaming term in readers utility (1) and (2). Taking these perspectives, all boundaries are shifted on the left, meaning a promoter is less willing to pay for roaming readership (\( \bar{F} \) decreases), to compensate for a loss in anchored readers, while publishers may accept lower fees (\( f \) decreases), since foreign content increases their anchored readers surplus. See Appendix B.1 for a detailed exposition.

Equation (5) shows there can be an increase or a decrease in quality, depending on whether \( F + f \) is above or below the value a marginal reader yields to advertisers when it roams to the competing newspaper \( \bar{F} = V \).

### 3.3 Surplus considerations

**CDP profit:** A CDP want to maximize its margin \( F - f \) under the constraint that there is inter-newspaper advertisement. Its profit is: \( \Pi_{CDP} = (F - f)k \). A monopolistic CDP with full bargaining power would set \( f = \hat{f} \) and \( F = \bar{F} \), so that the margin is maximized, under the constraint that newspapers accept the deal. A more detailed analysis of CDPs strategies when there is competition is carried out in section E.

**Reader surplus:** On the one hand, reader surplus is increased due to an increased diversity of content. However on the other hand, the quality effect, if negative, can offset or even exceed the diversity effect, potentially resulting in an overall loss of reader surplus.

Let us compare the utility of readers anchoring in newspaper 1, when they can access content from the competitor (\( k > 0 \)), to the utility when they can’t (\( k = 0 \)). Using (5):

\[
u_1(x, k) = u_1(x, 0) - K \left( \frac{V - F - f}{4ct} \right) k + k \left( q(K, k) - t(1 - x) \right)
\]

The case of readers anchored in 2 is symmetric. Readers incremental utility is increasing in \( x \): Indeed, the readers least well matched with their anchor website are those who benefit most from diversity,
Figure 3: Incremental reader surplus when there is inter-newspaper promotion, as a function of the preferences of readers. Each line corresponds to a given value of $F + f$ since they enjoy foreign content relatively more. Conversely readers at the extremities of the Hotelling line don’t benefit much from this inter-newspaper promotion, as they have to incur a large “transport” cost.

Plugging the value of $q_i$, the incremental utility of a reader located at $x$ is:

$$u_1(x, k) = u_1(x, 0) + \frac{k}{4ct} \left( (F + f)(K + k) - Vk \right) - kt(1 - x)$$

A first immediate result is that taking $f = F = 0$ (i.e. inter-newspaper promotion is priced at marginal cost), results in a decrease in utility for all readers, despite the increase in content diversity. Interestingly, this is true for all readers, including those with weak preferences ($x = \frac{1}{2}$), who are those who enjoy foreign content the most. It is worth at this stage noting that $f = F = 0$ yields the same quality outcome as if readers would visit both newspapers without using the CDP. This corresponds to a case when readers multi-home. We therefore recover the typical result that multi-homing softens competition (see e.g. Armstrong (2006) or Rochet and Tirole (2003)). The present multi-homing is however partial: readers only read the $k$ unique articles of the news outlet they roam to. Increasing $f$ will increase the marginal value of anchored readers, and increasing $F$ will increase competition between the two newspapers. Hence increasing either of both of them monotonically increases reader surplus. Taking them such that quality remains unchanged $(f + F = \bar{F})$ yields that all readers get an increment in surplus compared to the case with no promotion $(k = 0)$.

Thus, a social planner willing to maximize quality, or reader surplus should encourage such inter-newspaper promotion, and promote high fees $f$ and $F$. This is true even if the marginal cost of providing such promoted links is 0. Figure 3 illustrates the effect of $f$ and $F$ on reader surplus.

**Newspaper profit:** Denoting $\Delta_q$ the decrease in quality subsequent to the implementation of inter-newspaper promotion we find that:
\[ \Pi^1(q_i, q_j, k) = \Pi^1(q_i, q_j, 0) + \frac{1}{2}k(V - F + f) - c\Delta_qq(2q^* - \Delta_q) \]

It is easy to show that taking \( F = f = \bar{f} \) maximises the profits of newspapers (see Appendix B.2).

**Social surplus:** A social planner may not want to weight all agents equally. In particular there are reasons to think he may be biased against the CDP. Indeed, CDPs are often criticized for providing poor quality content, which may explain why a social planner may not weight their profits equally to readers surplus. Also, the two biggest CDPs are based in a small country (namely, Israel), meaning they essentially operate in foreign countries, regulated by national bodies. The latter may be less inclined to cater to foreign advertisement firms, than to local newspapers or readers. Hence, we allow the weight \( \lambda \) of CDP’s profits in the objective function of the social planner to be smaller than 1: \( 0 \leq \lambda \leq 1 \).

By assumption, advertisers make zero profits. Recalling that the surplus of advertisers is captured by newspapers, the social surplus is the sum of reader surplus, newspaper profits, and (potentially derated ) CDP profits:

\[
W(k, f, F) = \int_0^n u_1(x, k)dx + \int_1^n u_2(x, k)dx + \int_0^n WTP_1(x)kdx + \int_1^n WTP_2(x)kdx + \int_0^n WTP_1(x)K + WTP_2(x)Kdx - cq_1^2(f, F) - cq_2^2(f, F) - (F - f)(1 - \lambda)
\]

(6)

Where \( q_1 \) and \( q_2 \) are given by equation (5). One can show that in most reasonable cases the objective of the social planner is aligned with the objective of the reader, for all \( \lambda \in [0, 1] \) (see Appendix B.3). That is, the optimal fees (constrained by the participation of all agents) are \( f = F = \bar{f} \). Rather surprisingly, we also find that even if the social planner is biased against the CDP (\( \lambda < 1 \)), it may be optimal to let the margin of the CDP increase, so as to make \( F \) as large as possible, even if \( f \) is kept sub-optimally low. Appendix B.3 shows this happens when large underprovision of quality is observed.

As a conclusion of this section, if inter-newspaper promotion fees are set too low, reader surplus will be sub-optimally low due to a decrease in articles quality. When the fees increase, readers utility increase, especially for non-specialized readers. If the fees are high enough, all readers may be better off. Figure 4 summarizes the main findings of this section.
3.4 Introducing network externalities

The previous section assumes there are simple network effects from consumers to advertisers only. Only the number of readers, and also where they were located on the Hotelling line (Appendix D) mattered. This allowed to convey the main insight of the paper while keeping the model simple.

Many digital industries being characterized by two-sided network effects, we now introduce inter-group externalities in order to gain generality. We denote $n_{i}^{r}$ ($n_{a}^{i}$) the number of readers (advertisers) anchored with news outlet $i$. Mirroring (1), the utility of consumers is now:

$$U_{1}^{i}(x, k, K) = \bar{u}_{r} + (q_{1} + \alpha_{r}n_{a}^{1} - t_{r}x)K + \left(q_{2} + \alpha_{r}n_{a}^{2} - t_{r}(1-x)\right)k$$ (7)

Where $\alpha_{r}$ is the benefit that a reader enjoys from interacting with each advertiser on the other side. In our setting, $\alpha_{r}$ can be positive or negative$^5$. The utility of readers on platform 2 is symmetric. We assume further that the utility of advertisers in a given platform depends on both the number of consumers on that platform and a participation fee $p_{p}^{i}$:

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$^5$A negative sign would conform with most of the existing literature whereby advertisement is a nuisance to readers. More advertisement would therefore mean more nuisance. In the present setting where the quantity of advertisement is fixed, $\alpha_{r}$ could however be positive: more advertisers mean that the match between readers and advertisers will be better on average. Hence, both parties would benefit from a bigger number of participants on the other side. Advertisers find better consumer profiles, and consumers see ads that may actually be useful to them.
\[ U_a^1(x, k, K) = \bar{u}_a + \alpha_a n_a K + \alpha_a n_a^2 k - t_a x - p_a^1 \]  

Hence we have that\(^6\):

\[
n_r^1 = \frac{1}{2} + \frac{q_1 - q_2 + \alpha_r (n_r^1 - n_r^2)}{2t_a} \tag{9}
\]

\[
n_a^1 = \frac{1}{2} + \frac{p_a^2 - p_a^1 + \alpha_a (K - k) (n_r^1 - n_r^2)}{2t_a} \tag{10}
\]

Where \(\alpha_a\) is the benefit that an advertiser enjoys from interacting with each consumer on the other side.

Similar calculations as in the base model yield:

\[
n_r^1 = \frac{1}{2} + \frac{1}{2} \frac{\alpha_r (p_a^2 - p_a^1) + t_a (q_1 - q_2)}{t_r t_a - \alpha_r \alpha_a (K - k)} \tag{11}
\]

\[
n_a^1 = \frac{1}{2} + \frac{1}{2} \frac{\alpha_a (K - k) (q_1 - q_2) + t_r (p_a^2 - p_a^1)}{t_r t_a - \alpha_r \alpha_a (K - k)}
\]

The objective function of each is slightly modified compared to (3):

\[
\Pi^i(q_i, q_j) = (p_a^i - \gamma_a)n_a^i \quad \text{value extracted from advertisers}
\]

\[
+ (f_k - \gamma_r K)n_r^i \quad \text{value extracted from anchored consumers}
\]

\[
+ (-F_k - \gamma_r k)n_r^j \quad \text{value extracted from roaming consumers}
\]

\[
- cq_i^2 \quad \text{cost of provision of quality}
\]

Where \(\gamma_a\) and \(\gamma_r\) are the costs of serving advertisers and readers respectively.

Profit maximization, assuming symmetry yields:

\[
2c q_i = (p_a^i - \gamma_a) \frac{\alpha_a (K - k)}{2(t_r t_a - \alpha_r \alpha_a (K - k))} + (-\gamma_r (K - k) + k (f + F)) \frac{t_a}{2(t_r t_a - \alpha_r \alpha_a (K - k))} \quad (F.O.C. \, q)
\]

\[
(p_a^i - \gamma_a) \frac{t_r}{2(t_r t_a - \alpha_r \alpha_a (K - k))} = n_a^1 - (-\gamma_r (K - k) + k (f + F)) \frac{\alpha_r}{2(t_r t_a - \alpha_r \alpha_a (K - k))} \quad (F.O.C. \, p_a^i)
\]

Which simplifies into:

\[
q_1 = \frac{1}{4c t_r} \left((\alpha_a - \gamma_r) (K - k) + k (f + F)\right)
\]

\[
p_a^1 = \gamma_a + \frac{1}{t_r} \left(t_r t_a - \alpha_r (\alpha_a - \gamma_r)(K + k \alpha_r (\alpha_a - \gamma_r) - k \alpha_r (f + F))\right)
\]

Like in the base case without two-sided externalities, it is desirable for users that exchange fees be set as high as possible. It decreases the payment advertisers have to make, and it increases quality. The effect of fees is stronger the less differentiated platforms are, and the stronger network effects are. On the advertisers side, the corrective effect of fees is more effective as advertisers-to-reader externality increases.

\(^6\)Observe that this model is a generalization of the base model exposed in section 3, with \(\alpha_a = V\) and \(\alpha_r = \bar{u}_a = 0\). However there is now a unit mass of advertisers platforms have to compete for, while the base model assumed platforms had full bargaining power over advertisers.
Let us now calculate consumer surplus in equilibrium:

\[
U^S(x, k, K) = U^S(x, 0, K) + K \left( q_t(k) - q_t(0) \right) + k \left( q_t(k) - t(1 - x) + \frac{\alpha_r}{2} \right)
\]

\[
= -\frac{k}{K} q(k = 0) - k \frac{\alpha_a - \gamma_r - (f + F)}{4c t_r} + \frac{\alpha_r}{2} - t_r(1 - x)
\]

We observe again that in order to maximize consumer surplus, inter-platform balance fees should be set as high as possible. The advertiser-to-consumer externality \(\alpha_r\) mechanically increases the value of exchanges. Indeed exchanges allow readers to also benefit from the competitors’ network of advertisers. In equilibrium this network is preserved before and after introduction of exchanges. Hence readers are better off following the implementation of exchanges.

Two key results have been derived in this section. First, positive network externalities unambiguously increase the value of inter-platform exchanges. Second, exchange fees don’t modify the impact of network externalities on equilibrium quality. Hence our conclusions carry over to cases with network externalities. However we believe exchanges may also substantially modify entry decisions from competitors. The next section studies the impact of exchanges on potential entrants.

4 Impact of inter-platform exchanges on entry

The previous section analysed the effects of exchanges on competition between established platforms. However, to have a complete picture of the effects of such exchanges, one would also need to study their impact on entry of potential competitors. Because they exploit network effects, it is a well-established fact that platforms markets tend to be very concentrated. Many markets are dominated by only one player who, once established, may exploit its market power and become particularly hard to contest. We show below that inter-platform intermediation may mitigate the competition softening effects of network externalities, and may allow to restore efficient entry.

For the sake of simplicity, we consider the case when market participants are homogenous \((t_a = t_r = 0)\). We denote \(I\) the incumbent. We question under which conditions a competitor named \(E\) endowed with cost of production of quality \(c_E(q_E)\) may enter the market. \(E\) is a sibling of \(I\) in the sense it caters to the same readership as \(I\). Their only differences are potentially different costs of quality provision, and the fact \(k\) articles are original to each platform. The game has two periods. In the first period, \(I\) and \(E\) compete in order to become leader. If \(E\) successfully enters and following the terminology Caillaud and Jullien (2003b) and Halaburda and Jullien (2016) he becomes “focal”. He may then enjoy further profits in period 2. While we won’t give a precise micro-fundation of these profits, they could be derived from competition in another market with heterogeneous participants (market described in Section 3). A focal platform endowed with costs \(c_j\) will make profits \(\pi_j(c_j)\) in period 2. We classically assume that \(\frac{\partial \pi_j}{\partial c_j}(c_j) < 0\): a focal platform enjoys larger profits in period 2 if it has lower costs, since it can still mimic a less efficient platform and save on costs.

Following Doganoglu (2003), Mitchell and Skrzypacz (2006), Markovich (2008), we assume participants’ decisions are based on current observed market shares. This gives the incumbent an advantage in the sense a potential entrant will have to engage in very aggressive competition in order to convince consumers to switch in period 1. To enter the market, \(E\) has three options. The most direct is to offer both an attractive prices to advertisers and high quality to readers. This strategy, which we denote “AR” is fast and allows \(E\) to become focal rapidly. This is however a costly approach. \(E\) could instead employ a divide-and-conquer (DC) strategy (Caillaud and Jullien (2003b)). He may target first advertisers (strategy “A”), or readers (strategy “R”). Once the first side has enrolled, \(E\) benefits from favourable expectations and can attract the other side more easily.

We assume that period 2 is discounted by \(\delta_2\) with \(\delta_2 \geq 0\).\(^7\) Period 1 is divided into two sub-periods “D” and “C”, corresponding to each stage of the DC strategy. These periods are discounted

\(^7\)\(\delta_2\) may represent the discount factor of period 2 if international competition occurs only once. However another
by a factor $\delta_d$ and $\delta_c$ respectively. It aims at representing how long the (costly) divide-and-conquer pricing strategy needs to be maintained before all participants of a given side actually switch. If $E$ chooses the “AR” strategy, he enjoys profits $\pi_E(c_e)$ not only in period 2 but also in period $C$. We further assume that an exogenous share $\tau$ of original articles are shared. Full sharing corresponds to $\tau = 1$. While $\tau$ has no impact on our qualitative results, it will allow us to discuss the optimal level of sharing, as opposed to the optimal level of original articles – which is exogenous in the model. Other than parameter $k$ and costs functions $c_I(\cdot)$ and $c_E(\cdot)$, $I$ and $E$ are not differentiated. The utility of consumers is same as in Subsection 3.4. We however assume for simplification that users are homogeneous ($t_r = t_a = 0$):

$$U_r^I = \bar{u}_r + (q_r + \alpha_r n_r^I)K + (q_E + \alpha_r n_r^E)\tau k$$

(12)

$$U_r^E = \bar{u}_r + (q_E + \alpha_r n_r^E)K + (q_I + \alpha_r n_I^E)\tau k$$

(13)

Consumers choose $E$ if and only if $U_r^E \geq U_r^I$ which translates into $q_E - q_I \geq \alpha_r(2n_p^I - 1)$. I being by assumption originally focal, we have initially that $n_r^I = 1$. Hence consumers switch to $E$ if and only if $q_E \geq q_I + \alpha_r$, meaning network effects award the incumbent an advantage. $E$ optimally sets $q_E = q_I + \alpha_r$

Let us now turn to advertisers. Their utility if they join $I$ or $E$ respectively is:

$$u_a^I = \bar{u}_a + \alpha_a n_a^I K + \alpha_a n_a^E \tau k - p^I$$

(14)

$$u_a^E = \bar{u}_a + \alpha_a n_a^E K + \alpha_a n_a^I \tau k - p^E$$

(15)

Advertisers switch to $E$ if and only if

$$p_E - p_I \leq -\alpha_a(K - \tau k)(2n_a^I - 1)$$

(16)

Again, $I$ being initially focal, this translates in $p^E \leq p_I - \alpha_a(K - \tau k)$. In case of entry, this condition will be met with equality as any other pricing strategy is dominated. Again, we observe that $I$ is advantaged by network effects. However this advantage vanishes as content on the two platforms are less redundant, and there are more exchanges ($k$ and $\tau$ increase). The timing of entry is as follows:

- $E$ chooses which strategy he will follow
- $I$ observes $E$’s strategy and sets his price and quality accordingly.

As discussed $E$ can engage either in strategy $AR$, $A$ of $R$ or not enter ($NE$). In each cases the expected profits of $I$ are:

$$\Pi^I(AR, p_I, q_I) = 0$$

(17)

$$\Pi^I(A, p_I, q_I) = \delta_d(f \tau k - c_I(q_I)) - \delta_c c_I(q_I)$$

(18)

$$\Pi^I(R, p_I, q_I) = \delta_d(\alpha_a(K - \tau k) - Fk - c_I(q_I)) - \delta_c c_I(q_I)$$

(19)

$$\Pi^I(NE, p_I, q_I) = \delta_d(p_I - c_I(q_I)) + \delta_c(p_I - c_I(q_I)) + \delta_2 \pi(c_I)$$

(20)

Note that when $E$ chooses a DC strategy, profits of $I$ are not necessarily 0. After the divide period, $I$ still gathers one side of the market: if $E$ targeted advertisers first, $I$ receives exchange payments $f$, so $E$ can access his readers in stage $D$. If $E$ targeted readers first, $I$ still owns advertisers during the $D$ period and cashes their payments in.

*interpretation would be that period 2 is repeated and $\delta_2$ captures the discounted value of this repeated interaction. Hence we may have that $\delta_2 > 1$*
Profits of $E$, assuming his strategy is successful, are:

\[ \Pi^E(AR, p_I, q_I) = \delta_c(p_I - \alpha_a(K - \tau k) - c_E(q_I + \alpha_r)) + (\delta_c + \delta_2)\pi(c_E) \] (21)

\[ \Pi^E(A, p_I, q_I) = \delta_d(p_I - \alpha_a(K - \tau k) - F\tau k) + \delta_c(p_I - \alpha_a(K - \tau k) - c_E(q_I + \alpha_r)) + \delta_2\pi(c_E) \] (22)

\[ \Pi^E(R, p_I, q_I) = \delta_d(f\tau k - c_E(q_I + \alpha_r)) + \delta_c(p_I + \alpha_a(K - k) - c_E(q_I + \alpha_r)) + \delta_2\pi(c_E) \] (23)

\[ \Pi^E(NE) = 0 \] (24)

We now consider three cases, corresponding to each strategy of the entrant. For ease of computation we assume costs are quadratic: $c_j(q_j) = c_j(q_j)^2$. We assume that the entrant is more efficient $c_E < c_I$.

**$E$ chooses strategy $AR$:** This strategy would be sensible if the benefits from early focality $\delta, \pi(c_E)$ exceed the costs of waiting and engage in a DC strategy. $I$ will set $q_I$ and $p_I$ such that $E$ makes no positive profits. If $E$ successfully enters $I$’s profits are 0. The problem of the incumbent is:

\[ \max_{p_I, q_I} \pi^1(p_I, q_I) = \delta_d(p_I - c(q_I)) + (\delta_c + \delta_2)\pi(c_E) \]

s.t. (21) = 0

This translates into $q_I = \frac{c_E\alpha_a}{c_I^2 - c_E}$ and $p_I$ set by (21) = 0. There will be entry if and only if:

\[ \delta_d\alpha_a(K - \tau k) + \alpha_r^2 \frac{c_Ic_E}{c_I - c_E} + (\delta_c + \delta_2)(\pi(c_I) - \pi(c_E)) \leq 0 \]

Hence the higher the exchanges, the easier it is for $E$ to enter with strategy “AR”. Exchange fees have no impact here since in equilibrium there is always a platform that is focal on both sides and therefore no exchanges actually take place.

**$E$ chooses strategy $A$:** It is obvious from $I$’s profit function (equation 18) that $I$ optimally sets $p_I$ such that (22) is met with equality. A larger $p_I$ would result in a loss of all revenues in period 1 and entry in period 2, while a lower one would decrease the profits of $I$ in period 1 without changing the entry outcome. Similarly, $I$ optimally sets $q_I = 0$. Ensuring $E$ does not enter results in the following equivalence:

\[ \Pi_E(A) < 0 \iff \Pi_I(p_I, q_I) = \delta_1\alpha_a(K - \tau k) + \delta_2(\pi_1(c_I, c_2) - \pi_1(c_E, c_2)) > 0 \] (25)

There is entry if and only if $I$ cannot sustain a policy that prevents entry. This translates in $\alpha_a(K - \tau k) + \delta_2(\pi_1(c_I, c_2) - \pi_1(c_E, c_2)) < 0$. The extra term $\alpha_a(K - \tau k)$ compared to the efficient entry condition confers an advantage to the incumbent. However this advantage vanishes and the condition converges to the optimal one as $k$ and $\tau$ increase.

**$E$ chooses strategy $R$:** If $E$ chooses strategy “R”, $I$ optimally sets $p_I$ and $q_I$ so as to maximize its profits under the constraint that $\Pi_E(R) \leq 0$. After some calculations, we can show that there is entry if and only if:

\[ \delta_d\alpha_a(K - \tau k) \geq (\delta_d + \delta_c)\alpha_r^2 \frac{c_Ic_E}{c_I - c_E} + \delta_d(F - f)\tau k + \delta_2(\pi(c_I) - \pi(c_E)) \]

Contrary to previous strategies, exchanges make a $R$ strategy more costly. Indeed, exchanges in a DC strategy typically makes the divide weakly easier, but renders conquest weakly harder. In a $R$ strategy, $E$ targets readers first. However their choice is independent of $k$ (see equation 16). Hence $E$ does not benefit from exchanges at this stage, while $I$ will benefit from exchanges during the conquest
stage as he can avail his advertisers of roaming readers. Surprisingly, exchanges can therefore reinforce the network-related barrier to entry.

To sum up, exchanges improve the ability of a new entrant to enter a market by strategies “AR” and “A”. However it renders an approach by the “R” strategy more difficult. Indeed, readers choice is affected by network externalities (see demand function 9) but not by the level of exchanges $\tau k$. Hence $k$ does not help in attracting readers. However a high $k$ means an entrant having secured the participation of all readers will have more difficulties attracting advertisers in the “conquer” stage. The following graph show the indifference region between strategies “AR”, “R”, “A” and no entry. The hatched zone corresponds to regions where network externalities are so strong that they render all modes of entry ineffective. Solid (dotted) lines show case $k = 0$ ($k = 0.3$).

![Graph showing indifference regions](image)

(a) $\delta_d = \delta_c = 0.1$
(b) $\delta_d = \delta_c = 0.3$

Figure 5: Feasibility regions for entry with AR (green), R (red) or A (blue) strategies.

$c_I = 1, \pi_I(c_I) = 1, \pi_E(c_E) = 1.1, K = 1, \delta_2 = 1$. Solid lines are $k = 0$, dotted lines are $k = 0.3$.

Regions with no entry are hatched.

In two-sided markets, network effects generally favour the incumbent and render entry difficult. However, intermediation between platforms, in the form of exchanges modify entry incentives. Exchanges generally favour entry by simultaneous attraction of both sides of the market (AR strategy). When simultaneous entry is not feasible, a DC approach may be undertaken. Exchanges make division easier, but also make conquest more difficult. In particular it always facilitates entry by a DC strategy starting from the side whose choice is strongly affected by network effects. However, it may render the other DC strategy (targeting first the side whose choice is unaffected by exchanges) more difficult.

The policy implication is that if a regulator observes that strong network effects impede the entry of a competitor he may want to enforce exchanges between platforms. If exchanges don’t impact a side’s choice of a platform, exchanges may however make some DC strategies ineffective and act as an entry deterrent. In any of the strategies we studied, the level of exchange fees does not impact entry decisions. However a positive margin $F - f$ between the fees renders entry more difficult. Hence a social planner willing to enforce entry should strive to decrease the fee margins. High fee margins are desirable only if entry is deemed excessive.
5 Empirics

The impact of exchanges on quality being effective in the long run, and occurring together with many other effects, finding direct evidence of our theory is difficult. Instead, this section rather shows evidence of some stylized facts consistent with our theory, and aims at explaining them:

S1: Online newspapers promote content in each other websites

S2: Promoted stories from direct competitors are not closely related to publisher’s article

S3: Content from direct competitors is of lesser quality than the average of the competitors’ set of articles

We showed in section 3 that inter-newspapers advertising (stylised fact S1) increases content diversity but hampers competition, potentially resulting in a loss of surplus for readers. Even if inter-newspaper exchanges of readership is profitable and thus encouraged by newspapers (S1), they also need to make sure the external content creates new traffic, instead of stealing it from their own platform (which may explain S2). In the longer-run, promoting competitors may encourage readers to change anchor site, as shown in Appendix G. This pro-competitive effect is mitigated by directing readers to relatively low-quality content (S3).

5.1 Building the dataset

A web crawler, ran every night over the period from November 2016 to February 2017, collected the promoted links in all articles featuring on the home page of 40 French news outlets. It collects the title, text, date of issue of each article together with the same information on each promoted link. The data collection is run in ‘incognito’ mode so that suggestions cannot be tailored to a specific behaviour of the crawler. Overall, around 785,000 promoted links have been recorded.

The length of each article is the number of words in the article, or promoted content. We use the length of the article as a first proxy for the quality of an article (having controlled for the newspaper that publishes it). Indeed, short articles are usually small briefs, with pure informative content. In-depth or engaged ideas typically require longer articles. Also, these web articles are usually also published in the printed version of the newspaper: This means more important articles tend to be longer, while lower profile articles tend to be allocated to smaller spaces, because of limited space and reader attention.

It will also be useful to determine whether promoted links are catchy or not. Inspection shows many promoted articles have eye-catching pictures, and provocative or intriguing titles. We define as “catchy” a title, that displays interjections, use sentences like “you won’t believe this”, “an extraordinary/terrifying event”, calls out to the reader (“you”, use of imperative tense...), explicitly mention sex or violence.

Then, a topic analysis provides a probabilistic framework for the term frequency occurrences in documents in a given corpus, thus allowing to allocate documents to topics. To that purpose, we use latent Dirichlet allocation, a Bayesian mixture model for discrete data where topics are assumed to be uncorrelated. We find out to which topics \( t \) (out of \( T=30 \) topics) each article \( i \) belongs to, and with the associated probability \( p_{i,t} \). We define the topic distance between articles \( i \) and \( j \) (later referred to simply as “distance”) as follows:

\[
D_{i,j} = \sqrt{\sum_{t \in T} (p_{i,t} - p_{j,t})^2}
\]

We can verify that \( D_{i,i} = 0 \) : the distance between two exactly similar articles is zero. The less likely \( i \) and \( j \) are to deal with the same topics, the greater the distance. An illustration of the typical distance between articles is provided in figure 6.
5.2 Descriptive statistics

Descriptive statistics (table 1) do show that around 20% of online newspapers articles display promoted links from rivals (stylised fact S1). They support the intuition that catchy stories (exclamation marks, interjections) are preferred over less catchy stories, as catchy stories represent 42% of the promoted links, while they constitute only 36% of the published articles. Content is on average shorter in promoted articles, relative to the average of published articles (stylised fact S3). This evidence, together with evidence for stylized fact S2 will be confirmed in the following empirical analysis.

<table>
<thead>
<tr>
<th>News outlet</th>
<th>Number of articles</th>
<th>Average length</th>
<th>Catchy titles</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>published</td>
<td>promoted</td>
<td>published</td>
</tr>
<tr>
<td>le monde</td>
<td>1333</td>
<td>30811</td>
<td>713</td>
</tr>
<tr>
<td>pause people</td>
<td>253</td>
<td>25538</td>
<td>200</td>
</tr>
<tr>
<td>actuorange</td>
<td>2556</td>
<td>16644</td>
<td>415</td>
</tr>
<tr>
<td>l’obs</td>
<td>846</td>
<td>15355</td>
<td>644</td>
</tr>
<tr>
<td>la tribune</td>
<td>2059</td>
<td>10841</td>
<td>690</td>
</tr>
<tr>
<td>le figaro</td>
<td>525</td>
<td>9727</td>
<td>980</td>
</tr>
<tr>
<td>courrier international</td>
<td>928</td>
<td>9450</td>
<td>462</td>
</tr>
<tr>
<td>pause sport</td>
<td>62</td>
<td>8810</td>
<td>198</td>
</tr>
<tr>
<td>elle</td>
<td>334</td>
<td>6295</td>
<td>331</td>
</tr>
<tr>
<td>huffington post</td>
<td>1827</td>
<td>5927</td>
<td>343</td>
</tr>
<tr>
<td>capital</td>
<td>246</td>
<td>5847</td>
<td>635</td>
</tr>
<tr>
<td>l’équipe</td>
<td>705</td>
<td>4634</td>
<td>801</td>
</tr>
<tr>
<td>RTL</td>
<td>3</td>
<td>3377</td>
<td>978</td>
</tr>
<tr>
<td>Other(in sample)</td>
<td>24499</td>
<td>13035</td>
<td>494</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>36178</strong></td>
<td><strong>166291</strong></td>
<td><strong>516</strong></td>
</tr>
<tr>
<td>other (outside sample)</td>
<td>NA</td>
<td>619395</td>
<td>NA</td>
</tr>
</tbody>
</table>

Table 1: Descriptive statistics of collected articles– period: November 2016 to February 2017 some suggestions are “outside sample”, meaning they appear as suggestions in our data. However, we don’t crawl the home page of their promoter.
5.3 Choice model

Each newspaper seeks to choose the promoted link \( j \in J \) in each of its articles \( i \in I \) so as to maximize:

\[
\max_j V^i(j) = \alpha_0 + \alpha^i_X X_j + \alpha_D D_{i,j} + \alpha_{10} \mathbf{1}_{\text{Closest}} + \xi_j + \epsilon^i_j
\]

Where \( X^j \) represent the observable characteristics of promoted article \( j \). It includes:

- whether the article is catchy or not
- length of article (in number or words)
- type of newspaper issuing the promoted link (tabloids, specialized press, daily newspaper)

\( D_{i,j} \) is the “distance”, in terms of topics, between article \( i \) and \( j \). \( \xi_j \) is the unobserved attractiveness of each promoted article \( j \). The final term of the utility function, \( \epsilon^i_j \), is an idiosyncratic error term that captures unobserved variation in newspaper \( i \)'s preference for a particular article \( j \).

Each newspaper’s valuation of choice characteristics is allowed to vary with its own characteristics \( Z^i \), including the type of newspaper, and the length of the original article.

We assume that \( \epsilon^i_j \) is distributed according to the Weibull distribution, giving rise to the multinomial logit model. With this assumption, the probability that article \( i \) chooses to promote article \( j \), \( p_{i,j} \), is given by the expression:

\[
p_{i,j} = \frac{\exp(\alpha^i_X X_j + \alpha_D D_{i,j} + \xi_j)}{\sum_{k \in J} \exp(\alpha^i_X X_k + \alpha_D D_{i,k} + +\xi_k)}
\]

where \( k \) indexes all possible article choices.

Preliminary results: Due to computational issues, we had to restrict the size of the dataset substantially. Hence these are preliminary results. We do hope to circumvent these issues in the coming months, but preliminary inspection means we are confident the present insights will carry over to the larger dataset. To capture potential non-linearities, the distance parameter \( D_{i,j} \) is categorized into deciles. The first decile is \([0,0.1]\), the second decile is \([0.1,0.2]\), etc. The results are shown in table 2.

| Estimate   | Std. Error | z value | Pr(>|z|) |
|------------|------------|---------|----------|
| distancefactor2 | 0.59466 | 0.09424 | 6.31 | 2.79E-10 *** |
| distancefactor3 | 0.45051 | 0.09365 | 4.811 | 1.51E-06 *** |
| distancefactor4 | 0.29443 | 0.09279 | 3.173 | 0.001509 ** |
| distancefactor5 | 0.30871 | 0.09208 | 3.352 | 0.000801 *** |
| distancefactor6 | 0.55435 | 0.09184 | 6.036 | 1.58E-09 *** |
| distancefactor7 | 1.00922 | 0.09207 | 10.962 | <2e-16 *** |
| distancefactor8 | 1.54267 | 0.09344 | 16.51 | <2e-16 *** |
| distancefactor9 | 1.84501 | 0.11412 | 16.168 | <2e-16 *** |
| distancefactor10 | 2.38588 | 0.7186 | 3.32 | 0.0009 *** |
| catchy | 0.48578 | 0.056549 | 8.59 | <2e-16 *** |
| length | -0.41204 | 0.044337 | -9.272 | <2e-16 *** |
| distance:catchy | -0.0749 | 0.009797 | -7.646 | 2.08E-14 *** |
| distance:length | 0.037356 | 0.006611 | 5.651 | 1.60E-08 *** |

Signif. codes: 0 *** 0.001 ** 0.01 * 0.05 . 0.1 1
Deviance: 226200
Fisher Scoring iterations: 4
observations: 22340

Table 2: Results of the conditional logit
Results show that larger distances are preferred over shorter ones. This means the promoted content tends to create, rather than steal traffic, thanks to topic diversity. Articles are preferably catchy, which arguably improves the likelihood to be clicked upon. Finally, promoted articles seem to be of lesser quality than the overall corpus of articles of the promoter. We argue this may be an attempt to limit the pro-competitive effects of inter-newspaper promotion. Alternatively, this may be due to the fact such links direct to entertaining, rather than informative content.

6 Extensions and discussion

For the sake of concision, extensions are relegated to appendix. A brief summary is proposed here.

Appendix D considers the impact of inter-newspaper promotion on advertisers incentives to place specialized, or general ads. It shows that inter-newspaper exchanges lead to a homogenization of readerships. In turn, news outlets may find it profitable to sell their advertisement slots to generalist advertisers, instead of specialized ones. This leads to a homogenization of readers experience. Overall, reduced differentiation leads to more intense competition and higher quality. Readers with weak preferences are better off. However the impact on readers with strong preferences is ambiguous.

Appendix E endogenizes the CDP fees \( f \) and \( F \). It considers various situations differentiated along two dimensions. First, whether the CDP is a monopoly or if it is contested by competitors. Second whether there are only usage fees \( f \) and \( F \) or if participation fees can be charged to hosts and promoters. The findings are the following. If only usage fees are allowed, an uncontested monopoly will set \( f = 0, F = V \), as in figure 4. A contested monopoly will set the fees that maximise reader welfare \( f = F = V \). If the CDP can charge participation fees, many equilibria are possible and include the one that maximises consumer welfare, whether the CDP is contested or not.

Appendix F endogenizes the production of original articles \( k \). It shows that when CDPs act as monopolists and set \( f = 0, F = V \), exchanges are always detrimental to the production of new original items, because new articles become a public good that serves the consumers of the producer of the news, as well as its competitors. When platforms agree on exchange fees and set \( f = F = 0 \), exchanges are always desirable as a given piece of news will be seen by more readers. When \( f = F = V \) the intrinsic value of consumers needs to be high enough in order for exchanges to trigger the creation of more articles.

The paper assumes perfect information of readers. Appendix G relaxes this assumption and assumes some readers are uninformed about the quality of each newspaper. They are therefore willing to experiment the content of various newspapers. Hence, newspapers have an incentive to direct them to low-quality foreign content so as to misguide them into believing the competitor is of poor quality and remain as their anchor site.

Overall, this paper pleads in favour of inter-platform exchanges, with the caveat that associated fees must be high enough. A key policy implication is that such exchanges should not only be allowed but may even need to be enforced, so as to guarantee users an access to more diversity. While online platforms are often seen as a natural monopoly, the non-rival nature of the assets they are based on (namely information) means other solutions than the ones traditionally retained (nationalization, specific incentive schemes, public auctioning of service, price cap or cost plus regulation...) are available. In particular, this research suggests that imposing that platforms should share unique listings or content with competitors is desirable, provided the associated fees are high enough. This research took online media as a real-life example, since inter-platform exchanges are already observed. However, this formal model has a broader reach. In the case of vacation rentals, platform 1 could be Airbnb and platform 2 could be Booking.com. Enforcing exchanges between platforms could enhance the quality of service available to guests. For this to be true, however, exchange fees must be high: If a prospective guest used to navigate on Booking.com first finally clicks on a Airbnb link imbeded on Booking.com and finalizes the sale there, Airbnb should pay to Booking.com a fee corresponding to at least half of the profits it made with the sale. Failing that, exchanges result in a decrease in quality and a decrease consumer welfare. Further, enforcing such exchanges may also allow more efficient
“sibling” platforms similar to Airbnb or Booking.com to become focal.

The model also speaks to recent policy decisions. In June 2017 Google was fined a record 2.4 billion euros ($2.7 billion) by the European Commission after the company was accused of “giving illegal advantages” to its shopping service. Namely, Google prohibited . Following the ruling, price comparison competitors can now bid for ad space in the shopping box at the top of the results page on the same basis as Google Shopping. This equal treatment requirement whereby Google would list not only his offers but also those of competitors is in line with our recommendations.

7 Conclusion

We showed that transfers between platforms, even though they may be ex-post efficient (readers enjoy more diversity), may turn out to be undesirable once ex-ante considerations are taken into account. Indeed, such transfers may soften the competition between platforms: the side that is transferred, becomes less precious to a given platform, since a “lost” user can still come to the local platform through a transfer, which takes the form of a promoted link in the present paper. This research casts a doubt on the desirability of these links –ironically– labelled as “content you may like”.

A clear policy implication is that the promotion fees should be set as high as possible in order to increase reader or social surplus –under the constraint that these links are accepted by both the promoter and publisher. This conflicts with the interest of both contracting parties – CDPs want $f$ as small as possible, newspapers want both $f$ and $F$ to be small – meaning some regulation may be required. If regulators are confident exchange fees will be high, allowing exchanges may benefit users. Also, exchanges may facilitate the entry of more efficient competitors. It is then desirable that the intermediation agents set exchange fee margins as small as possible.

More generally, this model readily applies to other industries where a side of the business may be shared between platforms. It may be tempting to allow platforms such as Airbnb, Uber, energy communities to coordinate with competitors, so that in case of excess demand in a platform, they could re-direct the excess demand to competitors who have excess supply. Similarly, search engines for flights or hotels sometimes also list competitors results together with their own results. While these transfers may seem pro-competitive, this paper shows it may actually harm competition in the long run if fees are too low.
References


A Context on CDP

A.1 Inter-newspaper promotion on selected days

The following graphs show some of the main French online information sources (circle), and the links made between them by Outbrain (arrows). Arrows start from the promoter and point to where the promoted link has been published. Arrows width is proportional to the number of observed such promotions, on the 23rd of October 2016 (left graph) and 23rd of November 2016 (right).

Yellow labels mean my robot did not succeed in crawling their website. In that case they appear as promoters only, while they are probably also publishers.
A.2 A closer look at Content Discovery Platforms: the case of Outbrain.com

Outbrain.com is a CDP which provides additional content to publishers, by providing recommendation to other internal, or external content. Outbrain.com states its mission is to Help people discover content that they can trust to be interesting, relevant and timely for them. They claim they reach more than a half billion people globally each month. The suggestions are usually displayed at the end of the publishers article. Each suggestion shows the title of the promoted content, together with its main image. All traffic is remunerated on a per-click basis. Promoters pay a fee per click, that depends on the quality of the targeted audience (clicks from an audience composed high-value targets, like women would likely be charged a higher price). So of this revenue is then paid back to the publisher. Also, both the publisher and the promoter have a veto right on which content they want to display: Further, our distribution partners may choose to block specific pages or entire sources.

Even though the argument that such recommendations allow the reader to dig deeper into a subject, there is evidence that instead of providing closely related content, Outbrain tends to suggest “popular” links, or content tailored to reader behaviour. Therefore, Outbrain is likely to provide diversity, rather than depth of content.

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8 see http://www.outbrain.com/uk/about/company
9 see http://www.outbrain.com/fr/amplify/guidelines
B proofs of Section 3

B.1 Limit fees when news outlets anticipate the adoption effect

One can show that allowing one’s content to be promoted rival, leads to a decrease in anchored readers of \( \Delta_x = \frac{k}{2K} \left[ \frac{q_x}{r_x p} - \frac{1}{2} \right] \). These lost readers entail an advertising value of:

\[
\bar{V} - \frac{\alpha}{2} (1 - \Delta_x)
\]

Thus, a news outlet is willing to pay:

\[
\bar{F} = k(\bar{V} - \frac{3\alpha}{4}) - K \left( \bar{V} - \frac{\alpha}{2} (1 - \Delta_x) \right) \Delta_x
\]

Interestingly, if \( f \) is set to 0 meaning anchored reader don’t yield additional revenues from promoted links, \( F \) cannot be set high enough so that the quality is maintained at \( q^* \). This may be surprising, since \( F \) allows to mitigate the effect of readership sharing by re-installing competition. However, note that the value of a marginal reader is diminished by \((\bar{V} - \frac{3\alpha}{4})k\). However, since readers position on the Hotelling line is a private information of readers, a promoter would pay only up to the expected value of the reader anchored at the competing newspaper. This value is of order \((\bar{V} - \frac{3\alpha}{4})k\) only. This explains why in our model the quality cannot be fully recovered by increasing \( F \) only. Luckily, \( f \) need not be zero. A high \( f \) increases the value of anchored readership, meaning competition may intensify and quality may increase compared to the case with no inter-newspaper promotion.

B.2 Newspaper profits as a function of CDP fees

From (5), denote \( \Delta_q = \frac{1}{4c(t+pr)} ( (\bar{V} - \frac{9\alpha}{4})k - F - f ) \) the quality decrease induced by inter-newspapers promotion. The incremental profit resulting from an increase in \( F \) is:

\[
\frac{\partial \Pi_1(q_i, q_j, k)}{\partial F} = \frac{1}{2} + 2c(q^* - \Delta_q) \frac{\partial \Delta_q}{\partial F}
\]

Both these terms are negative. This means profit maximisation requires to set \( F \) as low as possible: \( F = f \).

Assuming \( F = f \), the incremental profit resulting from an increase in the CDP fee is:

\[
\frac{\partial \Pi_1(q_i, q_j, k)}{\partial f} = 2c(q^* - \Delta_q) \frac{\partial \Delta_q}{\partial f} < 0
\]

Hence, profit maximization requires \( F = f = f^* \).

B.3 Objective of the social planner

The objective of the social planner is stated in (6). Let the social planner choose the fees \( F \) and \( f \). Using the expression of readers’ utility 1, the first order conditions are:

\[
\frac{\partial W(k, f, F)}{\partial f} = \frac{1}{4ct} (K + k - 4c(q^* - \Delta_q)) + (1 - \lambda)
\]

\[
\frac{\partial W(k, f, F)}{\partial F} = \frac{1}{4ct} (K + k - 4c(q^* - \Delta_q)) - (1 - \lambda)
\]

Define the optimal level of quality, provided there is inter-newspaper promotion:

\[
q_{opt} = \frac{K + k}{4c}
\]

One can distinguish three cases.
1. **Strong underprovision of quality:**  
$q(\bar{F}, \bar{F}) \leq q^{opt} - (1 - \lambda)t$

Both partial derivatives are positive. A social planner would set both fees as high as possible: $f = F = \bar{F}$.

2. **Strong overprovision of quality:**  
$q(f, f) \geq q^{opt} + (1 - \lambda)t$

Both partial derivatives are negative. A social planner would set both fees as low as possible: $f = F = \underline{f}$. Indeed, if there is excess competition, setting low transfer fees help mitigate this effect.

3. **Intermediary level of quality:**  
There exist some feasible $(f, F)$ such that  
$q^{opt} - (1 - \lambda)t \leq q(f, F) \leq q^{opt} + (1 - \lambda)t$

A social planner increases $f$ and decreases $F$ and optimally sets:  
$f = F = \max \left( f, \min \left( \bar{F}, \frac{t(K + k) - V(K - k)}{2} \right) \right)$

Interestingly, in the likely case when the social planner finds that there is underprovision of quality, he will set as $F$ as high as possible, even if $f$ is fixed and set suboptimally low. This means he will strive to re-install competition for readers, despite the profit he may have to grant to the CDP.

C **Allowing direct roaming**

Section 3 analyses a case when roaming to news outlets other than the anchor one is possible only if intermediated by a CDP. In reality, if consumers are very eager to read all news items they may bypass the CDP and roam on their own to the other news outlets. We argue however that in the presence of a CDP, readers will always use the CDP service since it is free and the CDP uses algorithms designed to show pieces of news a reader may be particularly interested in. Hence, the CDP saves each reader the search or selection cost he would have to incur when roaming on his own. We denote this search cost $s$ per article that may be redundant with what the reader already read. Overall, the selection cost incurred by a reader who roams to the newspaper he is not anchored to is $sK$.

We assume in this section that there is no CDP, and consumers may roam on their own. They do so if the expected quality of the foreign news outlets is such that the benefit from reading extra news exceeds the transport cost to the foreign newspaper, and cost of selection between topics that have already been read (in that case the reader is not interested in reading the article), and new topics.

Define $s = \frac{k}{K} \left( \frac{V(K - k)}{4ct} - t \right)$, $\bar{s} = \frac{k}{K} \left( \frac{V(K + k)}{4ct} - t \right)$, $\bar{s} = \frac{k}{K} \left( \frac{V(K)}{4ct} - \frac{t}{2} \right)$, $\bar{\bar{s}} = \frac{k}{K} \left( \frac{V(K + k)}{4ct} - \frac{t}{2} \right)$. We have $s < \underline{s} < \bar{s} < \bar{\bar{s}}$. The following proposition lists the equilibria of the game.

**Proposition 1** Assume there is no CDP and roaming consumer incur a selection cost $s$:

- if $s < \underline{s}$, quality is $q = q^{*} - \frac{kV}{4ct}$. All readers roam.
- if $\underline{s} < s < \bar{s}$, quality is $q = t + s\frac{K}{K}$. All readers roam.
- if $\underline{s} < s < \bar{s}$, quality is $q = q^{*} + \frac{kV}{4ct}$. There are $2\frac{q - sK}{t}$ roamers.
- if $\bar{s} < s < \bar{\bar{s}}$, two equilibria coexist.
  - quality is $q = q^{*} + \frac{kV}{4ct}$. There are $2\frac{q - sK}{t}$ roamers.
  - or quality is $q = q^{*}$. There are no roamers.
- if $\bar{\bar{s}} < s$, $q = q^{*}$ and there is no roaming.
**Proof.** Equilibrium quality when there is no multi-homing is given by (4). Considering a reader at location \( x \) anchored in 1, the utility of roaming to 2, for is:

\[
\Delta U(x) = \left( \frac{KV}{4ct} - tx \right) k - sK
\]

Where \( s \) is the per-article selection cost, reflecting the fact a reader needs to figure out whether he is actually interested in the article or not. Hence, there will be partial multi-homing if and only if:

\[
s < \left( \frac{VK}{4ct} - \frac{t}{2} \right) \frac{k}{K} \equiv \bar{s}
\]

The possibility of multi-homing modifies the profit function (3) of each platform to:

\[
\Pi_1(q_i, q_j) = \text{anchedreaders} \left( n^1 \right) (VK) + \text{incomingroamers} \left( q_i - sK \frac{k}{t} - n^1 \right) kV - cq_i^2
\]

Note that the possibility of multi-homing does not affect readers choice of an anchor newspaper. Hence we still have that \( n_1 = \frac{1}{2} + \frac{q_1 - q_2}{t} \). Solving for a symmetric equilibrium, we find that:

\[
q(s < \bar{s}) = q^* + \frac{kV}{4ct}
\]

In turn, the symmetric increase in quality increases the value of roaming. If \( s \) is sufficiently small, all readers may be both anchored and roamers. It occurs if and only if:

\[
\frac{V(K + k)}{4ct} - t - sK \frac{k}{K} \geq 0 \iff s < \frac{K}{k} \left( \frac{V(K + k)}{4ct} - t \right) \equiv \bar{s}
\]

In that case, there is no competition any more for roamers. With full roaming, one can show that quality falls to:

\[
q(s = 0) = q^* - \frac{kV}{4ct}
\]

This can however be sustained as an equilibrium if and only if:

\[
s < \frac{k}{k} \left( \frac{V(K - k)}{4ct} - t \right) \equiv \bar{s}
\]

Hence, the possibility of roaming will increase quality compared to a situation when agents single home. This is in sharp contrast with most of the literature where prices to a multi-homing side increase. This is due to the fact competition for anchored readers—hence the incentive to produce quality to attract them—is in our case unaltered. The possibility of roaming adds an additional force: the value to consumers with weak preferences increases, which in turns pushes platforms to increase quality. For these roaming consumers, there is however no competition and each platform behaves as a monopolist.

Using direct roaming as a counterfactual complicates considerations on whether CDPs are welfare-improving or not. \( s > \bar{s} \) is the situation covered in Section 3. If \( s < \bar{s} \) a CDP is always desired since it saves on selection costs, and quality is a least as high as without a CDP. For intermediate levels of \( s \), the results are ambiguous. To preserve the quality that would prevail absent a CDP, both fees must be set at their maximum level \( f = F = V \).

Hence we have several results. First and perhaps counter-intuitively, if selection costs are small, a CDP is socially desirable. Indeed, the CDP saves selection costs the resulting quality will be at least as high as without a CDP. If fees are high enough, quality and consumer surplus increases. Second, if
selection costs are high the CDP is not desirable unless total fees \( f + F \) are set at least at \( V \). Finally, at intermediate levels of selection costs consumers with strong preferences will endure a surplus decrease unless fees are at their maximum level \( f = F = V \). Consumers with weak preferences are favoured if and only if fees are high enough. Figure 9 illustrates equilibrium quality with and without a CDP, as a function of selection costs.

![Figure 9: Quality in equilibrium without a CDP (solid line), and with a CDP (dotted lines)](image)

**D Introducing specialized advertisement**

We have seen that inter-newspaper promotion brought a trade-off between providing content diversity to readers, and decreasing the competition between news outlets. On top of that, notice that such transfers of readership not only increase the number of visits to each outlet, but also alters the composition of this readership. Indeed, inter-newspaper promotion means the average viewer becomes less specialized. This may alter the decision of newspapers, regarding which type of ads to place.

In this section we introduce two new types of advertisers, on top of the general advertisers described in Section 3. These are specialized advertisers, who value readership depending on the position of readers on the Hotelling line. There are two type of specialized advertisers, 1 and 2. Advertiser of type \( i \) is primarily interested in reaching the readers of newspaper \( i \), possibly because these readers have specific characteristics or interests that correspond to the advertising target. The willingness to pay of advertiser 1 and 2 for an impression on a reader located at distance \( x \) of 1 and \((1 - x)\) of 2 are:

- advertiser 1: \( WTP_1(x) = \bar{V} - \eta_a x \)
- advertiser 2: \( WTP_2(x) = \bar{V} - \eta_a (1 - x) \)

Where \( \bar{V} \) represents the willingness to pay for a reader in the core target (i.e. \( x = 0 \), for advertiser 1 displaying ads in newspaper 1), while this willingness to pay is discounted by \( \eta_a \) per unit distance. \( \eta_a \) is positive, meaning readers further away from the core target are less valuable to advertisers. We assume that \( \bar{V} > \eta_a \) so advertisers always get some benefits from reaching any reader.

Also, readers endure a disutility \( \eta_r x \) (resp. \( \eta_r (1 - x) \)) from advertisement when they see advertisement of type 1 (resp. type 2), where superscript \( s \) stands for ”specialized advertisement”. This disutility from specialized advertisement increases as the advertising becomes ill-targeted (i.e. \( x \) tends
to 1/2), capturing the fact advertisement can become more troublesome, when it is not tailored to readers’ needs and interests. The present model is illustrated in figure 10.

![Figure 10: Hotelling model with specialized advertisement](image)

If newspaper use specialized advertisement, the utility of readers of news outlet 1 is edited from (1) to:

\[ U^1 = \bar{U} + (q_1 - (t + \eta_r)x - s)K + (q_2 - (t + \eta_r)(1-x) - s)k \]

Utility of readers in 2 is symmetric, resulting in an equilibrium number of readers in 1

\[ n_1 = \frac{1}{2} + \frac{q_1 - q_2}{2(t + \eta_r)} \]

D.1 Conditions for general advertisement

Assume newspapers choose their quality first, and then decide which advertisers to display. Assume further that generalist advertisement yield a constant disutility to all readers \( \eta_g \). We have the following proposition:

**Proposition 2** A newspaper will deviate from general advertisement and choose specialized advertising over general advertising if and only if:

\[ V \leq \frac{(\bar{V} - \eta_a)}{2K} + \frac{(\bar{V} - 3\eta_a)}{2k}, \text{ with } A = \frac{\eta_r}{2} - \frac{\eta_g}{2t + \eta_r} \]

(26)

**Proof.**

Once quality has been chosen and its associated costs are sunk, the profits of newspaper 1, when both newspapers publish specialized advertisement is:

\[ \Pi^1_{General}(q_i, q_j, k) = \frac{1}{2} \left( \bar{V} - \eta_a \right) K + \frac{1}{2} \left( \bar{V} - 3\eta_a \right) k \]

If newspaper 1 switches to general advertisement, the relative disutility from advertising results in a gain of anchored readers \( A = \frac{\eta_r}{2} - \frac{\eta_g}{2t + \eta_r} \), and extracts value \( V \) from them. Hence, profits are:

\[ \Pi^1_{Specialized}(q_i, q_j, k) = \frac{V}{2} \left( (1 + 2A)K + (1 - 2A)k \right) \]

Comparing these profits yields condition (26).

This condition leads to interesting strategic interactions. Assume that condition (26) is met and

\[ V \leq \frac{1}{K + k} \left( \left( \bar{V} - \eta_a \right) K + \left( \bar{V} - 3\eta_a \right) k \right) \]

(27)

This may happen only if \( A > 0 \), meaning general advertisement harms the non-specialized readers less than specialized advertisement. Each news outlet has an individual incentive to switch to general
advertising. However, the rival immediately follows suit, resulting in a decrease in profits compared to the case when news outlet keep specialized advertising. Therefore, this situation constitutes a prisoner’s dilemma. On the contrary when \( A < 0 \), meaning selecting general advertising results in a loss of readers, both firms have an incentive to be a follower. When condition (28) is not met, news outlets have a strong incentive to coordinate and switch to general advertising, even if condition (26) is not met.

\( A \) can be positive or negative, depending on whether the nuisance of a general piece of advertisement \( \eta_g \), is smaller or greater than the nuisance exerted by specialized advertisement on the median reader \( \eta_r/2 \). Expression 26, the threshold for one newspaper to deviate to specialized advertising increases with \( k \) (see Appendix D.4), meaning general advertisement is more likely to be selected when there are more inter-newspaper promotion. If one newspaper switches to specialized advertisement, it is easy to show that the competitor is likely to follow suit (see Appendix D.4). Figure 11, shows the limit \( V^{\text{lim}} \) above which one newspaper selects general advertisement (solid lines) and the second one follows suit (dotted lines), as a function of the general advertisement externality \( \eta_g \).

![Figure 11](image)

**Figure 11:** limit \( V \) below which one newspaper switches to specialized advertisement (solid lines) and the second one follows suit (dotted lines), as a function of the general advertisement externality \( \eta_g \).

Black lines are the benchmark case when there is no inter-newspaper promotion. Red lines correspond to the case when there is, and 1/3 of the reading is made during roaming.

\[ \bar{V} = 1, \eta_a = 0.9, K = 2, \eta_r = 0.5, t = 1 \]

Thus, the region in which a newspaper switches to specialized advertisement decreases with \( k \), at least when the nuisance to unspecialized readers is sufficiently similar to these of specialized advertisement. This means inter-newspaper promotions tends to make it more likely that newspapers switch to general advertising, as opposed to specialized advertising.

### D.2 Quality equilibrium

Therefore, the newspapers may switch to a paradigm where both allocate their advertisement slot to specialized advertisers. Newspapers profit maximization results in quality:

\[
q(K,k) = \frac{1}{4c(t + \eta_r)} \left( (\bar{V} - \eta_a)K + \left( F + f - (\bar{V} - \eta_a) \right) k \right)
\]
First of all, specialized advertisement helps newspapers differentiate from one another, meaning the transport cost $t$ is virtually increased to $t + \eta$. This tends to decrease competition, and therefore leads to decreased quality. As before, the exchange fees may decrease or increase further the quality provided to readers. The main insights remain: conditional on newspapers displaying specialized advertising, inter-newspaper promotion tends to decrease quality. Increasing $f$ and $F$ alleviate this effect by restoring competition.

D.3 Surplus considerations

Again, the readers most negatively affected by inter-newspapers advertisement are the specialized ones ($x = 0$ and $x = 1$). On top of the effect of the greater preference costs identified in the previous section, they also have to endure some ill-targeted advertisement. Conversely, non specialized readers lose relatively less utility. This phenomenon adds to the phenomenon we observed in Section 3.3, namely that non-specialized readers also enjoy relatively more the content of the roaming newspaper. Hence, the difference in utility increment accentuates between specialized and non-specialized readers when news outlets select general instead of specialized advertisers.

As a conclusion, if a large share of readership originates from inter-newspaper promotion, newspapers may switch to general advertisement, as opposed to specialized advertisement. On top of the effects described in the previous sections, competition between newspapers is increased, which benefits both readers and social surplus. However, such general advertisement accentuates the discrepancy in utility gains between non-specialized and specialized readers.

D.4 Conditions for a deviation to general advertising

Sketch of the proof. Once quality has been chosen and its associated costs are sunk, the profits of newspaper 1, when both newspapers publish specialized advertisement is:

$$\Pi_{1, \text{specialized}}(q_i, q_j, E(K)) = \frac{1}{2} \left( \bar{V} - \frac{\alpha r}{4} \right) E(K) + \frac{1}{2} \left( \bar{V} - \frac{3\alpha r}{4} \right) E(K)$$

If newspaper 1 switches to general advertisement, the relative disutility from advertising results in a gain of anchored readers $A = \frac{\alpha^s}{2 + \alpha^s}$, and extracts value $V$ from them. Hence, profits are:

$$\Pi_{1, \text{general}}(q_i, q_j, E(K)) = \frac{V}{2} \left( (1 + 2A)E(K) + (1 - 2A)E(k) \right)$$

Comparing these profits yields condition (26).

This condition leads to interesting strategic interactions. Assume that condition (26) is met and

$$V \leq \frac{1}{E(K) + E(k)} \left( \left( \bar{V} - \frac{\alpha r}{4} \right) E(K) + \left( \bar{V} - \frac{3\alpha r}{4} \right) E(k) \right)$$

(28)

This may happen only if $A > 0$, meaning general advertisement harms the non-specialized readers less than specialized advertisement. Each news outlet has an individual incentive to switch to general advertising. However, the rival immediately follows suit, resulting in a decrease in profits compared to the case when news outlet keep specialized advertising. Therefore, this situation constitutes a prisoner’s dilemma. On the contrary when $A < 0$, meaning selecting general advertising results in a loss of readers, both firms have an incentive to be a follower. When condition (28) is not met, news outlets have a strong incentive to coordinate and switch to general advertising, even if condition (26) is not met.

E Strategies of the CDP

In previous sections, the fees of the CDP were exogenous, allowing to discuss their impact on quality in a simple manner. However in reality, CDP are also strategic players, who will set the fees so as
to maximize an objective function, taking into account the actions of potential rivals. Much of the formalism of this section is borrowed from Caillaud and Jullien (2003b). We now allow the CDP to set not only per-click fees $F$ and $f$ (commonly referred to as “usage fees” in the literature on two-sided markets), but also some participation fees $p_h$ and $p_p$. $p_h$ is the fee charged to a hosting news outlet, for the CDP to print its suggestions. $p_p$ is the fee charged to potential promoters. We allow these lump-sum payments to be negative. They are independent from the success rate of the suggestions.

Assume the total number of clicks is proportional to (1) the number of unique articles $k$ and (2) the number of promoters subscribing to CDP $i$, denoted $z_{ih}$. The expected number of clicks is thus expressed as $kz_{ip}$. Denote $z_{ih}$ the number of hosts participating in CDP $i$. We normalize the number of news outlets to 1: $\max(z_{ip}) = \max(z_{ih}) = 1$.

Each news outlet accepts to participate as a host if and only if the revenue it receives from referrals exceeds the cost of participation and the opportunity cost of the referral. This translates in:

$$kz_{ip}f - p_h \geq kz_{ih}F$$

Similarly, each news outlet accepts to participate as a promoter if and only if:

$$kz_{ih}F + p_p \leq kz_{ih}F$$

We will distinguish two cases. First, the case when the CDP is a monopoly, and second, the case when there is competition.

E.1 Uncontested monopoly

If the CDP is alone on the market and is not threatened by entry, he will strive to maximize the following objective function:

$$\Pi(f, F, p_h, p_p) = ((F - f)kz_{ip}^+ + p_pz_{ip}^+ + p_s)z_{ih}^+$$

s.t. $kz_{ip}^+f - p_h \geq \frac{f}{k}kz_{ip}^+$

$$kz_{ih}^+F + p_p \leq \bar{F}kz_{ih}^+$$

The CDP will obviously choose prices such that $z_{ip}^+ = z_{ih}^+ = 1$, as it maximizes the quality of its service overall. Being a monopolistic player, all value created will be appropriated by the CDP in the present setting. This maximization problem has an infinity of solutions. All solutions satisfying $F < \bar{F}$, $f > \bar{f}$, $p_h = (F - \bar{f})k$, $p_p = (F - \bar{f})k$ maximize the CDP profits. In all cases the CDP extracts all the surplus created by his service. In particular the CDP may set the fees at a welfare destructive level (i.e. $F = f = \bar{f}$). Fortunately, CDPs currently do not use explicit participation fees. As discussed in Section 3 a monopolistic CDP with all bargaining power sets $F = \bar{F}$, $f = \bar{f}$ and participation fees are de facto set at $p_p = p_h = 0$. In terms of social welfare this is a better outcome than some equilibria where the fees are both set at their minimum feasible level.

A social planner may however want to go further, by imposing that hosts be rewarded, on a per-click basis at $f = \bar{f}$. In that case the CDP may recover his monopoly profits by increasing the participation fees to hosts, leaving them with no surplus. However, the news outlets would be adequately incentivized to produce quality.

E.2 Contestable monopoly

Assume now that there is a new entrant in CDP services, named E. We show below that, given the set of pricing instruments, all equilibria are ex-post efficient in the sense that all active CDPs propose access to all participants, allowing the probability of a match to be 1. In all equilibria, CDPs make zero profits. Depending on the set of pricing instruments however, the fees may not be quality-maximizing.

We denote by superscript $I$ and $E$ respectively, the elements relative to the incumbent and the entrant. In line with Caillaud and Jullien (2003b), we assume that participants hold pessimistic beliefs,
meaning after a deviation from the entrant, participants expect zero market share for E, whenever possible. To attract participants even in pessimistic beliefs, a new entrant has to adopt a divide-and-conquer strategy. E must subsidize one group, say the group of promoters so that they accept to join the platform. For this to happen, he needs to set the entry fee low enough such that they are happy to join, even if it results in them not being matched at all:

\[
-p_p^E \leq (F - F^I)k - p_p^I
\]  

(29)

In case of strict inequality the entrant attracts all promoters, \( z^E = 1 \). E will subsequently benefit from the inter-group externality when it courts hosts. The latter rationally expect all promoters to be enrolled with the entrant, who needs to provide a payment:

\[
(f^E - f)k - p_h^E \geq -p_h^I
\]  

(30)

, so that hosts join the platform. The entrant can set \( F^E = F \) as it doesn’t affect the participation of either side –see equations (29) and (30). To prevent entry, the incumbent must choose its pricing such that the profits of the entrant are non-positive:

\[
\Pi^E(f^E, F^E, p_h^E, p_p^E) = p_p^E + p_h^E + (\bar{F} - f^E)k \leq 0
\]  

(31)

The maximization of the profits of the entrant result in conditions 29 and 30 being met with equality. Plugging them into (31) yields condition:

\[
\Pi^E(f^E, F^E, p_h^E, p_p^E) = \Pi^I(f^I, F^I, p_h^I, p_p^I) + (f^I - f)k \leq 0
\]  

(32)

For this condition to allow the incumbent to make positive profits, one would need the fee charged to hosts by the incumbent \( f^I \) to be smaller than \( f \). However, in that case no newspaper would be willing to publish external links. Hence (32) cannot be negative without the incuments’ profits being negative. This means preventing entry is possible, but requires the incumbent to make no profits.

Thus, we have that there exist only equilibria that provide efficient matching (the probability of a match is 1), result in a unique active firm, making zero profit \( (p_h + p_p + (F - f)k)k = 0) \). However, the resulting fees are \( F = \bar{F} \) and \( f = \bar{f} \), which does not result in the maximum quality in the long-run. When promoters are allowed to multi-home (i.e. the promotion service is not exclusive), one can easily show that reducing the set of instruments by disallowing participation fees will result in the fees being set optimally at \( f = F = \bar{F} \). The proof is in Appendix E.3. The basic argument is that hosts being single-homers while promoters may multi-home, CDPs cater to host, and extract surplus from promoters. This translates in a high remuneration \( f \) to hosts, and subsequently a large payment \( F \) from promoters.

In sharp contrast with the uncontested monopoly case where the regulator would seek to set \( p_h = (F - f)k \) so as to have \( f = F = \bar{F} \), a regulator willing to maximize quality should forbid both participation fees, so CDPs compete in per-click fees only.

The main findings of this section are illustrated in figure 12. When the CDP is an uncontested monopoly, a regulator may want to intervene so that the per-click fees are set optimally. This will be more easily implemented if the CDP has access to a rich set of instruments: introducing the participation fees will allow him to recoup the loss followed by the imposition of the click-fees, without distorting the equilibrium quality.
These conclusions are reversed when the market is contestable. In particular, in the likely case when participation of promoters is non-exclusive (i.e. they can promote their content in several platforms), restricting the set of available instruments to per-click fees result in CDPs posting the quality-maximizing set of fees. This insight relates to Caillaud and Jullien (2003b), where authors show that introducing participation fees ($p_h$ and $p_p$ in the present case) may erode all profits of an incumbent platform, with interaction fees (similar to our $F - f$ margin) set at their maximum level.

### E.3 Proof of equilibrium fees when markets are contestable

Assume that $f^I < F^I$. An entrant can offer to hosts a transaction fee $f^E = \frac{F^1 - F}{2}$ and a fee $F^E$ arbitrarily close to $F^I$. Then promoter would accept the offer, and the entrant can offer the same matching ability as the incumbent, with higher payment $f^E$. Hence the entrant would reap the whole market. We must therefore have that $f^I = F^I$.

Assume now that $f^I = F^I < F$. Then a new entrant could set fees at $F^E = F - \epsilon$, and $f^E = f^I + \epsilon$, with $\epsilon > 0$, arbitrarily close to 0. Again, he would reap the whole market and make positive profits.

Hence, one must have that $f^I = F^I = F$.

### F Effect of exchanges on the production of original articles

It is legitimate to fear that exchanges may reduce diversity available to readers. Indeed, if news items are shared with the readers of a competitor, one may suspect incentives to produce original news items may be decreases.

To analyse this case, we assume that on each news outlet produce the common $K$ articles of the base model exposed in Section 3. On top of these common articles, each news outlet $i$ can produce $k_i \geq 0$ extra original articles. We assume that only a share $\tau \in [0,1]$ of these new original articles...
are shared between competitors. We will analyse successively the infra-marginal effects of \( \tau \), and the competitive effects. Again, we seek symmetric equilibria.

First, the incremental value of original articles on inframarginal consumers is:\[ V k_1 n_1 + (V - F)(1 - n_1) \tau k_1. \] Hence the value of an original articles, extracted from inframarginal consumers is:\[ v_{ext}^{infra} = \frac{V}{2} + \tau \frac{V - F}{2} \] (33)

This is to be compared with an inframarginal value of \( v_{ext}^{infra} = \frac{V}{2} \) when there are no exchange. Hence exchanges always increase the value of inframarginal consumers.

Second, the number or original articles has an impact on readers’ anchorage decisions. The utility of consumers 1 and 2 becomes:

If the reader anchors in 1:
\[
U^1 = \bar{U}_r + (q_1 - tx)(K + k_1) + (q_2 - t(1 - x)) \tau k_2
\] (34)

Symmetrically, if the reader anchors in 2:
\[
U^2 = \bar{U}_r + (q_2 - t(1 - x))(K + k_2) + (q_1 - tx) \tau k_1
\] (35)

Solving for the indifferent consumer we find that:
\[
n_1(\tau) = \frac{K + k_2(1 - \tau) + \frac{1}{2}(q_1 - q_2)K + (q_1 k_1 - q_2 k_2)(1 - \tau)}{2K + (k_1 + k_2)(1 - \tau)}
\] (36)

One may verify that \( \frac{\partial^2 n_1}{\partial \tau \partial k_1}(\tau) < 0 \). This means the exchange of articles decreases incentives to create new articles. If there are full exchanges (\( \tau = 1 \)) producing new articles doesn’t modify consumers’ anchorage decisions: \( \frac{\partial n_1}{\partial k_1}(\tau = 1) = 0 \). Denote \( k^* \) the equilibrium amount of original articles created when there is no exchange. We analyse whether exchanges encourage the production of new articles. The value of an incremental article is:
\[
v(k_1) = \frac{V}{2} + \tau \frac{V - F}{2} + \frac{\partial n_1}{\partial k_1}(VK - (V - f - F) \tau k^*)
\] (37)

\[
\frac{\partial v}{\partial \tau}(k_1) = \frac{V - F}{2} - k(V - f - F) \frac{\partial n_1}{\partial k_1}(\tau) + \frac{\partial^2 n_1}{\partial \tau \partial k_1}(\tau) (VK - (V - f - F) \tau k^*)
\] (38)

Due to the complexity of this expression, we describe a few relevant situations:

- If the CDP is a monopoly, he sets \( f = 0 \) and \( F = V \) and having exchanges is detrimental to article creation: \( \tau^* = 0 \).

- If the newspapers jointly manage the CDP service, \( f = F = 0 \) numerical applications show the quantity-maximizing exchange level is \( \tau^* = 1 \).

Figure 13 shows the quantity-maximizing level of exchanges, as a function of exchange fees \( f \) and \( F \).
When \( f = F = V \) the intrinsic value of consumers need to be high enough in order for exchanges to trigger the creation of more articles.

\section*{G A pro-competitive effect of inter-newspaper promotion}

So far we have assumed that all readers were perfectly informed about all newspapers quality. However this setting is optimistic, and may result in an overestimation of the competitiveness of the market.
In reality, readers are only sporadically informed about the true quality of the newspapers they are not used to read. If a newspaper unilaterally increases his quality, his own readers will know it immediately but others won’t – if not through advertising or promotion. Thus, absent inter-newspaper promotion, we may observe limited competition. Inter-newspaper content promotion should convey a pro-competitive effect, in that it informs readers of the quality of competitors. This is something the previous sections ignores, as the setting is one of perfect information. As a consequence, allowing competitors to promote content did not result in additional information the reader could use: the reader didn’t change her “anchor” website, as she knew she had already chosen the optimal one. In this section, we aim at capturing the pro-competitive effect of information.

We now slightly edit the previous setting in the following manner. A share $\mu$ of readers is perfectly informed. They therefore behave similarly to the readers of the previous sections. However, we add some realism by assuming that their probability to click will depend on the perceived quality of the promoted content. A share $1 - \mu$ have received no information, and are assigned randomly to a newspaper. These readers actively search for information on competing content, in a move to find their optimal anchorage site. They are therefore more likely to click on the promoted content – and may discover the promoted newspaper has better quality or is a better fit to their taste. For simplicity, we assume here that uninformed readers are keen to discover new content and visit the promoted content with probability 1.

Two effects are at play. On the one hand, publishers want to have high-quality promoted content, so as to maximize the number of click from its local, informed readers. On the other hand, they want to make sure that the quality is low enough so that uninformed readers are unlikely to find that the promoted newspaper is a better place to anchor. This is consistent with the empirical observation that the promoted content from a given newspaper, is of significantly lesser quality than the promoted newspaper’s average (see Section 5).

The publisher may select promoted content which quality is different from the average quality $q_j$ of the competitor. Denote $v$ the derating of quality, so that promoted content has quality $vq_j$. I assume for simplicity that the publisher makes a take it or leave it offer to the promoter, leaving him the opportunity to accept to promote an article of such quality or article at all. This assumption ensures that promoters accept the deal, as otherwise they would not attract any roaming readership at all. The two types of readers have different incentives to click on the promoted content. The $\mu$ informed readers are not searching for information. They simply click if they expect the promoted content to be interesting. We assume the choice of whether to click results from a Tullock contest (Tullock (1980)), between clicking, and go to the outside opportunity (stop reading news and do something else), which yields positive benefit $\bar{u}_a$. Hence the probability to click, is $\frac{vq_j}{vq_j + \bar{u}_a}$. In that case the local newspaper gains $f$.

We assume there are an infinity of days, and news outlets have a discount factor $0 < \delta < 1$. The $1 - \mu$ uninformed readers are curious to discover new content, and thus always click. Again, the local newspaper gains $f$. However, this reader might decide to make the competitor her anchor site. Then, the local newspaper loses a reader of future value $\sum_{t=1}^{\infty} (KV + fk) \delta^t$, and gains some viewership from promoted links, coming at cost $F : \sum_{t=1}^{\infty} k(V + kf - F) \delta^t$. We assume that $\sum_{t=1}^{\infty} (KV + fk - k(V + kf - F)) \delta^t - f > 0$, meaning the local newspaper gets negative profits when an uninformed reader actually leaves. After inspection, an uninformed reader chooses to leave newspaper $i$ and elect the promoter $j$ as her new anchor site if and only if:

$$q_i - tx < vq_j - t(1 - x)$$

This means the expected number of returning uninformed readers is $(1 - \mu) \left( \frac{1}{2} + \frac{q_i - vq_j}{2 \delta t} \right)$. 

37
Local newspapers choose \( v \) so as to maximize:

\[
\Pi(v) = \mu \left( KV + \frac{v q_j}{v q_j + \bar{u}_a} \right) \frac{1}{1 - \delta} + (1 - \mu) \left( \frac{KV + k f}{1 - \delta} \left( \frac{1}{2} + \frac{q_i - v_i q_j}{2 t} \right) + \left( \frac{KV + k f + (V + k f - F)}{1 - \delta} \right) \left( \frac{1}{2} - \frac{q_i - v_i q_j}{2 t} \right) \right)
\]

After some calculations, we find that the optimal \( v^*_i \) is explicitly given by:

\[
v^*_i q_j = \sqrt{\frac{\mu}{1 - \mu} \frac{1 - \delta}{\delta} \frac{k f}{((K - k)V + F k - f k (k - 1))^{2 t} \bar{u}_a - \bar{u}_a}}
\]

Hence publishers don’t necessarily want to promote the best pieces of work of their competitors, for fear that they may lose some of their readers. The chosen quality is higher when the number of uninformed readers is small, and the relative value of roaming to anchored readers increases (i.e. \( F \) decreases). This section has shown that publishers may preferably select articles in the lower range of quality of their competitors. We argue this may be an attempt to limit the permanent leakage of readers to competitors, by providing them a biased signal of the quality of competing newspapers.