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News Media Bargaining Codes

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News Media Bargaining Codes*

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Abstract

We build a model of the news market where advertisers allocate their ads between a social media platform and a news website. Our objective is to evaluate policy interventions aimed at fostering news creation by transferring revenues from social media to news websites (already introduced in Australia, Canada, and Indonesia). We show that social media may voluntarily contribute to news development, but only suboptimally. Beyond a certain level of state-mandated transfer, the social media platform can credibly threaten to remove news content. We provide some guidance on how to design a policy that improves welfare by promoting news creation.

JEL classification: D43, D62, L13, L51, M37

Keywords: social media; news quality; platform regulation; news media bargaining code; online advertising

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1 Introduction

In March 2021, the Australian Government passed the *News Media and Digital Platforms Mandatory Bargaining Code (NMBC hereafter)*.[1] Motivated by a report by the Australian Competition and Consumer Commission (ACCC, 2019),[2] that highlighted serious imbalances in bargaining power between digital platforms (such as Alphabet's Google and Meta's Facebook) and news publishers, the purpose of the NMBC is to address such imbalances, and it does so by mandating a negotiation procedure that, ultimately, resolves in a monetary transfer from the platform to news publishers.[3]

The NMBC influenced legislation in several other countries. Canada and Indonesia passed the "Online News Act" in 2023 and the "Presidential Decree on Publisher Rights" in 2024, respectively.[4] These laws share many similar features with their Australian counterpart; in fact, the Canadian law was admittedly built on it.[5] Additionally, similar attempts at regulation are seriously being discussed in the US (both on the federal level and in California), as well as in the UK and New Zealand.[6]

All these laws design procedures that start with the governments designating which digital platforms will be subject to the law. Then, the designated platforms and eligible news media businesses are required to negotiate in good faith about a compensation scheme. Should the negotiation fail, the third phase, final offer arbitration, ensues, and the regulator selects one of the submitted offers (potentially with some adjustments). These procedures ensure that, ultimately, digital platforms will have to pay a monetary transfer to the press publishers for the distribution of their news content.

Arguing in favor of the regulations, news media businesses attribute their inability to monetize the news content they create to the systematic violation of intellectual property by news aggregators. In particular, digital platforms would allegedly display a large amount of the information embedded in a news item to the users, limiting their incentive to click through and, indirectly, the traffic generated on the news website. This practice, the news media businesses claim, constitutes a copyright violation that severely hampers newsrooms' incentives to invest in news quality. Arguing against the regulations, digital platforms have repeatedly claimed that the revenues directly linked to news media searches constitute only a small fraction of their total

[1] See https://www.legislation.gov.au/C2021A00021/latest/text. Accessed on April 21, 2024.

[2] Available at: https://www.accc.gov.au/system/files/Digital%20platforms%20inquiry%20-%20final%20report.pdf, accessed on April 21, 2024.

[3] In negotiating an agreement on, for example, how much content of a news item the digital platforms are allowed to show to consumers, these imbalances result in "media businesses accepting terms of service that are less favourable"(ACCC p. 210, 2019).

[4] Online News Act: https://laws-lois.justice.gc.ca/eng/acts/O-9.3/, Presidential Decree on Publisher Rights: https://setkab.go.id/en/govt-issues-regulation-on-publisher-rights/. All accessed on April 21, 2024.

[5] Lee and Molitorisz (2021) excellently summarizes and describes the Australian law.

[6] See https://www.congress.gov/bill/117th-congress/senate-bill/673/text for the US, https://www.washingtonpost.com/politics/2023/06/02/california-assembly-passes-journalism-bill-brushing-off-metas-threat/ for California, https://pressgazette.co.uk/uk-government-force-google-meta-pay-for-news/ for the UK, and https://www.beehive.govt.nz/release/big-online-platforms-pay-fair-price-local-news-content for New Zealand. All accessed on April 21, 2024.

revenues.[7] Also, news aggregators strongly point to their positive effect in expanding the reach of news, making their large user base available to news media businesses.

We contribute to this debate by discussing the effects of such regulations on i) the incentives of news media businesses to invest in news quality, ii) the incentives of digital platforms to voluntarily contribute to news quality, and iii) the welfare effects of such transfers.

We model the news media bargaining codes as mandatory transfers from digital platforms to news websites that redistribute advertising revenues. This is indeed the key feature of all the above-mentioned regulations. We design a model that satisfies four desirable properties. In particular, we assume that: i) there are two heterogeneous advertising channels - i.e., a social media platform (SM) and a news website (NW) - that compete to attract advertisers.[8] ii) SM is more efficient in targeting consumers; thus, from the advertiser's perspective, SM represents a more efficient advertising channel than NW. iii) NW needs ad revenues to create novel content, which is posted on SM. Finally, iv) consumers perceive ads as a nuisance, whereas they positively value the content generated by NW.

We identify a main trade-off from the social media platform perspective that drives our results. In particular, the social media benefits indirectly from news quality, as it increases the number of consumers in the market and, consequently, potentially increases advertising revenues. However, to stimulate additional news quality, the social media has to contribute with some monetary transfer. In fact, if the social media fully free rides on the news website's news quality, the latter would hold up investments entirely. Hence, in the *laissez-faire* regime, the social media platform participates in news creation with a monetary contribution, the size of which is the result of the trade-off. The regulator can intervene to mandate a negotiation between the social media and the news website on the size of the payment to promote social welfare. Building upon this trade-off, we derive three main results. First, we show that a well-designed transfer generates positive incentives for the news website to invest in additional news quality.

Second, the social media, under some conditions, may have an incentive to voluntarily contribute to the development of additional news quality. This is consistent with the existence of investment programs in the real world, such as Google News Showcase and Meta Journalism Project. However, the voluntary transfer the social media platform is willing to pay is always suboptimal, as the regulator would always prefer a higher monetary transfer to be paid.[9] In light of this market failure, we address the effect of a policy mandating a transfer from the so-

[7] Recent studies have seriously contested this argument. In more detail, using an experiment with Swiss internet users, Johann et al. (2023) finds that news contributes to improving the quality and trustfulness of platforms in consumers' eyes. Hence their share of the added value is, according to the authors, non-negligible. Similarly, Holder et al. (2023) proposes that the amount of money that news aggregators owe to news media businesses in the U.S. would be around 13 billion US dollars yearly.

[8] We use the term "social media platform" in a broad sense to encompass all types of digital platforms affected by the regulations.

[9] In an extension with multihoming advertisers, we show that both the voluntary payment and the socially efficient transfer could be negative under some conditions, for instance, when there is no business stealing or when the gap in advertising efficiency between the social media platform and the news website is very large. In these cases, we argue that a regulation mandating a transfer as the one modeled here would be detrimental to welfare.

cial media platform to the news website. Interestingly, we identify a threshold of the monetary transfer above which the social media can credibly commit to withdrawing its hosting service — i.e., to go dark, meaning that the news website is banned from posting news on the social media feed. Below that threshold, instead, there is room for negotiation.

Third, finally, the optimal design of the transfer is a simple rule that ties the monetary transfer to the quality of the additional news generated.[10] We believe this last result is particularly interesting from a policy perspective, as it can provide important implications for effective regulation.

Background. The issue of regulating market interactions between news media businesses and digital platforms is not new. Indeed, concerns about the sustainability of free press in a digital market dominated by large platforms have been worrying regulators worldwide in the last decades. These concerns originate from the negative trends of news media businesses' advertising revenues[11] and on newsrooms' employment levels.[12] Due to the strong positive externalities that journalism exerts on society,[13] preserving the sector from the overwhelming competitive pressure of large digital platforms has become a prominent objective in regulators' agendas, to the extent that the phrase "saving journalism" has become common (Schiffrin et al., 2022).[14]

Previous attempts to regulate digital platforms in the advertising market were unsuccessfully implemented in 2014 in Spain and Germany (Colangelo, 2021). In both cases, governments proposed a so-called "link tax" that news aggregator platforms would pay-per-click to news websites in exchange for embedding news content. Indeed, Google decided to shut down the Spanish edition of Google News. In Germany, most publishers accepted Google's new "opt-in" policy that required them to give up compensation to be listed in the Google News service. These events gave rise to two interesting empirical studies.

Calzada and Gil (2020) finds that following the Google News shutdown in Spain, daily visits to Spanish news outlets fall by 8-14%. Similarly, the German publishers who decided not to accept Google's new "opt-in" policy experienced a similar fall in daily visits by 8%. Athey et al. (2021) also analyzes the shutdown of Google News in Spain in 2014. Using data from users

[10] Measuring news quality is a hard task. One way to do it is by looking at the number of full-time equivalent employees hired in a newsroom. See the Canadian Online News Act Applications and Extensions Regulations https://canadagazette.gc.ca/rp-pr/p2/2024/2024-01-03/html/sor-dors276-eng.html.

[11] In Italy, as shown in a recent report by Accenture, advertising revenues have fallen by around 48% between 2003 and 2019. See the report at https://newsmedia-analysis.com/wp-content/uploads/2021/07/accenture_analysis_ItalyNewsMedia_english.pdf. Similarly, in the U.S., news media businesses' share of advertising revenues has been steadily declining. See the report on the State of News Media by the Pew Research Centre available at https://www.pewresearch.org/wp-content/uploads/sites/8/2016/06/state-of-the-news-media-report-2016-final.pdf. Both accessed on April 21, 2024.

[12] Focusing on the newspaper sector, newsroom employment in the U.S. has fallen 57% between 2008 and 2020. See https://www.pewresearch.org/short-read/2021/07/13/u-s-newsroom-employment-has-fallen-26-since-2008/.

[13] Recital 54 of the EU Directive on Copyright and related rights in the Single Digital Market states that "[A free and pluralist press] provides a fundamental contribution to public debate and the proper functioning of a democratic society." In addition, Angelucci et al. (2024) show empirically how changes in ad-financed media may harm local journals and, thus, have political effects.

[14] Indeed, the US regulations are called "(Californian) Journalism Competition & *Preservation* Act". In addition, see Cagé (2016) for a discussion on the implications of the decreasing size of newsrooms.

of Microsoft products, the authors find that daily visits to news websites following the Google News shutdown fell by 10%.

Whereas these previous attempts at regulation failed, there is suggestive evidence that the recently introduced news media bargaining codes work. In Australia, it is estimated that the introduction of the NMBC has increased the number of private deals between digital platforms and news media businesses.[15] In Canada, Google agreed to contribute 100 million CAD yearly to news organizations.[16]

Despite the seemingly positive effects, these regulations have caused very public controversies. In 2021, reacting to the NMBC being discussed in Australia, Facebook banned all news from the local users' feeds. Similarly, to date (April 2024), Canadians have not had access to news on Facebook since June 2023. In both countries, Google threatened to withdraw its search engine as a reaction to the new regulations.[17] Similarly, in California, US, Google started shadowing news from local outlets for a small fraction of their local users as a reaction to the proposed "California Journalism Preservation Act" in April 2024.[18] The digital platforms' main arguments against this new type of regulation are twofold: i) by providing access to their large user base, platforms allow news publishers to reach a larger audience (this is what the literature refers to as the market expansion effect, see Calzada and Gil, 2020; de Cornière and Sarvary, 2022; Jeon and Nasr, 2016); ii) Facebook and Google have already engaged in voluntary investment programs contributing to sustainable journalism (Meta Journalism Project and Google News Showcase).

Related literature. This paper contributes to the growing literature on the regulation of large digital platforms (Anderson and Bedre-Defolie, 2022; De Chiara et al., 2022; Cunningham et al., 2021; Hagiu et al., 2022; Hua and Spier, 2023; Johnen and Somogyi, 2024; Lefouili and Madio, 2022; Rafieian and Yoganarasimhan, 2021). We contribute to this literature by focusing on a novel type of regulation of large platforms that showcase news items, such as Facebook and Google. To date, the study of news media bargaining codes has mostly been relegated to the realms of media, communication, and legal studies.[19] The only other paper studying news media bargaining codes from an economic perspective is empirical work by Freimane (2023). The paper presents a novel dataset created by web-scraping data about Google News in Australia and other English-speaking countries before and after the acceptance of the Australian regulation. The main finding is that as a consequence of the regulation, Google seemed to substitute away from

[15] Recent estimates suggest that, in the first year, Google and Facebook signed private agreements with news publishers that sum up to over 200 million AUS dollars. According to Rod Sims, former Chair of the Australian Competition and Consumer Commission, the amount is almost 20% of the cost of journalists' salaries in Australia. Report available at https://jninstitute.org/wp-content/uploads/2022/05/Rod-Sims_News-Bargaining-Code_2022.pdf.

[16] See https://www.cbc.ca/news/politics/google-two-thirds-for-print-media-1.7060320, accessed on April 21, 2024.

[17] Commenting on these threats, the Canadian Prime Minister called Facebook's and Google's practices "*bullying tactics*": https://www.reuters.com/technology/google-meta-using-bullying-tactics-against-canadas-news-bill-says-pm-trudeau-2023-06-07. Last access on April 21, 2024.

[18] See https://www.washingtonpost.com/technology/2024/04/21/google-blocks-california-news/. Last access on April 22, 2024.

[19] See Bossio et al. (2022); Colangelo (2021); Furgał (2021); Lee and Molitorisz (2021), among others.

local publishers for international ones that are not subject to the regulation.

Our paper fits into the broad literature on two-sided markets, initiated by the seminal work of Armstrong (2006), Caillaud and Jullien (2003), and Rochet and Tirole (2003). A methodological contribution of our paper is that we model the news media market as a smaller two-sided platform (the social media connecting consumers to news websites) embedded in a larger two-sided platform, which also includes advertisers, a fourth player. Indeed, without the advertisers, the remaining players still constitute a two-sided platform: the social media connecting news websites to consumers, with positive indirect network externalities. Moreover, this smaller two-sided platform is part of the full game, where the social media and the news websites compete to connect advertisers to consumers.

Our analysis builds on previous work on two-sided media markets (Ambrus et al., 2016; Anderson and Coate, 2005; Anderson et al., 2017; Anderson and Peitz, 2020; Athey et al., 2018; Gabszewicz et al., 2004; Peitz and Valletti, 2008). These models mainly focus on the negative externality that advertisement exerts on consumers. Building on these studies, we highlight that ads are a source of revenue that can potentially remunerate content creators, i.e., news websites. Our main contribution to this literature is, therefore, twofold. First, we investigate the trade-off between allocating ads to the more efficient channel and allowing content creators to generate a positive externality for consumers. Second, we evaluate a policy instrument that would redistribute ad revenues from social media to news websites.

Social media platforms have been modeled as information gatekeepers when the consumers have limited attention, with potentially severe adverse effects for news websites, regarding the quality provision and revenues (Anderson and de Palma, 2009; Peitz and Reisinger, 2015). In particular, the relation between quality provision and ad revenues has been investigated in the literature (see Angelucci and Cagé, 2019; Bisceglia, 2023; Jeon and Nasr, 2016, among others). Our paper differs from this literature in three ways. First, we analyze the strategic behavior of competing advertising channels to attract revenues. Second, we identify a novel trade-off the social media platform faces when it decides about the voluntary contribution to pay the news website to participate in additional news quality investment. Finally, our paper diverges from the existing contributions by assessing the welfare effect of a specific policy intervention that mandates negotiation between the two advertising channels over a monetary transfer aimed at protecting publishers.

Differently from most of the previous literature, we design a model where two different and interdependent two-sided platforms interact. In this regard, our paper closely relates to de Cornière and Sarvary (2022) (C&S, hereafter), which analyzes the effect of on-platform content bundling of news and user-generated content on news quality. As in our model, C&S assumes the platform can host news produced by a news website, which is competing against the platform. Unlike our work, C&S models a market for consumers' attention where news websites can invest in the quality of news to attract more consumers and, indirectly, ad revenues. Instead, we model a market for ads in which the news website and the platform compete to sell ad spaces to advertisers. Although its main focus is on content bundling, in an extension, C&S looks at

the effect of a transfer from the platform to the news website. As our model is explicitly built to capture the trade-off generated by the regulation, it exhibits the following desirable features: i) our timing allows a strategic response by the players to the regulation and, thus, reflects the dynamic nature of renegotiations entailed by it; ii) our setting can explain some real-world behavior of platforms, namely that they voluntarily invest in journalism. In other words, the transfer does not constitute a zero-sum game between the news website and the platform.

The rest of the paper is organized as follows. First, in Section 2, we present the model setup. Next, Section 3 describes the main results. In more detail, Section 3.1 solves the model assuming no transfer is paid, whereas Sections 3.2 and 3.3 analyze the transfer that the SM is voluntarily willing to pay and the socially optimal transfer, respectively. We extend our results in several directions in Section 4. Finally, Section 5 concludes.

2 A model of regulating platforms in the news media market

We consider a model with four types of agents: i) a mass of consumers; ii) a monopolistic social media platform (e.g., Facebook or Google, SM hereafter); iii) a news website (NW hereafter);[20] iv) an advertiser who posts ads in order to sell her products. In the rest of the paper, we will often refer to the NW and the SM as "channels."

The value of news. We distinguish between two types of news: low value (f_L) and quality news (f_H). The NW can always generate low-value (f_L) news for free. Additionally, the NW can invest in developing additional news quality, which we define as f.[21] We normalize f_L to zero, i.e., the value of news is entirely captured by the additional quality f. In order for the NW to develop quality, it has to engage in costly investments and pay an innovation cost, which we assume to be convex. More in detail, we assume the cost of innovating has a standard quadratic cost function: $cf^2/2$.

The advertiser and the two channels. We consider a game in which one company, the advertiser, buys ad slots on a channel to reach the consumers and sell its products. We focus our attention on the monopolist case in which there is a single advertiser. In the baseline model, we impose that the advertiser single-homes on a single channel (i.e., buys ads on either the SM or the NW), an assumption that we relax in Section 4.2.

We denote the amount of ad space channel i sells by a_i, $i \in \{SM, NW\}$. For each consumer exposed to each ad, the advertiser pays the price p_i and receives income $k_i > 0$. Throughout the paper, we assume that the SM is more efficient than the NW – i.e., $k_{SM} > k_{NW}$. One can

[20] One can think of the news website as a conglomerate that represents the editorial association of media firms. In fact, the European, Australian, and Canadian regulations all explicitly allow for collective bargaining. In Section 3.5, we discuss how results change if more than one news website is considered.

[21] We interpret f, the value of additional news development, as an objectively measurable *key performance indicator*, such as the number of full-time equivalent employees, as stated in the Canadian Online News Act Application and Exemption Regulations, see https://canadagazette.gc.ca/rp-pr/p2/2024/2024-01-03/html/sor-dors276-eng.html.

interpret the efficiency parameters k_i as the average click-through rate of an ad on channel i.[22] The advertiser will only place a positive amount of ads in a channel if $k_i > p_i$.

We can write the profits of the advertiser choosing channel i as:

$$\pi_i^A = n_i \cdot a_i \cdot (k_i - p_i).$$

where n_i indicates the mass of consumers joining channel i. Both SM and NW derive profits from selling ad spaces.[23]

The two channels' profit functions can be written as:

$$\pi_{SM} = n_{SM} \cdot a_{SM} \cdot p_{SM} \quad \text{and} \quad \pi_{NW} = n_{NW} \cdot a_{NW} \cdot p_{NW}.$$

Consumers. We assume that a mass Z of potential consumers whose outside option is distributed uniformly on $[0, Z]$, with Z sufficiently large. Hence, the number of active consumers n will simply equal their utility, which we will later denote by U.[24]

Consumers derive positive utility from the news items developed by the NW and the content available on the SM, whereas they suffer a loss from being exposed to advertising. The consumers decide which channel to join and, by doing so, which content to consume. There are three possibilities.[25] First, consumers can access the NW and read the news item, which provides them a positive value $g(f) > 0$, where $g(\cdot)$ is an increasing, non-convex function (with $g(0) = 0$, $g'_f > 0$ and $g''_f \leq 0$).

Second, consumers can access the SM and benefit from the user-generated content, which we assume has an intrinsic value $v > 0$. On top of that, we assume that titles and snippets of the news item can be posted on the SM feed. Hence, consumers who join the SM channel also derive some utility $\theta\, g(f)$, where $\theta \in [0, 1]$ represents how informative the information shared on SM is about the actual content of the news. We interpret θ as a measure of the *business stealing effect* that the SM exerts on the NW. Indeed, when $\theta = 1$, the SM users learn everything about news and would have no additional benefit from visiting the NW. On the other hand, when $\theta = 0$, SM users do not learn anything about the news without visiting the NW.

Third, consumers can decide to multi-home and access both channels. Specifically, because we model the SM as a platform that can also intermediate between consumers and news websites, we allow the consumers who join the SM to discover a news item and click on it. By clicking the URL embedded in the post, the consumers are redirected to the NW, where they can read the entirety of the news. In this scenario, consumers will benefit from both v and $g(f)$.[26]

[22] Assumption $k_{SM} > k_{NW}$ is justified by the fact that the quality of data processed by social media platforms is, plausibly, better than news websites' data quality. Thus, consumers should be targeted more effectively on social media. In addition, digital platforms may be more effective as they sell ad space directly, without relying on intermediaries, unlike news websites (D'Annunzio and Russo, 2023).

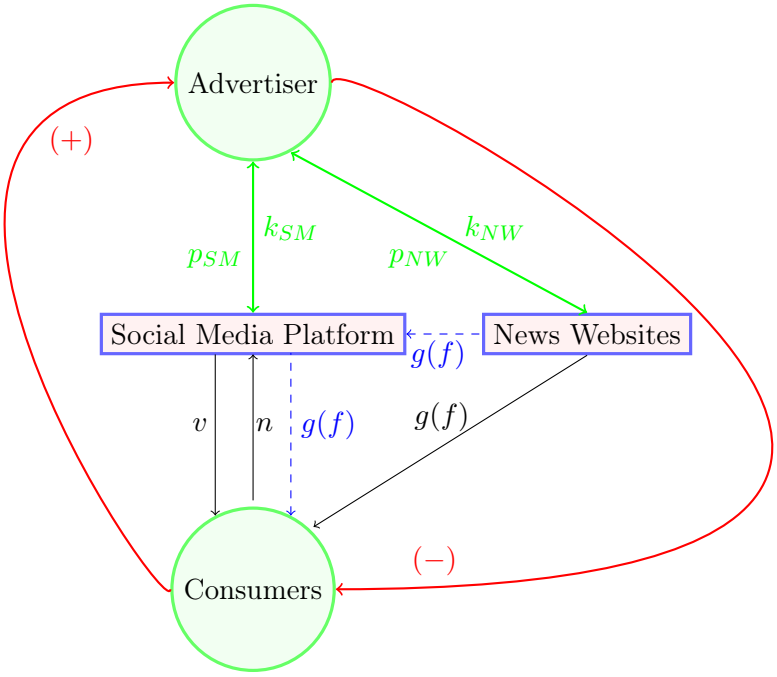
[23] We assume both channels have other sources of revenues, not modeled, allowing them to stay active even with zero ad revenues.

[24] Belleflamme and Peitz (2019a,b) make similar simplifying assumptions.

[25] We disregard the case in which consumers do not join the market at all as an irrelevant scenario for the purpose of our analysis.

[26] We assume there are no transportation costs involved.

Figure 1: Illustration of network effects and payments



In what follows, we assume $v > g(f)$ for two reasons. First, in this case, the platform is sufficiently attractive to constitute a competitive threat to news websites, which we believe is realistic. Second, one can interpret $v > g(f)$ as a large market expansion effect. Indeed, as v grows, the number of consumers joining the market via the platform also grows in equilibrium, thus the NW reaches a larger audience. Hence, we take the argument of the opponents of the regulations seriously by using this assumption.[27] Notice that consumers are assumed to be identical in their evaluations of news items and social media content. Hence, they all choose the same action. In Section 4.2, we extend our analysis to account for more sophisticated news consumption behavior, with consumers only consuming news titles and snippets on SM.

Finally, the presence of ads exerts negative externalities (d) on the utility of consumers.

Summing everything up and defining the label MH for the multi-homing scenario, we can write consumers' utility function as

$$U = \begin{cases} u_{SM} = & v + \theta\, g(f) - d(\mathbb{1}_{SM} a_{SM}); \\ u_{NW} = & g(f) - d(\mathbb{1}_{NW} a_{NW}); \\ u_{MH} = & v + g(f) - d(\mathbb{1}_{SM} a_{SM} + \mathbb{1}_{NW} a_{NW}); \end{cases} \tag{1}$$

depending on their channel choice. As the advertiser single-homes in this model specification, consumers are not exposed twice to advertisements. The element $\mathbb{1}_i$ is equal to 1 if the advertiser chooses to allocate her ads on channel $i \in \{SM, NW\}$, whereas it is 0 if she chooses channel $-i \neq i$.

Importantly, one can interpret the additional news development, $g(f)$, as a positive exter-

[27] Section 4.1 discusses how results change when we relax it.

nality. Indeed, it is generated by the NW, and it raises the number of consumers of the SM. Figure 1 provides an illustration of the different cross-group network effects and payments in our model.

The regulation. This article is aimed at investigating the effect of policies that mandate a monetary transfer from the SM to the NW. We denote the transfer by $T(f)$. In the main model, we investigate the effects of linear transfers proportional to news quality ($T'_f > 0$ and $T''_f = 0$). In an extension in Section 4.4 we also study lump-sum transfers ($T'_f = 0$) and more complex transfer structures ($T'_f > 0$ and $T''_f \neq 0$).

The timing The game's timing is as follows[28]: The transfer is paid at the beginning of the game, at stage $t = 0$, if the NW requires it. We distinguish three different scenarios. In particular, in section 3.1, we analyze the benchmark model without transfers. In subsection 3.2, we analyze the model with a voluntary transfer designed by the SM. Finally, in subsection 3.3, we analyze the model with a socially efficient design of the transfer. Upon observing the policy decision and the size of the transfer, at stage $t = 1$, NW invests in news quality and sets f. Prices of ad spaces on both channels, p_{SM} and p_{NW}, are determined simultaneously by SM and NW at stage $t = 2$. Given the price of ad spaces, the advertiser decides how to allocate ads at stage $t = 3$. Finally, consumers choose which channel to join (if any) at stage $t = 4$. Our solution concept is subgame-perfect Nash equilibrium. All omitted proofs are in the Appendix.

3 Equilibrium Analysis

In this section, we solve the model above using backward induction. Importantly, from stage 1, namely the choice of quality by the NW, the analysis trifurcates as we mention above. However, the analysis for the three scenarios is common in the last three stages.

The consumers' choice. At stage $t = 4$, consumers observe a_i and f and decide which channel to join. They have three alternatives: i) they can access the news directly from the NW; ii) they can join the SM and consume user-generated content and a snippet of the news; iii) they can multi-home and consume both news and user-generated content.

We proceed with our analysis by distinguishing two possible subgames. In the first one, consumers observe $a_{SM} > 0$ and $a_{NW} = 0$ — i.e., all ads are allocated on the SM. In the second subgame, consumers observe $a_{SM} = 0$ and $a_{NW} > 0$ — i.e., all ads are allocated on the NW.

In the first subgame $a_{SM} > 0$ and $a_{NW} = 0$. Consumers compare the utility levels in expression (1) to choose their actions. As there are no ads on the NW, consumers can multi-home "for free", i.e. without any additional nuisance, once they join the SM. Hence, the strategy of single-homing on SM is dominated by the strategy of multi-homing. Therefore, the comparison that the consumers must make is between multi-homing and being exposed to ads, or joining the NW and avoiding ad exposure, but missing user-generated content. Intuitively, multi-homing is

[28] For an alternative timing, see the discussion in Section 4.3.

a better strategy if $v > d\,a_{SM}$ —- i.e., if the added value of user-generated content outweighs the total disutility from being exposed to advertisements.

Instead, in the second subgame, $a_{SM} = 0$ and $a_{NW} > 0$. Consumers again compare the utility levels in expression (1) to decide what to do. Here, the channel with no advertisement is the SM, which means that, if consumers directly access the NW, they can multi-home for free. Hence, multi-homing dominates single-homing on the NW. Therefore, consumers compare multi-homing to single-homing on the SM, which allows them to avoid ad exposure at the cost of missing news items. As before, multi-homing proves to be a better strategy if the added value of reading news exceeds the cost of being exposed to ads: $(1-\theta)g(f) > d\,a_{NW}$.

The advertiser's choice. In the first subgame, it is important to notice that the advertiser must induce consumers to multi-home. In fact, if it does not, there is going to be no exposure to ads (as consumers join the NW) and, consequently, no revenues. Therefore, at stage $t = 3$, the problem of the advertiser is:

$$\max_{a_{NW}} \pi_{Ad}^{SM} = \underbrace{(v + g(f) - da_{SM})}_{\text{number of consumers } n_{MH}} \cdot a_{SM} \cdot \underbrace{(k_{SM} - p_{SM})}_{\text{revenue per-exposure}} \quad \text{s.t.} \quad a_{SM} \leq v/d$$

Recall that the number of consumers, n_{MH}, equals their utility u_{MH}. The result of the maximization problem yields:

$$a_{SM} = \min\left\{\frac{v + g(f)}{2d};\ \frac{v}{d}\right\} = \frac{v + g(f)}{2d}.$$

As $v > g(f)$, the unconstrained optimum is achievable, thus consumers multi-home in equilibrium and $a_{SM} = \frac{v+g(f)}{2d}$.

In the second subgame, the advertiser must also induce consumers to multi-home, otherwise it would not be able to get any revenues. Consequently, at stage $t = 3$, the problem of the advertiser can be written as:

$$\max_{a_{NW}} \pi_{Ad}^{NW} = \underbrace{(v + g(f) - da_{NW})}_{\text{number of conusmers } n_{MH}} \cdot a_{NW} \cdot \underbrace{(k_{NW} - p_{NW})}_{\text{revenue per-exposure}} \quad \text{s.t.} \quad a_{NW} \leq (1-\theta)g(f)/d$$

The result of the maximization problem yields:

$$a_{NW} = \min\left\{\frac{v + g(f)}{2d};\ \frac{(1-\theta)g(f)}{d}\right\} = \frac{(1-\theta)g(f)}{d}.$$

As $v > g(f)$, the unconstrained optimum is not achievable, thus the NW must choose $a_{NW} = (1-\theta)g(f)/d$ in order to induce multi-homing. Lemma 1 summarizes the analysis above:

Lemma 1. *The advertiser chooses the levels of advertisement on both channels in a way that*

induces consumers to multi-home. Depending on the prices, the advertiser chooses either

$$a_{SM} = \frac{v + g(f)}{2d}; \quad a_{NW} = 0 \quad \text{OR} \quad a_{SM} = 0; \quad a_{NW} = \frac{(1-\theta)g(f)}{d}.$$

The channels' choice. We proceed backward to stage $t = 2$, where the two channels compete in prices to attract advertisers. The two channels set their prices and, given that the advertiser single-homes, they attract either all ads or nothing. Hence, Bertrand competition ensues, and the two channels try to set the highest possible price that still provides the advertiser with a higher payoff than it would get if it allocated ads to the rival channel. In other words, from the SM's perspective, the problem is choosing p_{SM} such that the advertiser is better off by placing all ads on SM, regardless of the price the NW chooses, i.e.

$$p^*_{SM} = \max \left\{ p > 0 \quad \text{s.t.} \quad \frac{(v + g(f))^2 (k_{SM} - p)}{4d} \geq \frac{v\,(1-\theta)g(f)\,k_{NW}}{d} \right\}.$$

Using the values in Lemma 1, we derive the following:

Lemma 2. *The SM always wins the price competition by choosing*

$$p^*_{SM} = k_{SM} - k_{NW}\,\frac{4\,v\,(1-\theta)g(f)}{(v + g(f))^2}.$$

This equilibrium price depends negatively on $g(f)$, which makes intuitive sense: as the consumers' valuation of the news increases, the quality of the advertising service offered by the NW increases, and the SM must lower its price to convince the advertiser to allocate ads on its channel.

Important insights can be drawn from the analysis of the role played by business stealing in price competition and the choice of allocation of ads. The higher θ, the higher the price the SM can set while still securing all the ads (i.e., $\partial p^*_{SM}/\partial\theta > 0$). Very intuitively, if the SM can free-ride on the added value generated by NW's investment, it can use this advantage to soften price competition. In fact, an increase in θ has the effect of mitigating the trade-off faced by consumers (user-generated content versus news items), making multi-homing increasingly redundant.

3.1 Benchmark: No transfer

Here, we present the main result assuming that no transfer is paid from the SM to the NW. This scenario will serve as a benchmark for the more realistic cases presented in subsections 3.2 and 3.3.

The news website's choice. Next, we analyze the incentives of the NW to invest in additional news quality f (i.e., stage $t = 1$ of the game). In the Appendix, we prove the following Proposition:

Proposition 1. *Without transfers, the news website invests* $f^{no} = 0$ *and earns* $\pi_{NW}^{no} = 0$ *in equilibrium. Consequently, the price of ads is* $p_{SM}^{no} = k_{SM}$ *and the social media extracts all the surplus from the advertiser:*

$$\pi_{SM}^{no} = \frac{v^2}{4d} k_{SM} \qquad \text{and} \qquad \pi_{Ad}^{SM,no} = 0.$$

The consumer surplus and total welfare are $CS^{no} = \frac{v^2}{4}$ *and* $TW^{no} = \frac{v^2}{4}\left(1 + \frac{k_{SM}}{d}\right)$*, respectively.*

Proposition 1 anticipates a key element that drives the main result of the paper. Absent any transfer, the inability of the NW to appropriate at least some share of its R&D outcome implies that the NW will not invest in additional news quality. Importantly, the lack of investments in news quality hampers the intensity of competition in the digital ads market, allowing the SM to raise its price and extract all the advertiser's surplus. Indeed, price competition for ads implies that the SM must provide the advertiser with a higher net surplus than its rival. Yet, the NW anticipates that it cannot win the price competition and that the ad revenue will be zero, hence it withholds investments in additional news quality entirely. This makes it possible for the SM to set a price that fully extracts the advertiser surplus in equilibrium and still wins the price competition.

3.2 Laissez-faire: Voluntary transfer from the social media

Next, we study a model where the SM can voluntarily contribute to the creation of news items via a privately designed transfer. The Meta Journalism Project and the Google News Showcase come to mind as real-world examples.

We focus our attention on a specific class of transfer schemes: a proportional payment that depends positively on the additional quality of news developed by the NW.[29] We define the transfer as $T(f) = \alpha \cdot f$, where $\alpha \geq 0$ measures the level of the transfer. The transfer appears as an additional payoff in the profit function of the NW and as a cost in the profit of the SM. Using the result obtained in the previous section, we can write:

$$\pi_{NW} = 0 + \alpha f - c\frac{f^2}{2} \tag{2}$$

The optimal level of transfer is thus clearly given by

$$\frac{\partial \pi_{NW}}{\partial \alpha} = \alpha - cf = 0 \quad \Leftrightarrow \quad f = \frac{\alpha}{c}.$$

The transfer provides the NW with positive incentives to engage in costly investments, stimulating the production of additional news quality. Consequently, the level of investment is an increasing function of the transfer: as expected, $f'(\alpha) > 0$. In what follows, we denote by

[29] In Section 4.4, we show that i) a lump sum transfer would prove ineffective in stimulating additional news creation, and ii) a linear transfer is enough to achieve an efficient result.

α^v the *voluntary* profit-maximizing transfer chosen by the SM.

The first question we want to answer is whether the SM has any incentive to voluntarily subsidize news quality via direct payment. Observing the SM objective function, we disentangle three effects that govern its incentives. First, increasing α, and therefore $f(\alpha)$, consumers obtain higher utility, and participation in the market rises. This, in turn, allows SM to sell more advertising spaces, increasing its revenues even further. This is the effect of the transfer on the *extensive margin*.

Second, an increase in the transfer pushes news quality upwards in equilibrium, mitigating the comparative advantage of the SM in the price competition. As a consequence, in order to offer the advertiser the best offer and secure all ads, the SM has to lower its price p_{SM} and decrease the price of ads. This is the effect of the transfer on the *intensive margin*.

Third, increasing the coefficient α raises the costs the SM should shoulder. In turn, a larger transfer implies more investment, which also implies a larger transfer in equilibrium. In other words, the cost of the transfer is increasing in the size of α. We call this the *cost of transfer effect*.

Analytically, we start from the profit function of the SM:

$$\pi^v_{SM} = \frac{(v + g(f(\alpha)))^2}{4d}\left(k_{SM} - k_{NW}\frac{4\,v\,(1-\theta)g(f(\alpha))}{(v+g(f(\alpha)))^2}\right) - \alpha\, f(\alpha)$$

and identify the three effects as follows:

$$\frac{\partial \pi^v_{SM}}{\partial \alpha} = \underbrace{\frac{g'(f(\alpha))\,f'(\alpha)\,(v+g\,(f(\alpha)))\,k_{SM}}{2d}}_{\text{extensive margin}} - \underbrace{\frac{(1-\theta)g'(f(\alpha))\,f'(\alpha)\,k_{NW}\,v}{d}}_{\text{intensive margin}} - \underbrace{(\alpha\, f'(\alpha) + f(\alpha))}_{\text{cost of transfer effect}}$$

From the derivative above, it is clear that the business stealing effect (θ) only affects the intensive margin. Intuitively, if news quality increases, the NW becomes more attractive to the advertiser. However, if the SM can in large part replicate the value of news, this increased attractiveness is mitigated. In the Appendix we prove the following proposition:

Proposition 2. *The social media firm is willing to voluntarily contribute to the development of additional news quality if and only if the business stealing effect is sufficiently intense – i.e.,* $\alpha^v > 0$ *if and only if* $\theta \in (\bar{\theta}, 1]$, *with* $\bar{\theta} < 1$.

Proposition 2 complements the result in Proposition 1 and identifies the conditions under which, absent the regulatory intervention, the market is characterized by zero transfer. In particular, the proposition stresses that if the SM is free-riding on the IP of the NW, and if the consequent business stealing effect is sufficiently intense, the SM itself is willing to contribute to the development of additional news creation. This incentive derives from the fact that the positive effect of the transfer on the extensive margin that news quality entails benefits the SM, as it widens its user base by fostering consumers' participation. Moreover, the business stealing effect mitigates the negative effect of the transfer on the intensive margin. Together, a large business stealing effect and the positive effect on the extensive margin increase the SM's

incentives to contribute to news creation.

Corollary 1. *The voluntary contribution induces the NW to increase its investment compared to the benchmark to* $f(\alpha^v) = \frac{\alpha^v}{c}$*, which, in turn, generates competitive pressure in the market for digital ads, benefiting the advertiser. Consumers and society are also better off as the quality of news generates more participation and consumers' utility.*

The voluntary transfer, if conditioned on observed news quality, allows the NW to appropriate part of its investments in additional news quality, thus reestablishing its incentives to invest. This is particularly beneficial to society, as it increases the payoff of all the agents in the market. Clearly, the NW benefits from the transfer. Similarly, and by definition, the SM also benefits, as it voluntarily contributes to maximize its profits. The most interesting effect, however, is on the advertiser's payoff. As a consequence of increased news quality, price competition becomes more intense in the market for digital ads. Hence, the SM must reduce its price in order to win the price competition and attract all users. The advertiser directly benefits from this, as it is now able to retain part of the surplus generated by trading with the consumers. Also, as news quality increases consumer participation, the advertiser is also able to sell more units of its product. Hence, total welfare unambiguously increases.

3.3 Socially efficient transfer

Proposition 2 highlights how the SM is willing to contribute to the development of additional news creation. However, in deciding the level of voluntary contribution, the SM maximizes its own profits by construction. In this section, we look at the level of transfer that is optimal from a social welfare perspective — i.e., the level α^{opt} that maximizes total welfare. We define total welfare as the sum of aggregated profits and consumer surplus. Formally:

$$TW = \pi_{Ad} + \pi_{NW} + \pi_{SM} + U \cdot n = \frac{(v + g(f(\alpha)))^2}{4}\left(1 + \frac{k_{SM}}{d}\right) - \frac{cf(\alpha)^2}{2}.$$

From the regulator's perspective, the price of ads is merely a transfer from a channel to the advertiser, redistributing surplus. Hence, the effect on the *intensive margin* is absent in this case. In other words, a decrease in the price of ads generates two opposite effects on the SM and the advertiser that cancel each other out. Consequently, the regulator's decision is not driven by the effect of news quality on ad prices. Therefore, the transfer has only two effects, one on the extensive margin and one on the cost of investment:

$$\frac{\partial TW}{\partial \alpha} = \underbrace{\frac{g'(f(\alpha))\, f'(\alpha)\, (v + g\,(f(\alpha)))}{2}\left(1 + \frac{k_{SM}}{d}\right)}_{\text{extensive margin}} - \underbrace{cf'(\alpha)\, f(\alpha)}_{\text{cost of investment effect}},$$

resulting in the following proposition:

Proposition 3. *The socially optimal level of transfer that a regulator could mandate the social media firm to pay the news website is always larger than the voluntary contribution of the social media firm, i.e.,* $\alpha^{opt} > \alpha^v > 0$.

Proposition 3 completes our main findings by stating that, although positive for society, a voluntary payment by the SM is socially suboptimal. More in detail, the SM is willing to contribute less than what would be optimal from a social welfare perspective. The lower contribution leads, consequently, to a suboptimal level of news quality in equilibrium. This market failure occurs as the SM is not able to internalize the entire size of the externalities generated by investments in news quality. In fact, the voluntary contribution results from profit maximization and does not account for the positive effects that additional news quality exerts on consumers, the NW, and the advertiser.

To restore efficiency, the regulator must mandate a larger payment, which is the main takeaway from Proposition 3. The welfare effect is, by definition, positive as the socially optimal level of payment α^{opt} results from total welfare maximization. In detail, the mandated payment directly increases the payoff of the NW and of consumers by providing the former with more resources to invest optimally and the latter with higher news quality. It increases the advertiser's profits by exacerbating the competitive pressure in the market for ads described above. However, it negatively affects the SM, as the regulation forces it to pay more than its profit-maximizing choice. The next Corollary follows:

Corollary 2. *Any $\alpha \in (\alpha^v, \alpha^{opt}]$ lowers the payoff of the SM compared to α^v. However, the additional news quality that the larger transfer entails intensifies competition in the market for ads and benefits the advertiser and the NW. Consumers are also better off due to the increased utility generated by the additional investment in news quality.*

Because the NW is better off with a transfer larger than α^v, it is always willing to ask for public intervention in order to elicit a larger payment.[30]

3.4 Going dark as a credible threat

Proposition 3 states that the socially efficient transfer is larger than the privately designed one. A non-obvious matter is whether the SM is still better off paying the socially efficient transfer relative to the case in which no transfer at all is paid.[31] In other words, is withdrawing the possibility to post news a credible threat by the SM? As previously mentioned in the introduction section, this practice, usually referred to as *going dark*, was adopted by Facebook (in Australia and Canada) and is currently being experimented with by Google (California, US). It seems, therefore, appropriate to investigate if this strategy also emerges in our model.

To do so, we compare the payoffs of the SM in the benchmark case with no transfer ($\alpha = 0$) with the payoffs under different transfer levels. For tractability, we adopt the linear specification $g(f) = f$ in this subsection.

Figure 2 illustrates the problem of the SM. If the socially efficient payment is excessively large, the SM might prefer going dark and operating without including news items in its feed.

[30] This result is partially driven by the assumption of one news website. In Section 3.5 we illustrate how assuming many outlets allows the SM media to strategically design a payment that induces a sufficiently large fraction of NW not to ask for the regulation.

[31] Notice that in our model, this scenario is equivalent to the one in which the SM does not allow the NW to post news online.

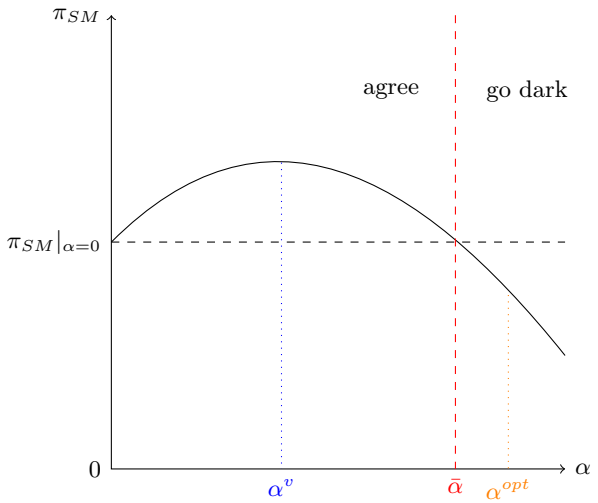


Figure 2: Social media incentives to *go dark* and withdraw news from its platform.

We identify the threshold of α that makes the SM indifferent between going dark and accepting the policy:

$$\bar{\alpha} = \frac{2c\,v(k_{SM} - k_{NW})}{4cd + k_{NW} - k_{SM}}$$

and we show that this threshold is always in the (α^v, α^{opt}) interval.

Proposition 4. *There always exists a threshold $\bar{\alpha} \in (\alpha^v, \alpha^{opt})$ such that any transfer $\alpha > \bar{\alpha}$, including the socially optimal one, induces the social media to go dark and withdraw news from its platform.*

Proposition 4 complements our results by identifying the conditions under which the SM is willing to *go dark* and withdraw its news-sharing service, disallowing consumers to share news items on the platform. The result shows how the threat of going dark might be credible if the mandated transfer exceeds a certain threshold. However, it also shows that the SM can be convinced to contribute more than it voluntarily would. Indeed, the regulator may induce a bargaining solution that has as threat points the new threshold for the SM and the socially optimal contribution. Within this range, an agreement leads to higher total welfare than the *laissez-faire* regime (i.e. with voluntary contribution).

This result echoes some features of the intense debate around these new policies, such as the adverse reaction from large digital platforms. Both during the discussion about the Australian regulation and after the introduction of the Canadian one, Google threatened to withdraw its core service from the two countries. Facebook decided to go even further and withdrew its news-sharing service in both Australia and Canada. Our results suggest that the regulator can find a regulatory compromise regarding the amount of the contributions that the digital platforms should adhere to which induce them to pay more than they would absent any regulation.

3.5 Multiple news websites

So far, we have assumed a single news website, a shortcut for modeling a conglomerate of news publishers. Next, we explain why we believe the results of the model would hold in a market with multiple websites as well.

Above, we have shown that three main scenarios exist. First, a benchmark case in which no transfer is paid by the SM; second, a case in which the SM voluntarily contributes to news creation by transferring a privately designed transfer; third, a regulated case in which the policymaker designs the transfer to maximize welfare. We claim that the only scenario where the number of news websites makes a qualitative difference with respect to the regulations we study is the second one, namely the *laissez-faire* regime.

Indeed, in the benchmark case where the transfer is zero by definition, the presence of additional news websites does not alter the equilibrium level of additional news quality ($f^{no} = 0$), because the social media is able to attract all ads and news websites get no advertising revenue.

In the regulated scenario, because the regulations we study explicitly allow the news websites to negotiate with the social media collectively, the problem of the regulator is essentially the same as the one analyzed above. In particular, the regulator would set α^{opt}, and the resulting transfer is then split proportionally between the news websites.

Let us now turn to the voluntary case. The social media may have the incentive to discriminate between news websites in order to avoid being designated. To do so, the social media may want to offer a personalized transfer to a sufficiently large fraction of the news websites which is larger than their share of the regulated transfer. Hence, the targeted news websites are better off by privately negotiating with the social media than they are by asking for the regulator's intervention. In the Australian specification of the regulation, it is up to news websites to elicit the government intervention. In such a model, the social media would offer a transfer to a restricted number of news websites in order to break the overall support for the regulation. Interestingly, we observe this outcome in Australia where some outlets claim to be left out of deals.[32]

For all these reasons, we conjecture that our main results hold qualitatively under multiple news websites. Namely, the voluntary contribution is still positive but arguably even lower than in our model, as only a fraction of news websites benefit from it. Therefore, the level of voluntary contribution remains suboptimal, and a public intervention is even more likely to be justified.

4 Extensions

4.1 Moderate market expansion effect

In Section 3, we assume that SM is intrinsically more attractive than NW in the eyes of consumers, formally $v > g(f)$ — i.e., the market expansion effect is relatively strong. Here, we extend our analysis to the case when the above assumption does not hold. The advertiser's choice, described in Lemma 1 is modified as follows.

[32] See page 10 of the Australian Government's report at https://treasury.gov.au/sites/default/files/2022-11/p2022-343549.pdf for details.

Lemma 3. *If $v \leq g(f)$, the advertiser chooses the levels of advertisement on both channels in a way that induces consumers to multi-home. Depending on the prices, the advertiser chooses either*

$$a_{SM} = 0; \quad a_{NW} = \begin{cases} \frac{v+g(f)}{2d} & \text{if } v < (1-2\theta)g(f) \\ \frac{(1-\theta)g(f)}{d} & \text{otherwise} \end{cases} \quad OR \quad a_{SM} = \frac{v}{d}; \quad a_{NW} = 0.$$

In the Appendix, we solve the model distinguishing between two cases, depending on the size of the market expansion effect: medium or small.

Medium v: If $g(f) > v > (1-2\theta)g(f)$ — i.e., the platform generates a medium market expansion effect — the problem is qualitatively the same as presented in our main model with a large market expansion effect. In particular, one can see that choosing the SM channel is a dominant strategy for the advertiser. Intuitively, the SM is a better advertising channel, as it guarantees both higher returns on ads (the intensive margin) and higher demand (the extensive margin). Thus, the SM can always set a price sufficiently low to secure all the ads. Therefore, all of our main results hold in this case. In other words, the findings of the baseline model assuming $v > g(f)$ extend to more market conditions, namely $v > (1-2\theta)g(f)$.

Small v: Things are more complex, instead, if $v < (1-2\theta)g(f)$. Here, the participation constraint of the consumers binds if the advertiser allocates ads on the SM, but it does not bind if the advertiser chooses the NW instead. Hence, from an economic perspective, the advertiser faces a trade-off between the intensive and the extensive margin. The higher efficiency of the SM channel means the advertiser can expect higher margins per person per ad. However, the high consumers' evaluation of news items induces a larger number of individuals to join the market and, consequently, allows the advertiser to list more ads and reach more users.

We show that, under some conditions, the NW can actually win the price competition by setting a price which is sufficiently low to outcompete the SM. In such a scenario, the NW secures all ads and invests in news quality, nullifying the scope of any regulation aimed at transferring monetary resources from the SM to the NW based on the imbalance of bargaining power in the market for digital ads. For this to happen, two conditions must hold simultaneously:

$$v < (1-2\theta)g(f) \qquad \text{and} \qquad \frac{k_{NW}}{k_{SM}} > \frac{4\, v\, g(f)}{(v+g(f))^2}.$$

That is, on top of v being small, the NW must have a sufficiently high advertising efficiency compared to the SM. Otherwise, the SM wins the price competition, and the analysis is qualitatively similar to the one described in the baseline model.

In sum, our main results hold when the social media succeeds in attracting advertising, which we believe is the more realistic scenario. This result also suggests that it is exactly when the platform generates a large market expansion effect that the regulation is more needed. In fact, in

the opposite case, i.e. when the platform is small, the news website may be able to successfully contest the market and secure revenues from advertising.

4.2 Advertisers multi-homing

In reality, advertisers do not place all of their ads in a single channel. Instead, they multi-home to maximize exposure. Our baseline model does not allow for multi-homing to emerge in equilibrium. Therefore, in this section, we adjust the model to account for this practice. In particular, we modify the baseline model in two main directions.

First, we assume that a representative consumer distributes their free time across the two channels. Formally, the representative consumer joins a channel if, by doing so, derives positive utility:

$$U_{SM} = v + \theta g(f) - da_{SM}; \quad U_{NW} = g(f) - da_{NW}$$

Second, differently from the baseline model, we assume that channels are in control of the level of advertising that they can host. In other words, we model channels' competition à la Cournot, where the output level is represented by the number of ad slots made available to advertisers. Accordingly, the channels' inverse demand functions are:

$$P_{SM} = \underbrace{v + \theta g(f)}_{\text{demand size}} - \underbrace{(da_{SM} + da_{NW})}_{\text{quantity of ad slots}}; \quad P_{NW} = \underbrace{g(f)}_{\text{demand size}} - \underbrace{(da_{SM} + da_{NW})}_{\text{quantity of ad slots}}.$$

In interpreting these demand functions, one should keep in mind that the demand side is represented by advertisers, which buy the ad slots. The intercept of the demand, therefore, coincides with the maximum surplus of the consumer available on each channel when no ads are posted. As in the baseline model, the parameter $\theta \in [0, 1]$ measures the business stealing effect, i.e. how much consumers are satisfied by reading the title and the snippet of news posted on SM.

The timing is as follows. First, at stage $t = 0$, a transfer (α) is designed and mandated from the SM to NW. At stage $t = 1$, the NW invests in costly investment to produce additional news quality $f(\alpha)$. Next, channels compete à la Cournot to attract advertisement at stage $t = 2$. Finally, upon observing the news quality and advertising level on both channels, the consumer chooses their consumption. In order to have internal solutions under advertiser multi-homing, we assume that consumers do not value news ($g(f)$) much more than other platform content (v) and vice versa, and that the cost of investment is sufficiently high.[33]

The first result we test in this extension is about the effects of the transfer size on the incentives to invest in news quality (Corollary 1). We confirm that the transfer has a positive effect on the level of investments in news quality, as shown in the baseline model.

Furthermore, this extension allows us to understand better the role of the business stealing effect on the incentives of the NW to invest in additional news quality. Unsurprisingly, the

[33] Formally, we assume $\frac{2v}{1-2\theta} > g(f) > \frac{v}{2-\theta}$ and $c > \max\{c_1, c_2\}$ with c_1 defined in (8) and c_2 defined in (10) in the Appendix.

business stealing effect is negative, meaning that the more the SM free rides on news quality, the lower the NW's investment. We summarize these findings in the following Lemma:

Lemma 4. *Under advertiser multi-homing, the news website's optimal level of additional news quality $f(\alpha, \theta)$ increases in the transfer coefficient α and decreases in the degree of business stealing θ. Moreover, absent any transfer, the level of investment is positive — i.e., $f(0, \theta) > 0$.*

Differently from the baseline model, the business stealing effect plays a more crucial role in altering the decisions of the channels. If in the baseline the main role was to redefine thresholds for one channel to win the price competition and the resulting price for advertisement, here it marginally modifies the incentives of the channels to offer ad slots to the advertiser. Because the business stealing effect implies more time is spent on the SM, which embeds part of the news quality generated by the NW, the SM anticipates the larger demand for ad slots and offers more of them. Conversely, the NW anticipates a demand contraction and reduces the level of ads it is willing to host. Thus, at the margin, an increase in the business stealing effect lowers the incentives of the NW to invest in additional news quality.

It must also be noted that because there are ads on both channels, the NW is always able to set up investments in additional news quality. Those investments are clearly promoted by the transfer and hampered by the business stealing effect.

The second main result that we want to study under multi-homing is whether the SM is always willing to voluntarily contribute to the development of additional news quality by transferring a positive amount of money to the NW. With a slight abuse of notation, in what follows, we will use $f'(\alpha, \theta)$ to indicate the first derivative of $f(\alpha, \theta)$ with respect to α. To identify the incentives of the SM to contribute to news quality development, we analyze its profit function:

$$\pi_{SM} = \frac{(2v - (1 - 2\theta)g(f(\alpha, \theta)))^2}{9d} - \alpha \cdot f(\alpha, \theta)$$

and identify the two main effects of a variation of α:

$$\frac{\partial \pi_{SM}}{\partial \alpha} = \underbrace{\frac{-2(1 - 2\theta)g'(f(\alpha, \theta)) \cdot f'(\alpha, \theta) \cdot (2v - (1 - 2\theta)g(f(\alpha, \theta)))}{9d}}_{\text{demand expansion/contraction effect}} - \underbrace{\alpha f'(\alpha, \theta) - f(\alpha, \theta)}_{\text{cost effect}} \quad (3)$$

The demand effect can be positive or negative depending on the intensity of the business stealing effect. We distinguish two cases. First, when the business stealing effect is very strong, $\theta > 1/2$, the demand effect is unambiguously positive. Second, using Lemma 4, we can show that the lower θ is below $1/2$, the lower the demand effect is, and a higher α can even lead to a demand contraction.

To summarize, when the business stealing effect is sufficiently strong, the NW's investment in additional news quality generates a demand expansion from the SM's perspective, which has a positive effect on its profit. Hence, a trade-off emerges with two opposite economic forces: the positive demand expansion effect and the negative cost effect. Instead, when the business stealing effect is relatively weak, an increase in news quality generates both a demand contraction

effect and a cost effect, which are both negative. In this second case, and the optimal α^v from the SM's standpoint is 0.

To proceed forward, we use $g(f(\alpha,\theta)) = \sqrt{f(\alpha,\theta)}$ and identify the conditions under which the SM has an incentive to voluntarily contribute to the investment in additional news quality.In the Appendix, we prove the next Proposition:

Proposition 5. *The social media is willing to voluntarily contribute to the development of additional news quality by agreeing to a transfer $\alpha^v > 0$ provided that it benefits enough from it – i.e., that the business stealing effect is sufficiently strong. Formally, there is a voluntary contribution if $\theta > \theta^*$, where*

$$0 < \theta^* \equiv \frac{\sqrt{144 f(\alpha,\theta) + 49v^2} - 7v}{12\sqrt{f(\alpha,\theta)}} < 1.$$

Notice that both sides of the inequality in Proposition 5 depend on the business stealing effect. However, from Lemma 4 we know that, in equilibrium, the level of investments in additional news quality decreases as the business stealing effect becomes more intense. Hence, if θ increases, the inequality in Proposition 5 is more easily satisfied — i.e., it is more likely that the SM is willing to contribute to additional news creation.

Finally, we investigate the socially optimal level of transfer from the regulator's perspective. A couple of comments are in order here. First, it is worth noting that the different competition model affects the surplus of the advertiser in a different way than in the baseline model. In that case, increasing the transfer limits the rent extraction by the SM and generates a downward pressure on the prices of ads, ultimately increasing the advertiser's payoff. Instead, in this model specification, the level of quality raises both prices and quantity of ads. Put simply, the advertiser faces two countervailing effects. On the one hand, the increase in prices reduces the intensive margin, as the expected return of advertising is independent of news quality. On the other hand, higher news quality raises the extensive margin, allowing the advertiser to expose more consumers to its products.

Provided that the downward pressure on the advertiser's intensive margin is not excessive,[34] the regulator, by internalizing the effect of news quality on consumers' utility and the NW's profits, is willing to mandate a larger transfer than the one the SM is voluntarily willing to design. However, if the business stealing effect is very low, it might be that the socially optimal transfer is zero, meaning that no policy should be introduced at all.

Corollary 3. *The regulator mandates a transfer $\alpha^{opt} \geq \alpha^v$. In more detail, $\alpha^{opt} > \alpha^v$ holds if the business stealing effect is sufficiently strong. Otherwise, $\alpha^{opt} = \alpha^v = 0$.*

Interestingly, the regulator (which is always willing to design a transfer larger than the one the SM is voluntarily willing to pay) can nevertheless prefer no transfer to be paid. In other words, under some conditions, in the region $\theta < \theta^*$, the regulator may deem transferring

[34] Formally, if (12) in the Appendix holds.

resources from the SM to the NW inefficient. From a policy perspective, this also means that the regulator may judge the business stealing effect as too weak to be regulated via a transfer.

4.3 Alternative timing

In our baseline model in Section 2, we follow a very traditional approach to timing. In particular, we consider the NW's investment in additional news quality as a long-run investment that precedes price competition and allocation of ads. Hence, when deciding how much to invest, the NW only observes the design of the transfer announced by the regulator (or voluntarily paid by the SM) and anticipates the strategic reactions of the SM, the advertiser, and the consumers.

Alternatively, one can imagine a timing in which the NW conditions its quality choice on the transfer and the amount of ads it attracts. Accordingly, the new timing would be: at time $t = 0$, the regulator (or the SM) announces the transfer level (if any). Then, at time $t = 1$ the news website and the social media compete in prices to attract ads. Given the prices for ad spaces, at $t = 2$, the advertiser decides how many ads to allocate to the most profitable channel. After this stage, at $t = 3$, the news website makes a costly investment in quality f. Finally, at time $t = 4$, consumers make their choice.

We develop and analyze such a game in detail in a previous version of this paper (Sandrini and Somogyi, 2022). In summary, we focus on the effect of a transfer on investments in quality and welfare. Similarly to our findings here, we show that a linear transfer is always more efficient than a situation where no transfer is paid. We also show that the SM, under certain conditions, may be willing to voluntarily contribute to the creation of additional news quality by agreeing to a transfer $\alpha^v > 0$. Similarly, such voluntary contribution turns out to be suboptimal, as it is inferior to the transfer a regulator would mandate to maximize total welfare.

4.4 Optimal structure of the monetary transfer

Finally, we investigate how the regulator should design the transfer to achieve efficiency. We believe this is a policy-relevant question, as the structure of a payment scheme alters the incentives of the actors involved. Moreover, we believe that practically, a very complex scheme may prove difficult to be designed and applied to real-world cases.

Lump-sum transfer. Given we model the regulation as a static game, a lump-sum transfer proves ineffective as it does not create any incentives to invest in additional news quality. In practice, the NW would rather "take the money and run" than to engage in costly investment. Hence, in this context, the lump-sum transfer only implies a redistribution of resources from the SM to the NW, without any efficiency gains.

It must be said, though, that the regulations we study entail a periodic renegotiation of the terms of payments, depending on specific indicators such as the online traffic of consumers on each NW channel. Hence, a lump-sum transfer that is conditioned on achieving specific goals that are somehow correlated with news quality may generate similar incentives as a linear transfer. However, we do not explicitly account for repeated games in our model.

Linear payment scheme. In our baseline model, we use a linear payment scheme in the form of $T(f) = \alpha f$ which, we claim, is sufficient to achieve efficiency. It is so for two main reasons: first because the regulator can induce an efficient level of investments in news quality by mandating a simple linear transfer, and second because such a payment scheme is simple to implement and does not require sophisticated calculation.

Consider the problem of the regulator in our baseline model. If she could design the news website's investment plan, her problem would be the following:

$$\max_{f} \; TW(f) = \frac{(v + g(f))^2}{4}\left(1 + \frac{k_{SM}}{d}\right) - \frac{c\, f^2}{2}$$

Define $f^{opt} = \arg\max_f TW(f)$. In order to induce the efficient level of investment, the regulator must design a payment scheme such that the NW has the very same incentives to produce news quality. Formally, it must be that

$$f^*(\alpha) \equiv \frac{\alpha}{c} = f^{opt} \quad \Longleftrightarrow \quad \alpha^{opt} = c\, f^{opt}. \tag{4}$$

If the NW receives a transfer equal to α^{opt}, its first-order condition becomes identical to the regulator's, leading to the desired result $f^* = f^{opt}$. Regardless of how this scheme is funded — i.e., if it is the SM that pays for it, or if it is a public spending program — inducing the first-best outcome does not require any non-linearity.

Proposition 6. *A well-designed linear payment scheme is able to induce the first-best investment level from the regulator's perspective.*

By well-designed, we mean that the scheme satisfies equation (4). Therefore, even though more complex payment schemes could achieve the same result, we argue that they are not necessary. Indeed, for the regulations we study, more complexity would raise the cost of implementation without any additional benefits.

5 Conclusion

This paper addresses the welfare implications of policies that redistribute ad revenues from social media platforms to news websites. Proponents of the regulations claim it is important to design mechanisms that induce economic agents to compensate each other their fair share of value-added, to ensure news creation and, ultimately, consumers' protection.[35]

Contrary to this, opponents of the regulation deem it excessive as platforms are already benefiting news websites by providing them with an audience that would not otherwise be accessible to them. Moreover, platforms have repeatedly argued that sharing news contributes

[35] In a recent study focusing on Swiss consumers, Johann et al. (2023) illustrate that "journalistic content contributes to the attractiveness of Google [*search*], as it makes Google [*search*] more valuable, more credible and more complete". Furthermore, Holder et al. (2023) estimates the monetary contribution of news to Meta's and Alphabet's core services at around 13 billion US dollars annually.

little to their overall revenues.[36]

In this paper, we build a theoretical model to understand the above trade-off. In more detail, we model a market environment where consumers can access news via social media platforms and news websites. Social media redirects traffic to news websites; the presence of news makes the social media more attractive, but at the same time, the news website and the social media platform are in competition for ads. We show how a payment from the social media platform to news websites displays multiple welfare-enhancing effects: first, it directly provides the news websites with the incentives to invest in additional news quality; second, by inducing higher news quality, the monetary transfer makes publishers more attractive and indirectly intensifies competition in the market for digital ads.

We also show that the platforms may have the incentives to voluntarily contribute to news quality, in particular, when the free-riding effect is substantial. This is in line with existing investment projects supported by digital platforms, such as the Meta Journalism Project and the Google News Showcase programs. However, we find that such a voluntary payment is suboptimal as it does not induce sufficient investments in news development. To achieve the first-best, a mandatory transfer designed by the regulator is required.

Considering the possibility that platforms disable news on their sites (*go dark*), the first-best transfer cannot be implemented as it violates the participation constraint of the platforms. Importantly, even in such a case, we find that it is possible to design a transfer that delivers a more efficient outcome than the one obtained by the voluntary payment.

The EU Directive 790/2019. In 2019, after a long debate, the EU passed the "Directive on Copyright and related rights in the Digital Single Market".[37] Even though the Directive and the news media bargaining codes are very different from a legal perspective,[38] they nevertheless share important features from an economic perspective.[39] In fact, the EU Directive ultimately aims at inducing digital platforms to negotiate a copyright compensation to news businesses, in the shadow of a fine. In the NMBC case, the final offer arbitration plays a similar role, generating a credible threat that induces the two parties to agree on a transfer scheme. Consequently, depending on how the new related rights are enforced, we believe that our main results should also apply to the EU market.

[36] For example, Meta claims that "news makes up less than 3% of what people around the world see in their Facebook feed"; see their update from February 2024: https://about.fb.com/news/2024/02/update-on-facebook-news-us-australia/.

[37] Directive on Copyright and related rights in the Digital Single Market: https://eur-lex.europa.eu/eli/dir/2019/790/oj. Accessed on April 21, 2024.

[38] Article 15 of the EU Directive provides neighboring rights to press publishers and is, therefore, part of copyright law. Instead, the Australian, Canadian, and Indonesian regulations use the toolkit of competition law.

[39] The economic similarities are recognized by practitioners, e.g., see the Chairman of the Executive Board of Le Monde Group, Louis Dreyfus, at the CEPR event on News Bargaining Codes available at https://cepr.org/multimedia/news-bargaining-codes. See also Schwemer (2020). These similarities are particularly evident if we look at the way France has transposed article 15 of the Directive in the Law No. 2019-775 of 24 July 2019 and enforced it *in combination* with the antitrust authority (Colangelo, 2021).

Limitations of the model. In this paper, we model the regulations as transfers and abstract away from the bargaining aspect many of them contain. We do this for two reasons other than tractability. First, our understanding of the regulations is that a transfer is mandated by the regulator if no agreement is reached between the parties after a period of arbitration. In our view, this constitutes a credible threat, which is crucial for the regulation to work (unlike some previous attempts, described in the Introduction). Second, perhaps more importantly, as we are mainly interested in welfare effects, the outcome of the negotiation counts arguably more than the process itself.

A second limitation is that our model is static; the game is played only once. In reality, the regulations we study set a time frame after which the deals are renegotiated. One concern could be that our model misses the strategic considerations related to such dynamics. News quality being endogenous, our model can be viewed as a shortcut for news websites taking into account future renegotiations. In fact, when the transfer is proportional to news quality, a news website would use the resources to foster news quality and secure a better deal in the next round of negotiations. Hence, we believe our model is able to at least partially capture these incentives.

Finally, we assume consumers have a homogeneous taste for news. In reality, different consumers value news differently. That said, our goal is to analyze the effect of policies that mandate a transfer from a social media platform to news websites on the quality of news. For this purpose, we believe that the distribution of tastes does not play a major role. Indeed, as long as the SM is able to capture the majority of ad revenues, the transfer would restore news websites' incentives to invest in news quality and benefit all consumers.

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Appendix

Proof of Lemma 2

The optimal price of the NW is given by:

$$p^*_{NW} = \max\left\{p > 0 \text{ s.t. } \frac{v\,(1-\theta)g(f)\,(k_{NW}-p)}{d} \geq \frac{(v+g(f))^2 k_{SM}}{4d}\right\} = k_{NW} - k_{SM}\,\frac{(v+g(f))^2}{4\,v\,(1-\theta)g(f)}.$$

Notice that $v > g(f)$ implies $(v+g(f))^2 > 4\,v\,(1-\theta)g(f)$ for all $\theta \in [0,1]$, and thus using $k_{SM} \geq k_{NW}$, we get $p^*_{NW} < 0$, i.e., the price that the NW should set in order to win the price competition is negative. It follows that NW cannot win the price competition, and the SM always wins by setting the price p^*_{SM}. □

Proof of Proposition 1

In this scenario, no transfer is allowed ($\alpha^{no} = 0$). Hence, the equilibrium level of additional news quality is $f^{no} = \alpha^{no}/c = 0$.

Substituting $f = 0$ into the price for ad slots, we can see that it collapses to $p^{no}_{SM} = k_{SM}$. We substitute these results into the profit functions of the two channels and the advertiser, and obtain:

$$\pi^{no}_{SM} = \frac{(v+g(f^{no}))^2\,k_{SM}}{4d} = \frac{v^2\,k_{SM}}{4d}; \qquad \pi^{no}_{SM} = 0 + \alpha^{no} f^{no} - \frac{c\,f^{no}}{2} = 0;$$

$$\pi^{no}_{Ad} = \frac{(v+g(f^{no}))^2\,(k_{SM}-p^{no}_{SM})}{4d} = 0.$$

Finally, we compute the consumer surplus and total welfare using the outcome above:

$$CS^{no} = U^{no}\cdot n^{no} = \frac{(v+g(f^{no}))^2}{4} = \frac{v^2}{4};$$

$$TW^{no} = CS^{no} + \pi^{no}_{SM} + \pi^{no}_{NW} + \pi^{no}_{Ad} = \frac{v^2}{4} + \frac{v^2\,k_{SM}}{4d} + 0 + 0 = \frac{v^2}{4}\left(1 + \frac{k_{SM}}{d}\right)$$

□

Proof of Proposition 2 and Corollary 1

Substituting $f = \alpha^v/c$ into the profit of the SM, we obtain:

$$\pi^v_{SM} = \frac{(v + g(\frac{\alpha^v}{c}))^2}{4d}\left(k_{SM} - k_{NW}\frac{4\,v\,(1-\theta)g(\frac{\alpha^v}{c})}{(v+g(\frac{\alpha^v}{c}))^2}\right) - \frac{(\alpha^v)^2}{c}$$

from which we derive the first derivative evaluated at $\alpha^v = 0$:

$$\left.\frac{\partial \pi^v_{SM}}{\partial \alpha^v}\right|_{\alpha^v=0} = \frac{v g'(\frac{\alpha^v}{c})\,(k_{SM} - 2(1-\theta)k_{NW})}{2cd}. \tag{5}$$

This derivative is strictly positive if and only if $\theta > 1 - \frac{k_{SM}}{2k_{NW}} \equiv \bar{\theta}$. Therefore, the profit-maximizing voluntary contribution is strictly positive under the same condition. Clearly, $\bar{\theta} < 1$.

This proves Proposition 2. Corollary 1 derives from a simple comparison of the main economic variables of the analysis (profits of the two channels, of the advertiser, and surplus of consumers) with $\alpha = 0$ and $\alpha = \alpha^v > 0$.

The profit of the SM is clearly larger with $\alpha = \alpha^v > 0$, by definition ($\alpha^v = \arg\max_\alpha\{\pi^v_{SM}\}$). The NW earns positive profits and invests in news quality when α^v is in place. The advertiser faces a lower price of ads, and so it retains part of the surplus, which would be otherwise completely extracted by the SM when $\alpha = 0$. Finally, consumers' utility increases with news quality. □

Proof of Proposition 3 and Corollary 2

Substituting $f = \alpha^{opt}/c$ into the total welfare, we obtain:

$$TW = \frac{(v + g(\frac{\alpha^{opt}}{c}))^2}{4}\left(1 + \frac{k_{SM}}{d}\right) - \frac{\left(\alpha^{opt}\right)^2}{2c},$$

from which we derive the first derivative evaluated at $\alpha^{opt} = 0$:

$$\left.\frac{\partial TW}{\partial \alpha^{opt}}\right|_{\alpha^{opt}=0} = \frac{v g'(\frac{\alpha^{opt}}{c})}{2cd}\,(d + k_{SM}) > 0$$

This derivative is always larger than the one derived from the profits of the SM in (5) as

$$d + k_{SM} > k_{SM} - 2(1-\theta)k_{NW}$$

always holds. Moreover, the cost function embedded in the SM's profits is more convex than the one in the total welfare function (notice that the latter is divided by 2). Hence, the total welfare function reaches a maximum for $\alpha^{opt} > \alpha^v$. This proves Proposition 3.

The proof of Corollary 2 follows from comparative statics of each element of the welfare function. One should notice that both consumers and the advertiser strictly benefit from the larger α. The former derives positive utility from the additional news quality, and the latter

faces lower prices for ads and gets part of the surplus that would otherwise be captured by the SM. A larger α also increases the revenues of the NW directly, which more than compensates the additional cost of developing higher quality. Finally, by definition, $\alpha^{opt} = \arg\max_{\alpha}\{TW\}$ — i.e., it is the level of transfer that maximizes welfare. This completes the proof of Corollary 2. □

Proof of Proposition 4

Let us assume the simple linear case $g(f) = f$. Using the results derived above, the profit-maximizing and the socially optimal transfers are, respectively:

$$\alpha^{v} = \frac{cv(2k_{SM} - (1-\theta)k_{NW})}{4cd - k_{SM}}; \quad \alpha^{opt} = \frac{cv(d + k_{SM})}{2cd - (d + k_{SM})}.$$

Simple algebra reveals that $\alpha^{v} < \alpha^{opt} \ \forall\, \theta \in [0,1]$. We now proceed and evaluate the maximum level of α that the SM is willing to sustain, which is:

$$\bar{\alpha} = \{\alpha > 0 \ s.t. \ \pi_{SM}|_{\alpha=\bar{\alpha}} = \pi_{SM}|_{\alpha=0}\} = \frac{2cv(2k_{SM} - (1-\theta)k_{NW})}{2cd - k_{SM}}.$$

One can immediately see that $\alpha^{v} < \bar{\alpha}$, as expected. Moreover, simple algebra allows us to verify that:

$$\bar{\alpha} = \frac{2cv(2k_{SM} - (1-\theta)k_{NW})}{2cd - k_{SM}} < \frac{cv(d + k_{SM})}{2cd - (d + k_{SM})} = \alpha^{opt} \quad \forall \theta \in [0,1].$$

Hence, the socially optimal level of transfer is above the maximum level the SM is willing to pay.

This proves Proposition 4. □

Proof of Lemma 3

Lemma 3 is derived analogously to Lemma 1. In fact, the proof originates from the same analysis in Section 3. In order to ensure that consumers multi-home both in the case when ads are allocated on NW and in the case when ads are allocated on SM, the advertiser has to consider their participation constraint. This leads to the allocation as specified in Lemma 3. Building on that, we can derive the profit function of the advertiser:

$$\pi_{Ad} = \begin{cases} \frac{v\, g(f)}{d}\,(k_{SM} - p_{SM}) & \text{if it chooses SM} \\ \begin{cases} \frac{(v+g(f))^2}{4d}\,(k_{NW} - p_{NW}) & \text{if } v < (1-2\theta)g(f) \\ \frac{v\,(1-\theta)g(f)}{d}\,(k_{NW} - p_{NW}) & \text{otherwise} \end{cases} & \text{if it chooses NW} \end{cases} \tag{6}$$

Notice that, at this stage, the level of additional news quality is given. Going backward to stage 2, price competition ensues as described in Section 3. Naturally, the profit function of the

advertiser is different due to the consumer's constraint binding its ad allocation choice.

Medium v. When $g(f) > v > (1-2\theta)g(f)$, the consumers' participation constraint is binding on both channels. Hence, in order to capture all the ads, SM and NW set the following prices:

$$p^*_{SM} = \max\left\{p > 0 \,\middle|\, \frac{v\, g(f)\,(k_{SM} - p)}{d} \geq \frac{v\,(1-\theta)g(f)}{d}\, k_{NW}\right\} = k_{SM} - (1-\theta)k_{NW}$$

and

$$p^*_{NW} = \max\left\{p > 0 \,\middle|\, \frac{v\,(1-\theta)g(f)}{d}\,(k_{NW} - p) \geq \frac{v\, g(f)\, k_{SM}}{d}\right\} = k_{NW} - \frac{k_{SM}}{1-\theta}$$

Because $k_{SM} > k_{NW}$ and $\theta \in [0,1]$, it follows that the price of the NW can not be positive. Hence, the SM is always able to win the price competition.

It follows that, with no transfer, there would be no investment in additional news quality, and the NW does not obtain any ad revenue. One should notice that the price is, in this case, independent of f. This implies that the intensive margin effect described in Section 3.2 is absent here. This is due to the fact that the consumers' participation constraint binds in both channels. Hence, the only source of surplus from the advertiser's perspective is advertising efficiency k_i. As a consequence, the incentives of the SM to contribute to the development of news are even stronger. However, the SM does not internalize the externalities of the other agents that news quality entails. Hence, the voluntary contribution is suboptimal.

Small v When $v < (1-2\theta)g(f)$, the consumers' participation constraint binds only when ads are allocated on SM. Hence, using Lemma 3 and the profit function of the advertiser, we go backward to the price competition stage and derive the best responses of the two channels

$$p^*_{SM} = \max\left\{p > 0 \,\middle|\, \frac{v\, g(f)\,(k_{SM} - p)}{d} \geq \frac{(v + g(f))^2\, k_{NW}}{4d}\right\} = k_{SM} - k_{NW}\,\frac{(v+g(f))^2}{4\, v\, g(f)}$$

and

$$p^*_{NW} = \max\left\{p > 0 \,\middle|\, \frac{(v + g(f))^2\,(k_{NW} - p)}{4d} \geq \frac{v\, g(f)\, k_{SM}}{d}\right\} = k_{NW} - k_{SM}\,\frac{4\, v\, g(f)}{(v+g(f))^2}.$$

As described in the discussion in Section 4.1, this scenario allows for the existence of a region of parameter where the NW wins the price competition. Simple algebra reveals that this region is characterized by the following conditions:

$$v < (1-2\theta)g(f) \qquad \text{and} \qquad \frac{k_{NW}}{k_{SM}} > \frac{4\, v\, g(f)}{(v+g(f))^2}.$$

If one of those conditions is not satisfied, then the SM wins the competition, and the results are qualitatively similar to the other cases. If, instead, the two conditions are simultaneously satisfied, then the NW captures all ads and ad revenues. The larger $g(f)$ with respect to

v, the larger the revenues of the SM. In this case, investments in additional quality are not hampered. □

Proof of Lemma 4

Starting from the inverse demand functions specified in Section 4.2, we proceed to derive the number of ad slots that the two channels want to sell, given the level of transfer, the intensity of business stealing effect, and the level of news quality. From the profit functions of the two channels:

$$\pi_{SM} = (v+\theta g(f)-d(a_{SM}+a_{NW}))\, a_{SM}-\alpha f; \quad \pi_{NW} = \alpha f+(g(f)-d(a_{SM}+a_{NW}))\, a_{NW}-\frac{cf^2}{2}$$

the number of ad spaces sold by the two channels are:

$$a_{SM} = \frac{2(v+\theta g(f))-g(f)}{3d}; \qquad a_{NW} = \frac{2g(f)-(v+\theta g(f))}{3d}$$

which are both positives provided that $\frac{2v}{1-2\theta} > g(f) > \frac{v}{2-\theta}$.

Using these quantities, we can determine the Cournot price of the ad spaces in the two channels:

$$P_{SM} = v+\theta g(f)-d\left(\frac{2(v+\theta g(f))-g(f)}{3d}+\frac{2g(f)-(v+\theta g(f))}{3d}\right) = \frac{2v+(2\theta-1)g(f)}{3};$$

$$P_{NW} = g(f)-d\left(\frac{2(v+\theta g(f))-g(f)}{3d}+\frac{2g(f)-(v+\theta g(f))}{3d}\right) = \frac{(2-\theta)g(f)-v}{3}.$$

We proceed backward to measure the incentives of the NW to engage in costly investment to develop additional quality. The profit function becomes:

$$\pi_{NW} = \frac{((2-\theta)g(f)-v)^2}{9d}+\alpha\, f-\frac{c\, f^2}{2}$$

where $\alpha\, f$ is the transfer mandated by the regulator.

The first-order condition with respect to f is:

$$\frac{\partial \pi_{NW}}{\partial\, f} = \frac{(2-\theta)g'(f)((2-\theta)g(f)-v)}{9d}+\alpha-c\, f = 0 \tag{7}$$

whereas the second-order condition is satisfied if

$$\frac{\partial^2 \pi_{NW}}{\partial\, f^2} < 0 \quad \Longleftrightarrow \quad c_1 \equiv \frac{(2-\theta)}{9d}\left(g''(f)((2-\theta)g(f)-v)+(2-\theta)(g'(f))^2\right) < c, \tag{8}$$

i.e., if c is sufficiently large. Assume the second-order condition is satisfied and define $f^*(\alpha)$ as the solution of (7). Then $f^*(0) > 0$ follows directly as the fraction in (7) is positive.

From the implicit function theorem, we can show that by increasing the coefficient of the

transfer α, the regulator can induce the NW to invest more in news quality. Indeed, as $\frac{\partial \frac{\partial \pi_{NW}}{\partial f^*(\alpha)}}{\partial \alpha} = 1$ from (7), we have

$$\frac{\partial f^*(\alpha,\theta)}{\partial \alpha} = -\frac{\frac{\partial \frac{\partial \pi_{NW}}{\partial f^*(\alpha)}}{\partial \alpha}}{\frac{\partial \frac{\partial \pi_{NW}}{\partial f^*(\alpha)}}{\partial f^*(\alpha)}} = -\frac{1}{\frac{\partial^2 \pi_{NW}}{\partial f^2}} > 0,$$

which is satisfied by the second-order condition (8) in the neighborhood of the optimum.

Finally, from (7) the business stealing effect negatively impacts the incentives of the NW to invest in news quality: $\frac{\partial^2 \pi_{NW}}{\partial f \partial \theta} < 0$. Therefore, using the implicit function theorem again, $\frac{\partial f^*(\alpha,\theta)}{\partial \theta}$ must have the opposite sign than $\frac{\partial f^*(\alpha,\theta)}{\partial \alpha}$, which concludes the proof of Lemma 4. □

Proof of Proposition 5

We solve the game assuming $g(f) = \sqrt{f}$. The utility functions are:

$$U_{SM} = v + \theta\sqrt{f} - d a_{SM}; \quad U_{NW} = \sqrt{f} - d a_{NW}.$$

Hence, profit maximization yields the following numbers of advertising slots sold by the two channels:

$$a_{SM} = \frac{2(v+\theta\sqrt{f}) - \sqrt{f}}{3d}; \qquad a_{NW} = \frac{2\sqrt{f} - (v+\theta\sqrt{f})}{3d}.$$

Using the quantities derived above, we can determine the Cournot price of the ad spaces in the two channels:

$$P_{SM} = \frac{2v + (2\theta - 1)\sqrt{f}}{3}; \quad P_{NW} = \frac{(2-\theta)\sqrt{f} - v}{3}.$$

We can now proceed backward to derive the incentives of the NW to engage in costly investment to develop additional quality. The profit function is

$$\pi_{NW} = \frac{((2-\theta)\sqrt{f} - v)^2}{9d} + \alpha f - \frac{c f^2}{2}$$

where αf is the transfer mandated by the regulator.

The first-order condition with respect to f is:

$$\frac{\partial \pi_{NW}}{\partial f} = \frac{(2-\theta)((2-\theta)\sqrt{f} - v)}{9\sqrt{f}d} + \alpha - c f = 0 \tag{9}$$

whereas the second-order condition is satisfied if:

$$\frac{\partial^2 \pi_{NW}}{\partial f^2} < 0 \quad \Longleftrightarrow \quad c_2 \equiv \frac{(2-\theta)v}{18\sqrt{f^3}d} < c \tag{10}$$

i.e., if c is sufficiently large.

Assume the s.o.c. is satisfied and define $f^*(\alpha,\theta)$ as the solution of the first-order condition.

Using the implicit function theorem, just like in the proof of Lemma 4:

$$\frac{\partial f^*(\alpha)}{\partial \alpha} = -\frac{\frac{\partial \frac{\partial \pi_{NW}}{\partial f^*(\alpha)}}{\partial \alpha}}{\frac{\partial \frac{\partial \pi_{NW}}{\partial f^*(\alpha)}}{\partial f^*(\alpha)}} = -\frac{1}{\frac{\partial^2 \pi_{NW}}{\partial f^2}} > 0,$$

which is satisfied by the assumption in (10).

We now move to the incentives of the SM to voluntarily contribute to the development of additional new quality via a transfer. The profits of the SM are

$$\pi_{SM} = \frac{(2v - (1 - 2\theta\sqrt{f^*(\alpha,\theta)}))^2}{9d} - \alpha f^*(\alpha,\theta)$$

from which we derive the first-order condition:

$$\frac{\partial \pi_{SM}}{\partial \alpha} = \frac{(2\theta - 1)f'(\alpha,\theta)}{9\,d\,\sqrt{f^*(\alpha,\theta)}}(2v - (1 - 2\theta)\sqrt{f^*(\alpha,\theta)}) - \alpha f'(\alpha,\theta) - f^*(\alpha,\theta) = 0$$

which evaluated at $\alpha = 0$ is:

$$\left.\frac{\partial \pi_{SM}}{\partial \alpha}\right|_{\alpha=0} = \frac{(2\theta - 1)f'(0)}{9\sqrt{f^*(0)}d}\left(2v + (2\theta - 1)\sqrt{f^*(0)}\right) - f^*(0) > 0.$$

This condition can be written as:

$$(4(2\theta-1)v\sqrt{f^*(\alpha,\theta)} + 2(2\theta-1)^2 f(\alpha,\theta)) - (18\,c\,d\,\sqrt{(f^*(\alpha,\theta))^3} - v(2-\theta))\sqrt{f^*(\alpha,\theta)} > 0. \quad (11)$$

Note that condition (11) is sufficient for the SM's profit to attain its maximum at a transfer level that is strictly positive, i.e., $\alpha_v > 0$. Rearranging expression (9), we obtain the following:

$$18\,c\,d\,\sqrt{(f^*(\alpha,\theta))^3} = 2(2-\theta)((2-\theta)\sqrt{f^*(\alpha,\theta)} - v)$$

which we substitute into the condition in (11). After some algebra, the condition in (11) boils down to:

$$\sqrt{f^*(\alpha,\theta)}\left((7v\theta - 6\sqrt{f^*(\alpha,\theta)}(1-\theta)^2\right) > 0$$

Given that θ is always positive, this inequality is satisfied if and only if

$$\theta > \frac{-7v + \sqrt{144 f^*(\alpha,\theta) + 49v^2}}{12\sqrt{f^*(\alpha,\theta)}} \equiv \theta^*.$$

This threshold is always larger than zero but smaller than one, increasing in f, and, by Lemma 4, decreasing in θ. This proves Proposition 5. □

Proof of Corollary 3

The total welfare function is defined as the aggregate of all players' payoffs. Hence, the regulator internalizes all the externalities of additional news quality. Formally:

$$\frac{\partial TW(\alpha,\theta)}{\partial \alpha} = \frac{\partial \pi_{SM}(\alpha,\theta)}{\partial \alpha} + \frac{\partial \pi_{NW}(\alpha,\theta)}{\partial \alpha} + \frac{\partial \pi_{Ad}(\alpha,\theta)}{\partial \alpha} + \frac{\partial U(\alpha,\theta)\cdot n(\alpha,\theta)}{\partial \alpha}$$

For Corollary 3 to hold, it must be that:

$$\frac{\partial \pi_{NW}(\alpha,\theta)}{\partial \alpha}\bigg|_{\alpha=\alpha^v} + \frac{\partial \pi_{Ad}(\alpha,\theta)}{\partial \alpha}\bigg|_{\alpha=\alpha^v} + \frac{\partial U(\alpha,\theta)\cdot n(\alpha,\theta)}{\partial \alpha}\bigg|_{\alpha=\alpha^v} > 0. \tag{12}$$

By definition, α^v is the value that maximizes the profit function of SM. Hence, in order for $\alpha^{opt} > \alpha^v$, it must be that the aggregate derivatives of the payoff of the other players with respect to α and evaluated at α^v is positive.

From the proof of Proposition 5, we know that $f^*(\alpha,\theta)$ is increasing in α. Hence, because f unambiguously increases the utility of consumers, this implies the consumer surplus is increasing in α. Similarly, α directly increases the transfer size that accrues NW's payoff.

The payoff of the advertiser represents the ambiguous component. This is so because an increase of α has a positive effect on $f^*(\alpha,\theta)$, which, in turn, increases the demand for ad slots on NW, as well as the price paid by the advertiser to buy them (see the proof of Proposition 5). Moreover, if θ is large, the price of allocating ads on the SM also increases.

Without a close solution, it is impossible to exactly evaluate how strongly the impact of the advertiser's surplus affects the total welfare. However, given the positive effect of increasing α on the surplus of consumers and NW, the negative effect on the advertiser's payoff must be extremely large to out-compensate the former. Hence, provided that $\frac{\partial \pi_{Ad}(\alpha,\theta)}{\partial \alpha}\Big|_{\alpha=\alpha^v}$ is not excessively large, it is possible to conclude that

$$\frac{\partial TW(\alpha,\theta)}{\partial \alpha} > \frac{\partial \pi_{SM}(\alpha,\theta)}{\partial \alpha}.$$

Notice that this does not imply that $\alpha^{opt} > 0$. If both the SM and the advertisers are at a loss when α is positive, it can be that the regulator (who is not allowed to impose a negative transfer) sets its optimal policy at $\alpha^{opt} = 0$. Hence, we derive Corollary 3.

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