Superstars in two-sided markets: exclusives or not?

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This article studies incentives for a premium provider (Superstar) to offer exclusive contracts to competing platforms mediating the interactions between consumers and firms. When platform competition is intense, more consumers affiliate with the platform favored by Superstar's exclusive deal. This mechanism is self-reinforcing as more firms follow consumer decisions and some singlehome on the favored platform. Our model shows that the presence of indirect network externalities may overturn the common conclusion in the one-sided literature that exclusivity could be deemed as anti-competitive. Exclusivity can be welfare-enhancing and a vertical merger (platform-Superstar) may make non-exclusivity more likely than if the Superstar was independent.

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1. Introduction

With the advent of digitization, most markets moved online where network effects play a crucial role. In these markets, two-sided platforms mediate interactions between different groups (sides), and agents on one side value the presence and the characteristics of agents on the other side of the market. For instance, sellers and buyers interact with one another on online marketplaces, streamers and users on e-sport platforms, artists and listeners on music-on-demand outlets.

Oftentimes, agents are heterogeneous, some are more important than others and have significant market power. Namely, there are small, atomistic, or amateurish agents as well as important and marquee players who generate a high value to the other side of the market, which we refer to as *Superstars*. By being more attractive than atomistic agents, Superstars can agglomerate consumers and induce switching behavior between platforms. As a result, they are in a better bargaining position *vis-à-vis* platforms and can negotiate lucrative deals in exchange for their presence. Examples exist in several digital markets. The music industry features the presence of a few top-rated artists (*e.g., Beyoncé, Taylor Swift*) and a long tail of smaller, often unknown, artists. Same patterns are also observed in the market for apps (*e.g., Angry Birds*), podcasts (*e.g., Joe Rogan*), open-source software (*e.g., Pivotal, Red Hat*), videogames (*e.g., Fortnite, Battlefield*), top gamers (*e.g., Ninja, Shroud*), audio-books (*e.g., Robert Caro, Jeffery Deaver*), MOOC websites (*e.g., Stanford University*), or by the market for investors and peer-to-peer (P2P) payment networks (Markovich & Yehezkel 2019). Even in more traditional markets, such as the shopping mall industry, consumers often have a strong preference for anchor stores (*e.g.,* prestige and fashion stores, departmental stores).

The current literature in two-sided markets mainly features atomistic agents.It falls short of explaining how the market outcome is shaped by the presence of agents with market power (Biglaiser et al. 2019). One immediate observation is that there is a great deal of heterogeneity across industries regarding the contracts signed by *Superstars*. As reported in Table 1, there are many examples of exclusive dealing (*e.g.,* windowed releases, radius clauses), and these decisions co-exist with the choice of other Superstars to be non-exclusively on some platforms.

This paper aims to understand the rationale behind the contractual choices (exclusive or non-exclusive deals) of these agents and the welfare implications of such choices. The Superstars face a clear-cut trade-off. On the one hand, an exclusive contract can be highly remunerative but allows interactions only with a subset of the consumer market. On the other hand, a non-exclusive contract affords the Superstar the largest market reach, but it may reduce the rent extraction from the platforms. We provide intuitive market conditions under which either contractual scheme is chosen.

We develop a general and tractable model with two competing platforms acting as intermediaries between consumers and firms. Unlike previous studies dealing with exclusive contracts (Armstrong & Wright 2007, Hagiu & Lee 2011, Halaburda & Yehezkel 2013), we introduce heterogeneity on the firm side of the market, which is composed of a fringe of atomistic firms and the Superstar, who acts as a monopolist supplier of her product. Both consumers and firms enjoy cross-group externalities. Consumers benefit from the presence of firms they can meet, and firms benefit from interacting with consumers on

Market	Exclusives	Type	Vertical integration
Music on-demand	Drake, F. Ocean on Tidal; Rihanna, Beyoncé on Apple; Taylor Swift on Spotify	Full or "windowed release"	Spotify acquired Gimlet and Parcast
Gaming	Spider Man, Gran Turismo Sport, The Last of Us, God of War on PS; Super Mario Odyssey and Pokemon: Sword and Shield on Switch; Fornite on Epic Game Store	Console-specific, feature-specific, often limited in time	Historical feature of the industry (Lee 2013)
E-sport	Ninja, Shroud (top gamers) left Twitch for Mixer	Exclusive streaming of games	No(t yet)
Audio books	Garzanti, Loganesi, " Originals", Robert Caro, Jeffery Deaver, Michael Lewis on Amazon Audible; Bompiani on Storytel	Full	"Originals"
Apps	Bear, Timepage, Overcast on iOS; Steam Link, Tasker on Android	Full	Apple's Arcade and Shazam, Google's Suite
Shopping Malls	Anchor store	Often radius clauses	Departmental store
⋮	⋮	⋮	⋮

Table 1: Industry Background

a platform. We explore two variations of this model. First, when the platform and the Superstar are vertically separated, the decision of the Superstar is between offering her product to one (exclusive contract) or both platforms (non-exclusive contract). Second, when there is a platform-Superstar merger, the decision of the merged entity becomes whether (or not) to give access to the product to a rival platform. This provides insights on competition when the service/product is self-produced by one competing platform or integrated following mergers or acquisitions.

To understand the ability of exclusive deals to reshape platform competition, we focus on an ex-ante symmetric market configuration and we isolate the contribution of the Superstar, net of any coordination domino-effect linked to externalities.[1] A non-exclusive contract is neutral to market competition. In particular, consumer demand is equally split

[1]In markets with network externalities, a coordination problem typically leads to a multiplicity of equilibria (*e.g.,* Caillaud & Jullien 2003, Hagiu 2006, Jullien 2011) when agents have different beliefs regarding the number of agents on the other side of the market affiliating to each platform. We discuss this issue in Section 6.1.

between the two differentiated platforms, and firms are either active on both platforms (multihoming) or are inactive (zerohoming). Indeed, platforms are also ex-post symmetric. On the contrary, exclusivity renders a platform *favored* in the competition with the rival *unfavored* platform. In particular, more consumers follow the Superstar, and, in turn, more small firms become active in the market and agglomerate on the *favored* platform. As a result, the number of active firms increases relative to a non-exclusive contract as more of them find it profitable to enter the market and affiliate with the *favored* platform only. In practice, some zerohomers become singlehomers. Moreover, some firms, which were active on both platforms when the Superstar was non-exclusive, find it profitable to join only the *favored* platform in the presence of an exclusive contract. In other words, some multihomers become singlehomers. Indeed, an exclusive contract between the Superstar and platform induces more exclusivity and creates direct and indirect asymmetries and externalities that are capitalized by the Superstar.

Although exclusivity entails the above-discussed gains, this choice requires the Superstar to give up interacting with a share of the potential customer base. Indeed, the surplus extracted from the *favored* platform needs to be sufficiently large to compensate for the foregone revenues otherwise obtained under non-exclusivity. We find that this choice ultimately depends on the fierceness of the platform competition, *i.e.,* how much switching the Superstar ensures. On the one hand, when platforms are less differentiated and competition intensifies, a relatively large mass of consumers and fringe firms migrate to the *favored* platform. This generates an additional surplus which the Superstar extracts through an exclusive contract. On the other hand, when platforms are more differentiated, consumers are less mobile and switching becomes less likely. In this case, only a few consumers and fringe firms would follow the Superstar, thereby reducing the competitive edge for the *favored* platform. As the surplus to be capitalized by the Superstar with an exclusive contract is not large enough, reaching the entire market with a non-exclusive contract becomes more profitable.

At first sight, exclusive contracts might be considered harmful to both sides of the market. In 2016, when Tidal and Apple Music signed exclusive deals with some Superstar artists, Spotify complained about the negative impact on consumers, artists, and the entire industry.[2] Similarly, in 2019, the Chinese regulator started an investigation against Tencent Music for its exclusive deals with some labels and considered policies like bans on exclusive deals in this market.[3] These concerns do not pay enough attention to the differences between one-sided and two-sided markets. Typically, these concerns stand on the possibility of foreclosure or entry deterrence of efficient rivals arising in markets without network effects, as already discussed by previous pioneering studies (see *e.g.,* Rasmusen et al. 1991, Bernheim & Whinston 1998, Fumagalli & Motta 2006, *inter alia*). Our model shows that the presence of indirect network externalities may overturn the common conclusion in the one-sided literature that exclusivity is anti-competitive. The

[2]See *e.g.,* RollingStone, October 5, 2016. 'How Apple Music, Tidal Exclusives Are Reshaping Music Industry': http://www.rollingstone.com/music/news/inside-the-war-over-album-exclusives-w443385.

[3]See mLex, September 13, 2019. 'Tencent Music probe opens up whole new avenue for China antitrust enforcement in digital sector':https://mlexmarketinsight.com/insights-center/editors-picks/antitrust/asia/tencent-music-probe-opens-up-whole-new-avenue-for-china-antitrust-enforcement-in-digital-sector

value creation stemming from exclusivity is intrinsically linked to the two-sidedness of the market, as the entry of new firms which agglomerate on the *favored* platform creates a surplus for consumers and more consumers on the *favored* platform stimulate additional entry and agglomeration. As a result, when indirect network externalities are powerful, exclusivity may eventually lead to a scenario that is welfare-enhancing.

A variation of our model featuring a platform-Superstar merger (vertical integration) with network effects adds to the antitrust debate on the ensuing potential anti- (pro-) competitive effects of vertical mergers. The recent stream of high-profile mergers and acquisitions in markets with network externalities (*e.g.,* RedHat-IBM, Pivotal-WMware, Gimlet-Spotify) makes it all the more pertinent. There is an extensive literature in one-sided markets discussing these effects (see Rey & Tirole 2007 for a review). The overwhelming consensus is that post-merger there is an increased incentive to foreclose a rival of an essential input. In our model with indirect network externalities, on the contrary, exclusivity is less likely under vertical integration than under vertical separation. Under exclusivity, the merged entity internalizes the network benefits the Superstar obtains from the interactions with consumers and this puts downward pressure on prices and rival's profits. Under non-exclusivity, instead, being vertically integrated or separated does not change the platform competition. This makes non-exclusive contracts more likely post-merger. Our results suggest due diligence for antitrust enforcers when scrutinizing vertical mergers. Overlooking the presence of network externalities might lead to an overestimation of the (potential) harm and, thus, excessive bans. In the article, we discuss these results in light of the European Commission's guidelines on non-horizontal mergers and provide a comparison of the competitive outcome arising in markets with and without network externalities.

The road map is as follows. In the next section, we discuss the related literature and then the following Section 3 provides descriptive evidence of contractual arrangements in different industries. In Section 4, we present the preliminaries of the model. Section 5 studies the optimal contractual arrangements, the welfare impact of exclusive dealing, and the effect of a vertical merger. Section 6 discusses the generality of our setting when several assumptions are relaxed and how the Superstar can solve the coordination problem typical of these markets. Section 7 discusses the main results and their policy relevance.

2. Related Literature

Our article relates to several streams of industrial organization literature. Above all, it relates to a number of papers dealing with two-sided markets (Caillaud & Jullien 2003, Rochet & Tirole 2003, 2006, Armstrong 2006, Jullien 2011).

Traditionally, the literature of the two-sided markets considers exclusive contracts as a tool in the hands of platforms to manage the homing decisions of the two sides of the market. For instance, Armstrong & Wright (2007) show that when platforms offer an exclusive contract to sellers, they do so by charging a prohibitively high price to multihomers and a discount to singlehomers. As a result, there is a partial (complete) foreclosure as all users on this side (both sides) would prefer to singlehome.[4]

[4] Recently, Belleflamme & Peitz (2019) have shown that when platforms prefer to impose exclusivity to

Our article takes a novel perspective: the Superstar has all the bargaining power in deciding upon exclusivity or non-exclusivity, with the only constraint that contractual offers must be incentive compatible for the platforms. Our result under exclusivity is outcome-equivalent to a second-price sealed-bid auction with negative externalities (see Jehiel & Moldovanu 2000) in which the optimal bid equals the difference in payoffs when winning and losing the auction. Differently, non-exclusivity can emerge, for example, as a result of a unilateral renegotiation.

This article also adds to this literature by explicitly modeling heterogeneity in market power on one side of the market. Up until recently, most of the literature has considered markets populated by atomistic agents. Notable exceptions are Lee (2014) and Adachi & Tremblay (2019), who consider oligopolistic firms contracting with the platform(s), and Ishihara & Oki (2017), who consider the decision of a monopolist multi-product content provider on how much content to offer exclusively on each platform. Differently from these two contributions, we introduce a *marquee* player, that is, an agent able to shape the decisions of the atomistic players and the market configuration (see *e.g.,* discussion in Biglaiser et al. 2019). In doing so, our paper is closely related to Markovich & Yehezkel (2019), who present a model of platform competition, with direct rather than indirect externalities.[5] The authors study how grouping users may facilitate the migration from a less efficient focal platform to a more efficient one. In our paper, instead, it is the Superstar that, by joining exclusively one platform, may coordinate some users and, in turn, some fringe firms towards one platform.

Contrary to the efficiency argument put forward by the "Chicago critique", the most recent economic literature has highlighted how exclusivity might entail anti-competitive effects by deterring entry or leading to foreclosure of more efficient rivals (Aghion & Bolton 1987, Rasmusen et al. 1991, Fumagalli & Motta 2006, Abito & Wright 2008, Fumagalli et al. 2009, 2012). Similar anti-competitive practices can also arise in the presence of network externalities when an incumbent can make exclusive introductory deals and prevent more efficient platforms from entering the market (Doganoglu & Wright 2010) or in the presence of interlocking bilateral relationships between upstream and downstream firms (Nocke & Rey 2018). Nevertheless, exclusive dealing might also entail pro-competitive effects such as effort provision (Segal & Whinston 2000, De Meza & Selvaggi 2007) or entry deterrence by inefficient firms (Innes & Sexton 1994). In supporting this view, the empirical evidence from the videogame industry has shown that exclusive deals between platforms and videogame producers might help small platforms to enter the market and challenge the incumbent (Lee 2013). A major difference between our framework and the discussed studies is the presence of indirect network externalities, which amplifies the impact of exclusive dealing, generating, in equilibrium, a market entry on the fringe and a possible benefit for consumers. This is a new result linked to the two-sidedness of the market.[6] If applying our model to a one-sided market, free of network externalities,

both sides of the market, at least one side is likely to be harmed, whereas allowing multihoming may make all market participants better off.

[5] Heterogeneity on one side of the market is also considered by Johnen & Somogyi (2019). The authors consider how the presence of naifs and sophisticated buyers influence the decision of platform(s) to shroud or unshroud add-on fees.

[6] This is partly similar to what presented by Kourandi et al. (2015), who study the contractual deci-

exclusivity would always emerge, causing harm to consumers.[7]

Further, our article makes several contributions to the literature on vertical integration in two-sided markets. As discussed, the presence of first-party content, in-house production, and several acquisitions have rendered platforms vertically integrated. Starting from similar motivating examples, Pouyet & Trégouët (2018) focus on the impact that vertical integration in two-sided markets may have on competition, showing that the relative size of the indirect network externalities is key to assess the pro- or anti-competitiveness of a vertical merger. D'Annunzio (2017) presents one of the first studies dealing with competing platforms and the decision to provide premium content. She shows that whereas a premium content is always offered exclusively, vertical integration between the provider and one platform may change incentives to invest in quality. In ours, non-exclusivity arises more prominently in the presence of vertical integration to soften market competition and avoid aggressive pricing strategies that indirect network externalities trigger.

Unlike the above-discussed studies, in our model, the Superstar faces a trade-off between exclusivity and non-exclusivity, and this choice depends on how intense the platform competition is. These results partly resemble those of Weeds (2016).[8] She studies the incentives of a vertically integrated TV to offer its premium programming to a rival distributor. She finds that when the competition is dynamic, exclusivity might be the best solution, thereby contrasting traditional findings in static markets. Because of switching costs, the future market-share advantage might outweigh the opportunity cost of giving up to some current audience. Similar to Weeds (2016), in our model, the emergence of exclusivity is linked to the strength of the downstream competition. However, our result depends on the static competition and rent extraction effects rather than on the dynamic aspects linked to switching costs.

3. Industry Background

In this section, we present circumstantial evidence of some industry practices which may feature and motivate our model. Although practices and contract types may differ on a case-by-case basis, these industries are all characterized by interactions between different sides of the market, network externalities, Superstars, exclusive dealing, and some degree of vertical integration.

sion made by Internet Service Providers to content providers. Differently from us, they show that exclusivity can be welfare enhancing when the competition of content providers over informative ads is sufficiently intense.

[7]Similarly, Armstrong (1999) shows that, in a traditional one-sided market, premium content is always offered exclusively. Moreover, in comparing different types of contracts, he also shows that, with exclusivity, a lump-sum contract is revenue-maximizing relative to a royalty-based one.

[8]In Abito & Wright (2008), exclusive dealing between a buyer and an input supplier is more likely to arise when the competition between downstream firms is sufficiently intense. Their result differs from that of Fumagalli & Motta (2006), who, instead, found that exclusivity is more likely to arise when the competition is softened. We differ from these papers by considering a two-sided market and the fact that an exclusive deal between a platform and a Superstar does not lead to market tipping scenarios.

Music on-demand industry. In the music streaming market, the global growth rate reached 34% in 2019. The streaming market accounted for almost half of music revenues (IFPI 2019). Since 2016, the music streaming industry has experienced an exclusives war. Starting with Apple Music and Tidal, several artists signed exclusive contracts, often in the form of windowed release.[9] Notable examples refer to Drake (*Views, Hotline Bling, Summer Sixteen*), Frank Ocean (*Blonde*, followed by his album *Endless*), Chance the Rapper (*Coloring Book*), and more recently PNL (with the *Deux Fréres album*) on Apple Music, Kanye West (*The Life of Pablo*), Rihanna (*Anti*) or Beyoncé (*Lemonade* and *Die With You*) on Tidal. Revenues from exclusive deals can be highly lucrative, ranging from $ 500,000 obtained by Chance The Rapper to $ 20 millions by Drake, and equity stakes obtained by Rihanna, Kanye, Beyoncé.

Whereas these artists opted for exclusives, others continued to offer their records to their largest possible audience.[10] In 2018, Spotify turned into exclusives as well (*e.g.,* with Taylor Swift's *Delicate* and the acoustic version of *Earth, Wind & Fire's September)* and, more recently, stuck a multi-year deal with Higher Ground Audio, a podcast production company, to produce a series of podcasts with Barack and Michelle Obama, and with Joe Rogan. The exclusive deal of the author of the "The Joe Rogan Experience" is reported to be worth more than $100 million.[11] Moreover, the industry features several cases of vertical integration (*e.g.,* Tidal was launched as an artist-owned streaming platform)[12] and acquisitions (*e.g.,* Spotify acquired podcast producers Gimlet and Parcast).

Gaming industry. The gaming industry, which expects to hit $300 billion by 2025,[13] has been historically characterized by a large proportion of exclusive agreements, negotiations, and a high degree of vertical integration (Lee 2013). In this context, exclusivity may be console- or/and PC-specific, permanent or limited in time, or only related to some features of the videogame. In 2019, Epic Store, the gaming house producing the popular *Fortnite*, announced that "*store exclusives are the only way to improve Steam and the PC market*". Thanks to that game, Epic Games Store was able to attract as many as 85 million users on the platform and additional exclusive developers due to generous revenue split (*e.g., Metro Exodus*, initially planned to be released on Steam).[14] In the same year,

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[9] Windowed releases represent a new practice in the music industry market under which songs or albums are released exclusively on a platform for a limited period.

[10] For instance, Lady Gaga expressed her strong opinion against exclusive contracts. The opposition against exclusive contracts also mounted on the platform side, with Spotify claiming in 2016 that Superstar exclusives were bad for artists, consumers, and platforms.

[11] See The New York Times, 'Joe Rogan Strikes an Exclusive, Multiyear Deal With Spotify ' https://www.nytimes.com/2020/05/20/business/media/joe-rogan-spotify-contract.html

[12] Current owners are Jay-Z, who also offers exclusive contents on the platform and the US mobile carrier Sprint. According to the platform's website, the artists-owners also include Alicia Keys, Arcade Fire's Win Butler and Regine Chassagne, Beyoncé, Calvin Harris, Coldplay's Chris Martin, Daft Punk, Damian Marley, deadmau5, Indochine, J. Cole, Jack White, Jason Aldean, Kanye West, Lil Wayne, Madonna, Nicki Minaj, Rihanna, T.I., and Usher.

[13] See Variety, 'Video Games Could Be a $300 Billion Industry by 2025 (Report)' https://variety.com/2019/gaming/news/video games-300-billion-industry-2025-report-1203202672/.

[14] See *e.g.,* The Verge "Epic Games Store chief says they'll eventually stop paying for exclusive PC games" https://www.theverge.com/2019/3/21/18276181/epic-games-store-exclusives-pc-gaming-fortnite-steve-allison-gdc-2019

several small indie games, including *Ooblets*, were announced exclusively on that platform and an agreement was signed with Ubisoft, a major games publisher, on selected exclusive titles.

Most titles are also developed in-house as first-party content, e.g., Epic's Fortnite was a publisher turned into a distributor. In the home console market, *MLB The Show 19, Gran Turismo Sport, The Last of Us, God of War,* amongst others, are developed by Sony and only available on Sony's own console PlayStation (PS) 4. Nintendo released exclusively *Super Mario Odyssey* and *Pokemon: Sword and Shield* for its Switch, while in 2020 Electronic Arts (a gaming producer vertically integrated with Origin) has announced the release of *Battlefield* non-exclusively also on the competing Twitch.Third-party developers are mostly heterogeneous in their homing decisions, with some available exclusively on some consoles (*e.g.,* Marvel's *Spider Man* on PS), and others available non-exclusively (*e.g., Grand Theft Auto V* on Xbox and PS or Electronic Arts's *FIFA 2019* on Xbox, Switch, and PS). Similar trends can be observed in the emerging cloud streaming market, with Google Stadia and Apple Arcade launched in 2019.

E-sport Market. This market is worth $10.1 billion by the end of 2019 and consists of streaming live or pre-recorded games. Two platforms (YouTube Gaming and Amazon's Twitch) dominate the market, followed by fast-growing platforms such as Facebook Live and Microsoft's Mixer (StreamLab 2018). The most played game is *Fortnite*. Platforms compete by attracting game streamers and users paying a monthly subscription fee to have access to the platform. In 2019, a significant change in the industry concerned the decision of the most followed player (with more than 14 million followers), Ninja, to leave Twitch for an exclusive contract with Mixer. Following Ninja's decision, the number of downloads of the app increased by 650,000 in five days. According to Streamlabs & Newzoo Q3 2019 Statistics, "Ninja's move may have spurred a significant migration of users to Mixer" and stimulated an influx of new streamers on the platform. Amongst others, in October 2019, another famous streamer, Shroud, left Twitch for Mixer.[15] However, despite these exclusive contracts, in June 2020, Microsoft decided to shut down Mixer and started a new partnership with Facebook Gaming.

Publishing Industry. In the publishing industry, audio-books are on the rise, with revenues growing by 24.5% and more than 44,685 titles published in the US in 2018 (APA 2019). Platforms such as Amazon's Audible and Storytel charge consumers a fixed monthly fee for access to their audio-book catalog. More importantly, this market is characterized by several exclusive titles. For instance, Audible has an exclusive agreement with Italian publishers (*e.g., Garzanti, Loganesi*) and so Storytel (with Gruppo

[15]See TheVerge, 'What is Mixer, Ninja's new exclusive streaming home?', August 1, 2019: https://www.theverge.com/2019/8/1/20750432/mixer-ninja-microsoft-twitch-youtube-streaming-fortnite. Also, see e.g 'Twitch Streamers React to Ninja's Exclusive Move to Mixer' https://www.ign.com/articles/2019/08/01/twitch-streamers-react-to-ninjas-exclusive-move-to-mixer and The Business Insider, 'Ninja became the first Mixer streamer to reach 1 million subscribers, less than a week after announcing he was ditching Twitch for Microsoft', August 7, 2019, 'https://www.businessinsider.com/ninja-mixer-top-streamer-one-million-followers-2019-8?. For Streamlabs & Newzoo Q3 2019 Statistics, see https://blog.streamlabs.com/streamlabs-newzoo-q3-2019-live-streaming-industry-report-896fc713d752?

Giunti's *Disney/Bompiani*). The former has also launched "Originals", a series of exclusives produced in-house by the platform and narrated by celebrated storytellers. In the US, Audible struck a deal directly with some best-selling authors by-passing major publishers (*e.g., Robert Caro, Jeffery Deaver, Michael Lewis*)[16] and Amazon's own distribution channel, ACX, allows right-holders (*e.g.,* authors, publishers) to distribute their rights exclusively to its network or non-exclusively to other retailers.

Apps and Developers Industry. The app market is characterized by two dominant platforms, Apple iOs, and Android, which allow interactions between developers and users. Whereas most apps are available on both platforms, there are several others which are either exclusive on Apple iOS (*e.g., Bear, Timepage, Overcast*) or on Android (*e.g., Steam Link, Tasker*). Both platforms charge a fee to developers to get an account and publish their apps (*e.g.,* Google charges a one-time fee, whereas Apple a yearly fee) but the former scrutinizes apps based on their content and safety. Developers can offer their apps for free and earn from in-app ads, ask for an upfront payment, or have in-app purchases features. In the latter two cases, the platform obtains a share.[17] This market features a long tail of apps and few tops and best-sellers (*e.g., Angry Birds, WhatsApp*) whose appearance might generate more entry in the market by similar apps (Ershov 2018) and act as discovery facilitators. Moreover, several apps are also built in-house or acquired by platforms, so featuring a certain degree of vertical integration (*e.g., Apple's Arcade* and *Shazam, Google's Suite*).

Shopping Mall Industry. Shopping malls are an example of non-digital platforms characterized by externalities. Consumers decide to which mall to shop based on the number of retailers and their preferences (*e.g.,* distance), and retailers may sign an exclusive or non-exclusive contract with the mall. This market features the presence of anchor stores which can benefit from more favorable contractual terms. Previous research has shown that anchor stores generate demand externalities to non-anchor stores which experience higher sales (Pashigian & Gould 1998, Gould et al. 2005).

Moreover, exclusive dealing in the industry is common, and lease agreements often feature radius clauses, that is, contractual arrangements which prohibit the opening of the same shopping activity within a given distance (Lentzner 1977). The presence of contracts featuring radius might hinder market competition and, therefore, attracted the attention of several competition agencies (*e.g.,* the German Federal Cartel Office, the UK Competition and Markets Authority) and the Austrian Supreme Court.[18]

[16] See *e.g.,* The New York Times, 'Want to Read Michael Lewis's Next Work? You'll Be Able to Listen to It First', June 2, 2019, https://www.nytimes.com/2018/06/02/books/audible-michael-lewis-audiobooks.html.

[17] However, whereas exclusivity is common practice in this market, we are not currently aware of exclusive *contracts* between developers and platforms. Albeit these may arise in the future.

[18] See *e.g.,* Kluwer Competition Law Blog, 'Property leases and competition law: Some clarity on restrictions in leases' http://competitionlawblog.kluwercompetitionlaw.com/2015/12/08/property-leases-and-competition-law-some-clarity-on-restrictions-in-leases/

4. The Model

We consider a two-sided market in which consumers singlehome and firms can either multihome or singlehome. The firms' side is composed by a premium provider that we label as Superstar and a fringe of small providers. There are two platforms $i = 1, 2$ which compete for the two sides.

Consumers. There is a unit mass of consumers, whose preferences are quasi-linear in money and are indexed by $m \in [\underline{m}, \overline{m}]$, which is symmetric around 0 with $\underline{m} = -\overline{m} < 0$. The parameter m denotes the measure of the relative preference for 2 against 1 and it is distributed according to a cumulative distribution function $F(\cdot)$ with density $f(\cdot)$. We also assume that, for a well-behaved function, $\underline{m}$ is large enough such that an equilibrium with two competing platforms exists (*i.e.,* platforms are differentiated á la Armstrong 2006). Hereafter, we refer to m as the consumer type.

When consumers join a given platform, they obtain a value (v) independent of externalities. They also receive positive externalities due to the presence of firms on the other side. The Superstar generates a value ϕ for the consumer, whereas each firm affiliated with platform i provides an indirect network benefit θ. We assume v to be sufficiently high so that all consumers subscribe to either platform and to ensure competition between the platforms. We denote by $g_i = \{0, 1\}$ the indicator function expressing the presence/absence of the Superstar and by N_i the number of other fringe firms active on platform i. This is a generalized Hotelling setup, in the spirit of Fudenberg & Tirole (2000). As a result, the total utility of a type-m consumer from joining platform 1 at price p_1 is

$$u_1(g_1) = v + \phi g_1 + \theta N_1 - p_1 - m/2,$$

where p_1 is the price paid. Similarly, the utility a consumer m enjoys by patronizing platform 2 is

$$u_2(g_2) = v + \phi g_2 + \theta N_2 - p_2 + m/2.$$

Consumers prefer to join platform 1 over platform 2 whenever $u_1(g_1) > u_2(g_2)$ or

$$m < m^*(g_1, g_2) := \phi(g_1 - g_2) - (p_1 - p_2) + \theta(N_1 - N_2). \tag{1}$$

The demand for platform 1 is represented by all consumers with $m < m^*$ and the remaining consumers will join platform 2. Hence,

$$D_1(g_1, g_2) = F(m^*(g_1, g_2)) = F(g_1, g_2), \qquad D_2(g_2, g_1) = 1 - F(g_1, g_2). \tag{2}$$

Note that the first argument in the demand function relates to the associated player's exclusivity choice and the second argument to that of the rival. With a slight abuse of notation, we sometimes replace $F(m^*)$ with $F(g_1, g_2)$. For instance, $D_i(g_i, g_j)$, is the demand at platform i where g_i is the indicator function of the Superstar's choice to join platform i and g_j is the Superstar's choice to join its rival, platform j. We follow the same notations throughout the article. Moreover, we also assume regularity conditions. As in Fudenberg & Tirole (2000), we let the demand on platform 1 be a cumulative distribution function (cdf), $F(m)$, with the following properties.

Assumption 1. *$F(\cdot)$ is smooth, with strictly positive density function $f(\cdot)$, symmetric around zero and the monotone hazard rate $\frac{f(m)}{1-F(m)}$ is increasing with m.*

Firms. On this side of the market, there is a fringe of small firms s and the Superstar, S. Both types benefit from interactions with consumers. The value of such interactions is denoted by γ and γ^S for the small firms and the Superstar, respectively. These represent a measure of the indirect network externalities in this side of the market.

The fringe firms have heterogeneous outside option $k \in [0, \infty)$ to enter each platform. The outside option is distributed according to a cdf $\Lambda(\cdot)$ with density $\lambda(\cdot)$.The outside option can be interpreted as entry costs, or development and porting costs that each firm has to face when joining a platform.[19] Their utility when joining platform i is $u_i^s = \gamma D_i(g_i, g_j) - k$, and they do so for any $u_i^s > 0$, that is for any $k < \gamma D_i$. This implies that if a fringe firm stays out of the market, not entering any platform, it gains $2k$. As a result, the mass of firms on platform i is

$$N_i = \Lambda(\gamma D_i).$$

As for the consumers, the following properties apply.

Assumption 2. *$\Lambda(\cdot)$ is smooth, with strictly positive density function $\lambda(\cdot)$ and $\lambda'(\cdot) > 0$.*[20]

Unlike the small firms, the Superstar has all the bargaining power over her product and can offer it to the platform(s), with $T_i(g_i, g_j)$ representing the tariff she sets. $T_i(1,0)$ ($T_j(1,0)$) implies that platform i (j) has an exclusive contract with the Superstar, whereas $T_i(1,1)$ and $T_j(1,1)$ imply a non-exclusive contract. Other than tariffs, the Superstar makes ancillary revenues when interacting with consumers. These are a measure of the indirect network externality in this side of the market and can comprise of merchandising, royalties from participation in concerts and live events, in-app purchase, or other forms of short-run revenues. This way, the Superstar cares about her total market reach: the larger the number of the consumers she interacts with, the larger her profits.

The profit of the Superstar when offering an exclusive contract to platform i is given as:

$$\Pi^S(1,0) = \gamma^S \cdot D_i(1,0) + T_i(1,0),$$

whereas the profit when offering non-exclusive contracts is:

$$\Pi^S(1,1) = \gamma^S \cdot (D_i(1,1) + D_j(1,1)) + T_i(1,1) + T_j(1,1).$$

Platforms. Platforms collect revenues from the consumer side of the market. In Section 6.6, we also consider the case in which the platform sets prices to fringe firms as well. Given the offer of the Superstar, platform(s) decide whether to accept the offer and then

[19]For simplicity, we ignore increasing returns to scale (or entry cost synergies) for the fringe firms. These synergies only increase the incidence of multihoming fringe firms while our main results are unchanged.

[20]The economic intuition behind $\lambda' > 0$ is that there is a larger number of firms with a high outside option than with low outside option. This is needed to fulfill concavity conditions and this is a sufficient condition for the monotone hazard rate to be increasing with k.

they compete in prices. Specifically, platforms set prices to maximize their profits which are given by:

$$\Pi_i(g_i, g_j) - T_i(g_i, g_j) = p_i \cdot D_i(g_i, g_j) - g_i T_i \cdot (g_i, g_j). \tag{3}$$

Note that the tariff T_i depends on g_1 and g_2, since the payment to have the Superstar on board differs under exclusivity and non-exclusivity. When a platform receives an offer, the contract specifies whether that contract is an exclusive or non-exclusive one as well as the associated tariff. Moreover, the platform does not observe the sequence in which exclusive contracts were offered. This implies that a rejection of an exclusive contract by a platform does not impact the contract type offered by the Superstar to its rival. The contractual structure is reminiscent of Ordover et al. (1990) and is better clarified in Section 5.2.

Timing. The timing of the game is as follows. In the first stage, the contractual arrangements are made. In the second stage, the outcome of the contractual stage becomes public and, conditional on hosting the Superstar, each platform simultaneously and independently sets a price for the consumers. Finally, consumers decide to which platform affiliate and firms decide whether to join a platform. The equilibrium concept is subgame perfect Nash equilibrium.

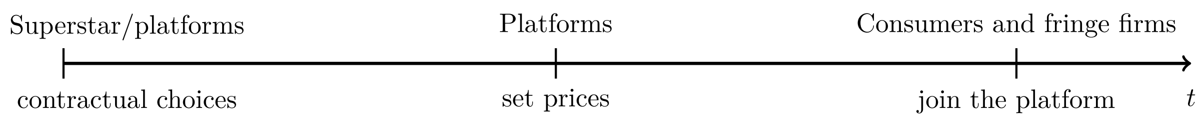

Figure 1: Timing of the model

5. Analysis

In this section, the model is analyzed by backward induction. By using the demands in equation (2), we study how market outcomes result in the two contractual regimes. Given that externalities require coordination among agents and, hence, expectations, the multiplicity of equilibria typically arises. In our analysis of non-exclusivity, we focus on the symmetric scenario in which consumers believe that the market will be equally split between the platforms at equal prices. Under exclusivity, we isolate what the contribution of the Superstar, net of any coordination domino-effect linked to externalities, is. Recall that $\overline{m}$ is sufficiently large to avoid tipping even under exclusivity. This implies that it is too costly to coordinate on one platform, no matter the belief structure.

5.1. Price competition

When prices are chosen, platform i has already received and accepted (or not) the offer of the Superstar. Thus, the price p_i only impacts the first term in the platforms' profits.

By differentiating equation (3) with respect to p_i, the first-order conditions are given as follows:

$$\begin{aligned}\frac{\partial \Pi_1}{\partial p_1} =& D_1(g_1,g_2) + p_1 \frac{\partial D_1(g_1,g_2)}{\partial p_1},\\ \frac{\partial \Pi_2}{\partial p_2} =& D_2(g_2,g_1) + p_2 \frac{\partial D_2(g_2,g_1)}{\partial p_2},\end{aligned} \tag{4}$$

where $\frac{\partial D_1(g_1,g_2)}{\partial p_1} = \frac{\partial D_2(g_2,g_1)}{\partial p_2} = \Big(- \frac{f(g_1,g_2)}{1-f(g_1,g_2)\gamma\theta[\lambda(D_1)+\lambda(D_2)]}\Big)$. The following lemma provides the conditions of the equilibrium prices given g_1 and g_2.

Lemma 1. *The optimal prices are implicitly determined as follows:*

$$\begin{aligned} p_1(m^*(g_1,g_2)) &= \frac{F(m^*(g_1,g_2))}{f(m^*(g_1,g_2))} - F(m^*(g_1,g_2))\gamma\theta[\lambda(\gamma D_1) + \lambda(\gamma D_2)],\\ p_2(m^*(g_1,g_2)) &= \frac{1-F(m^*(g_1,g_2))}{f(m^*(g_1,g_2))} - (1-F(m^*(g_1,g_2)))\gamma\theta[\lambda(\gamma D_1) + \lambda(\gamma D_2)]. \end{aligned}$$

Proof. See Appendix A.1. □

The optimal prices account for consumer heterogeneity of preferences and indirect network externalities. Indeed, consumers are rewarded for the positive externality created on the other side. The cutoff m^*, which is a function of (g_1, g_2), captures the impact of the Superstar on prices. If $g_i = g_j$, platforms are symmetric and the price is equal to that one in the standard competitive-bottleneck models (Armstrong 2006, Rasch & Wenzel 2013). This case is summarized by the following lemma.

Lemma 2. *If $g_i = g_j = g \in \{0, 1\}$, the two platforms charge the same price*

$$\begin{aligned} p^* =& \frac{F(0)}{f(0)}\Big(1 - f(0)\gamma\theta(\lambda(\gamma D_1) + \lambda(\gamma D_2)\Big)\\ =& \frac{1}{2f(0)} - \gamma\theta\lambda(\gamma/2). \end{aligned}$$

The platforms split the market equally. All active firms given by $N_1^* = N_2^* = \Lambda(\gamma/2)$ multihome, whereas all the others zerohome.

Proof. See Appendix A.2. □

Lemma 2 describes a symmetric scenario where neither platform enjoys the competitive advantage of the premium content. Two cases are subsumed in this lemma. In the first case, $g = 0$ and no platform hosts the Superstar. In the second case, $g = 1$ and both platforms host the Superstar. We obtain that the final consumer demand is equal in the two cases, $F(0,0) = F(1,1) = F(m^* = 0)$. Figure 2 provides a graphical representation of consumers' and firms' participation.

Assume that the Superstar offers an exclusive contract to platform 1. The equilibrium outcome is reported in the following lemma.

Lemma 3. *With an exclusive contract, e.g., $g_1 = 1$ and $g_2 = 0$, equilibrium prices are*

$$p_1^*(1,0) > p^* > p_2^*(0,1).$$

Platform 1 has a higher consumer demand

$$D_1^*(1,0) > 1/2 > D_2^*(0,1).$$

Proof. See Appendix A.3. □

Lemma 3 highlights important differences with the symmetric case described above. First, one can observe that an exclusive contract renders the final prices asymmetric: the platform *favored* by Superstar exclusivity sets a higher price than the rival. Note that this price is higher than in the case with non-exclusive contracts, *i.e.,* $p_1^* > p^*$. By contrast, the rival's price decreases, *i.e.,* $p_2^* < p^*$. Importantly, the magnitude of the price change is lower than the value generated by the Superstar, $\frac{\partial p_1}{\partial \phi} - \frac{\partial p_2}{\partial \phi} \in [0,1]$. As such, there is some surplus left over to the final consumers and this triggers a demand expansion for the *favored* platform. This is the typical (first-order) *business-stealing effect*, which further gives rise to positive indirect network externalities on the other side of the market (fringe firms' side), which again feeds back into the consumer utility.

This is a relevant result: the asymmetry generated by an exclusive contract on the demand side is further magnified by a large number of firms on the fringe joining the platform with the Superstar as well. Indeed, the Superstar agglomerates consumers and firms on the *favored* platform. Formally, the feedback loop on the fringe side is such that:

$$N_1 = \Lambda(\gamma D_1^*) > \Lambda(\gamma/2) > N_2 = \Lambda(\gamma D_2^*).$$

In Section 6.5 we discuss how our results are robust to a setting in which the market is not fully covered.
The following proposition summarizes our findings, discussing the impact of an exclusive contract offered by the Superstar on the homing decision of the other fringe firms.

Proposition 1. *Superstar exclusivity fosters entry in the market and induces singlehoming of some fringe firms. Specifically,*

- *fringe firms with $k \in (0, \gamma D_2^*]$ multihome;*
- *fringe firms with $k \in (\gamma D_2^*, \gamma D_1^*]$ singlehome on platform 1;*
- *fringe firms with $k \in (\gamma D_1^*, \infty)$ zerohome.*

The intuition of the above results is as follows. Under exclusive dealing, the impact on the fringe firms is twofold relative to non-exclusivity. First, a larger mass of fringe firms is active in the market. Second, some firms become exclusively active on the *favored* platform without the need for an exclusive contract. This is an interesting result in itself as the exclusive presence of the Superstar affords some fringe firms with a high outside option to be active in the market. This creates more exclusivity as some firms singlehome.

To see this mechanism graphically, consider Figure 2, which depicts the case when the Superstar offers a non-exclusive contract. The consumer side is equally split between the two platforms, all firms with low $k < \gamma/2$ multihome, whereas those firms with a high outside option remain inactive. With Superstar exclusivity on platform 1, a larger mass of consumers is active on that platform with respect to the rival ($D_1^* \equiv F(1,0) > 1/2$). As the size of fringe active on a platform depends on the beliefs regarding the number of consumers on that platform, some firms that were zerohomers in the non-exclusive case are now singlehomers. Moreover, some of the multihomers (in the non-exclusive contracts case) now singlehome on the *favored* platform. Figure 3 provides a graphical representation of the effect of an exclusive contract on both sides.

Note that exclusive contracts by the Superstar create exclusivity in the firms' side of the market without the need for explicit exclusive contracts. This result differs from that of Armstrong & Wright (2007), in which single-homing (exclusivity) occurs on the firm side only when exclusive contracts are explicitly offered to (small) firms.

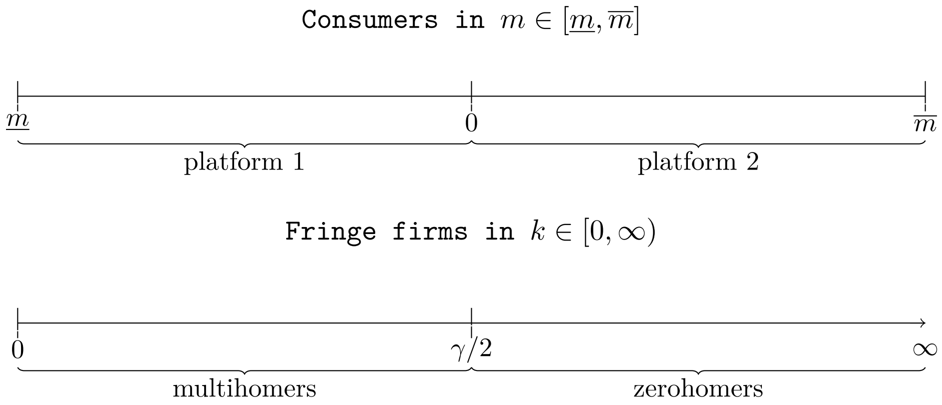

Figure 2: Non-exclusive contract.

Under non-exclusivity, the consumer side is equally split and symmetric around 0. All fringe firms with $k \leq \gamma/2$ are multihomers, whereas the others are zerohomers.

5.2. Contractual stage: exclusive and non-exclusive contracts

To determine the optimal contractual design, we proceed as follows. The Superstar has all the bargaining power *vis-à-vis* the platforms and offers an exclusive contract or a non-exclusive contract. We consider a contractual setup such that a platform rejecting the Superstar's offer is in the weakest market position (*unfavored*). Therefore, if the Superstar offers an exclusive contract, the maximum tariff she can set is equal to $T_1(1,0) = \Pi_1^*(1,0) - \Pi_1^*(0,1)$. If the Superstar prefers a non-exclusive contract, then the tariff she can set equals the following $T_1(1,1)^* = \Pi_1^*(1,1) - \Pi_1^*(0,1)$. Note that the outside option of a platform rejecting the contract is again equal to the profit obtained in the worst market scenario in which the Superstar is exclusive on the rival platform.

These tariffs can be implemented in several ways and an example of a contractual arrangement is provided in Appendix B.1. For instance, this can follow the implementation of a second-price sealed bid auction á Jehiel & Moldovanu (2000) in the framework of Ordover et al. (1990).

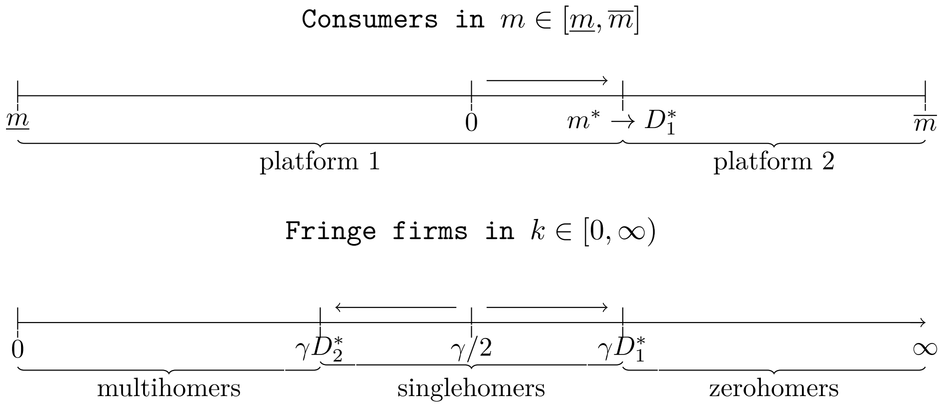

Figure 3: Exclusive contract with platform 1.

Under exclusivity with platform 1, more consumers affiliate with platform 1 ($\hat{m} \equiv D_1^* > 1/2$)). Fringe firms with $k \leq \gamma D_2^*$ multihome, firms with $k \in (\gamma D_2^*, \gamma D_1^*])$ singlehome on platform 1 and firms with $k \geq \gamma D_1^*$ zerohome.

It follows that the Superstar profits under exclusivity are:

$$\Pi^S(1,0) = \gamma^S D^*(1,0) + \Pi^*(1,0) - \Pi^*(0,1),$$

whereas her profits under non-exclusivity are:

$$\Pi^S(1,1) = \gamma^S + 2[\Pi^*(1,1) - \Pi^*(0,1)] = \gamma^S + 2[\Pi^*(1,1) - \Pi^*(0,1)].$$

It easy to note that non-exclusivity occurs if, and only if, $\Pi^S(1,1) > \Pi^S(1,0)$. This allows us to conclude the following.

Proposition 2. *There exists a cutoff*

$$\tilde{\gamma}^S = \frac{\Pi^*(1,0) + \Pi^*(0,1) - 2\Pi^*(1,1)}{1 - D^*(1,0)}$$

such that non-exclusive contracts are chosen in equilibrium if, and only if, $\gamma^S \geq \tilde{\gamma}^S$. Else, an exclusive contract is chosen.

When the Superstar offers an exclusive contract, two forces are at stake. First, a *rent extraction effect*, which is captured by the numerator of $\tilde{\gamma}^S$. This simply represents the difference between the tariffs collected under the two regimes, *i.e.,* $T_1^*(1,0) - 2T_1^*(1,1)$. Second, a *competition effect*, which results from the demand expansion of the customer base of the *favored* platform. This is captured by the denominator of $\tilde{\gamma}^S$. Such an effect gets stronger as the degree of differentiation between platforms decreases. When competition is very intense, consumers are more responsive to the presence of the Superstar, which therefore increases $D^*(1,0)$. In turn, as $D^*(1,0)$ increases, the denominator of $\tilde{\gamma}$ shrinks, thereby expanding the space in which exclusivity exists.

Differently, when γ^S is sufficiently large, the Superstar highly benefits from the interactions with consumers. Indeed, the Superstar finds it optimal to sign a non-exclusive contract with both platforms. This way, she can reach the entire market and gains from indirect network externalities outweigh any rent extraction effect.

In the following corollary, we show how the value generated by the Superstar affects the already discussed critical cutoff $\tilde{\gamma}^S$.

Corollary 1. *Exclusivity becomes more likely the larger the network externalities and the value generated by the Superstar.*

$$\frac{\partial \tilde{\gamma}^S}{\partial \theta} > 0, \quad \frac{\partial \tilde{\gamma}^S}{\partial \gamma} > 0, \quad \frac{\partial \tilde{\gamma}^S}{\partial \phi} > .0$$

Proof. See Appendix A.4. □

The above corollary states that when the Superstar brings about value to consumers, then the latter are more responsive to it, and many migrate from one platform to another, *ceteris paribus*. A similar result also applies due to an increase in cross-group network externalities. For instance, the stronger the benefit for consumers from the presence of fringe firms, the more significant is the asymmetry between platforms, and the higher the number of fringe firms joining the *favored* platform exclusively. Hence, the rent extraction and competition effects are larger and this drives the critical value $\tilde{\gamma}^S$ up, thereby making exclusivity more likely.

5.3. Welfare Analysis

In what follows, we show how the contractual choice of the Superstar impacts on the surplus of fringe firms and consumers.

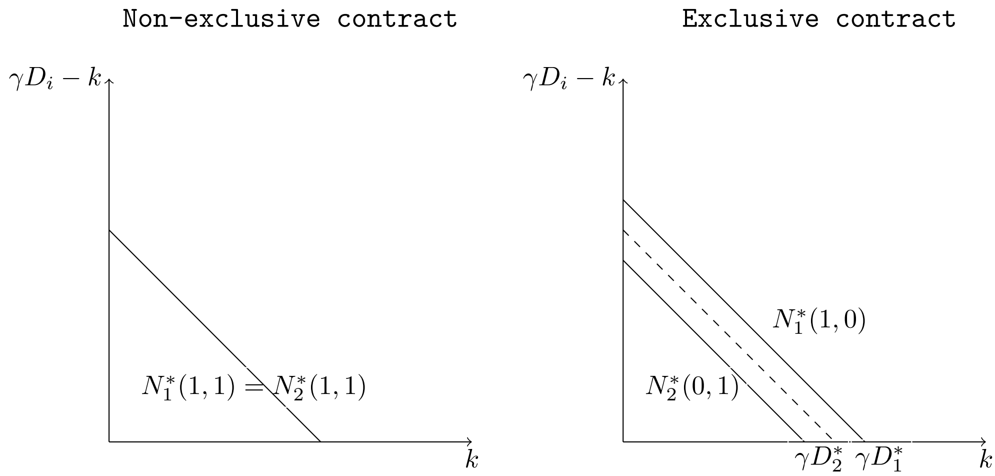

Figure 4: Profit Surplus on the Fringe

The figure depicts the surplus on the fringe side of the market under both regimes. The exclusive case always achieves higher total surplus.

Impact on Fringe Firms. When the Superstar is either absent or offers a non-exclusive contract, welfare of small firms is unchanged due to the symmetry of platforms. In contrast, when exclusivity emerges, the mass and the homing decision of the active fringe firms change accordingly. This is because the Superstar grants to the *favored* platform an advantage in terms of market reach and some firms find it optimal to join that platform only or to switch. By comparing the surplus of the fringe under the two regimes, we state the following.

Proposition 3. *The fringe firms' surplus is higher under an exclusive contract than under non-exclusive contracts.*

Proof. See Appendix A.5. □

The result in Proposition 3 is determined by the gains enjoyed by the zerohomers and multihomers who become singlehomers. It suggests that those small firms (*e.g.,* emerging artists, startups, retailers) with sufficiently high costs and who otherwise would have struggled to be active on the market should welcome Superstar exclusivity. This result can also be explained graphically as in Figure 4, which plots the surplus of each firm according to their outside option. The triangles represent the mass of active firms in each platform. Moving from the case of non-exclusivity (left panel) to the case of exclusivity (right panel), the intercept increases for firms on platform 1 and decreases for firms in platform 2. The net effect is positive. Note also the fact that small firms may benefit from the presence of superstars is also empirically supported by Ershov (2018), who shows demand-discovery spillovers on small developers of apps.

Impact on Consumers' Surplus. In what follows, we present the effect that exclusivity has on consumer surplus.

Denote $\Delta CS = CS(1,0) - CS(1,1)$ the net gain (loss) from exclusivity in platform 1, where $CS(1,0)$ and $CS(1,1)$ represent the consumer surplus under exclusivity and non-exclusivity, respectively. Direct computation is reported in the Appendix. After some arithmetic manipulation, we have the following expression:

$$\Delta CS = \underbrace{\theta[\overline{N} - N^*(1,1)]}_{\Delta \text{ externalities}} - \underbrace{\phi D_2^*(0,1)}_{\text{prevented access}} - \underbrace{[\overline{p} - p^*(1,1)]}_{\Delta \text{ prices}} - \underbrace{\int_0^{m^*} mf(m)dm}_{\text{preference mismatch}}. \tag{5}$$

where $\bar{N} = F(m^*)N_1(1,0) + (1 - F(m^*))N_2(0,1)$ and $\bar{p} = F(m^*)p_1(1,0) + (1 - F(m^*))p_2(0,1)$ are the expected mass of firms and the expected prices under exclusivity, respectively. We can then state the following proposition.

Proposition 4. *Consumers on the favored platform are always better-off under exclusivity, whereas consumers on the unfavored platform are always better-off under non-exclusivity. For sufficiently large indirect network externalities (θ), exclusive contracts are welfare-enhancing.*

Proof. See Appendix A.6. □

There are two opposite forces at stake. On the one hand, consumers joining the *unfavored* platform suffer. This is because the exclusive presence of the Superstar on platform 1 prevents access to the premium product to those consumers affiliating with platform 2. On the other hand, consumers on the *favored* platform benefit from additional surplus. These effects are further amplified by the indirect network externalities.

Equation (5) provides insights on the effects of exclusivity in our setup. One can observe four elements. The first one is about the externalities that the presence of entrant fringe firms generates on consumers. This is higher under exclusivity as consumers on the *favored* platform are exposed to a large variety of firms than under non-exclusivity. More firms become active in the market and follow the Superstar. However, exclusivity also entails three negative effects. These are represented by (i) the prevented access to the Superstar to consumers on the *non-favored* platform; (ii) the increase in the expected price consumers pay; and (iii) the augmented preference mismatch, as there are consumers who inefficiently buy from their less preferred platform.

As (i), (ii), (iii) enter negatively in ΔCS, one can understand the paramount relevance of indirect network externalities in driving up consumer surplus under exclusivity. In the limit case in which consumers do not benefit from the presence of the fringe ($\theta = 0$), the net effect of exclusivity is unambiguously negative. Indeed, it is the presence of indirect network externalities that might create value from exclusivity. What is critical in determining the net effect when $\theta > 0$ is how many consumers the Superstar moves toward the *favored* platform and this depends on the distribution of consumer preferences. If a large mass of consumers is concentrated around zero, the market is very competitive, and then many consumers would follow the Superstar on the *favored* platform. This lowers the extent of the prevented access associated with exclusivity. Moreover, there are also strong network externalities as many firms would follow these consumers, thereby creating additional surplus on this side. One can also notice that as the number of consumers that agglomerate on the *favored* platform increases, then the number of consumers whose access to the Superstar is prevented decreases, rendering exclusivity welfare-enhancing. In this case, as not only fringe firms but also consumers are better-off under exclusivity, an exclusive contract can be regarded as the first-best in the industry. In the Appendix, we provide an example of how consumer surplus changes with exclusivity using a uniform distribution of consumer preferences and fringe firms.

In our model, the Superstar and the fringe firms are not competing for consumer attention. Interestingly, through network externalities, small firms and the Superstar benefit from a form of indirect complementarity. This is consistent with most of the markets this paper considers. However, one may wonder what happens in the presence of negative direct network externalities between the Superstar and the fringe firms, *e.g.,* as a consequence of competition, congestion, or substitutability (see *e.g.,* Karle et al. 2020). Suppose the Superstar can crowd out consumer attention away from fringe firms. This implies that the network benefits of fringe firms from joining the *favored* platform are lowered. Then, for large enough reduction in the network benefits of fringe firms, the presence of exclusive contracts with the *favored* platform would lead some of the fringe firms to join the *unfavored* platform exclusively. This is because, on the *unfavored* platform, they would not be crowded out by the Superstar. As a result, the Superstar has lower incentives to sign an exclusive contract than in our benchmark case and non-exclusive contracts are more likely to lead to fringe firms exit. In turn, this suggests that exclusivity may be welfare-enhancing as compared to non-exclusivity although it will arise less often.

5.4. Vertical Integration

This section aims to understand the impact of a vertical merger (platform-Superstar) in markets with network effects and provide policy-relevant insights. Typically, vertical mergers are viewed with suspicion by policy makers as they might increase the likelihood of anti-competitive conduct by the merged entity. We focus in this article on the input foreclosure theory of harm espoused by the antitrust agencies, and which have been widely discussed by the previous literature (see *e.g.,* Salinger 1988, Ordover et al. 1990, Bourreau et al. 2011 and, for a survey, Rey & Tirole 2007). As in the main model, we focus on a fixed tariff contractual choice, which ensures that our results are not biased by any efficiency gain due to the avoidance of the standard double marginalization problem.

The European Commission, in its merger control, follows the Non-Horizontal Merger Guidelines (NHMG) for assessing a vertical merger. The commission looks at the ability and incentive of a vertically integrated entity to foreclose rivals and the ensuing impact of such a strategy on the effective competition. According to the above guidelines, foreclosure is a concern when the upstream firm *(i)* has a significant degree of market power, *(ii)* is an important supplier of input, *e.g.,* it represents a significant cost factor for the downstream firm (NHMG 2008, para 35), and *(iii)* the merged entity would be able to negatively affect the availability of inputs to its rivals, (NHMG 2008, para 36). In our case, the three conditions are fulfilled by the Superstar. She is bestowed with a significant degree of market power *vis-à-vis* the platforms and her premium product is an important but not indispensable input in the downstream market. Small firms are still active on the non-integrated platform. Moreover, she has the ability to negatively affect the rival by excluding access to this input and triggering consumer and firm agglomeration on the *favored* platform. Thus, according to the NHMG (2008), a vertical merger in our setup presents overwhelming evidence on the ability to (input) foreclose a rival platform.[21] In the following, we discuss the incentives to foreclose a rival when there are network externalities.

Incentive to foreclose. We modify our baseline model as follows. Without loss of generality, let us assume that the Superstar is integrated with platform 1. This merged entity has two alternatives: be the sole distributor of the premium product, or distribute it to the rival, platform 2. In the latter case, the merged entity sets $T_2(g_2)$. The profits of the merged entity are denoted by Π_1^S, which comprise of the revenues made in the downstream market, Π_1, and those made by the Superstar. The latter are the ancillary

[21] The rationale for these incentives is nicely captured by NHMG: *"The incentive to foreclose depends on the degree to which foreclosure would be profitable. The vertically integrated firm will take into account how its supplies of inputs to competitors downstream will affect not only the profits of its upstream division, but also of its downstream division. Essentially, the merged entity faces a trade-off between the profit lost in the upstream market due to a reduction of input sales to (actual or potential) rivals and the profit gain, in the short or longer term, from expanding sales downstream or, as the case may be, being able to raise prices to consumers. (NHMG 2008, para 40, p.7)".*

revenues and the tariff charged to the rival in case of a non-exclusive contract, $T_2(g_2)$. The merged entity can now choose both p_1 and T_2. Formally, the profits of the merged entity are:

$$\Pi_1^S(g_2) = \underbrace{p_1 D_1(g_2)}_{\Pi_1} + \gamma^S (D_1(g_2) + g_2 \cdot D_2(g_2)) + g_2 T_2(g_2).$$

Under exclusivity ($g_2 = 0$), the first-order conditions are:

$$\frac{\partial \Pi_1^S(0)}{\partial p_1} = D_1(0) + p_1(0)\frac{\partial D_1(0)}{\partial p_1} + \underbrace{\gamma^S \frac{\partial D_1(0)}{\partial p_1}}_{\text{Network internalization effect}},$$

where *network internalization effect* represents the main difference between the main model (equation (4)) and this variation in the presence of a merged entity.

We can now state the following lemma.

Lemma 4. *In the exclusive regime, the prices under vertical integration are lower than the prices under vertical separation. If $g_2 = 0$, equilibrium prices are:*

$$\frac{\partial \Pi_1^S(0)}{\partial p_1}|_{p_1^*(1,0)} = \gamma^S \frac{\partial D_1(0)}{\partial p_1}|_{p_1^*(1,0)} < 0.$$

The above lemma provides an interesting result. The merged entity internalizes the benefit that the Superstar obtains when reaching consumers and this exerts downward pressure on prices. This makes the presence of consumers on the platform more valuable than in the case of the vertical separation. Therefore, the merged entity prices more aggressively to attract consumer demand. As prices are strategic complements, also the price of the rival platform falls. One can note that such a downstream pricing externality in the presence of vertical integration is reminiscent of the downstream externality (caused by high investments) in the seminal paper of Bolton & Whinston (1993).

This is a relevant result for antitrust enforcers. The NHMG suggests that under input foreclosure softens downstream competition with resulting higher prices.[22] Against this backdrop, Lemma 4 shows that, when accounting for network externalities γ^S, exclusivity entails a pro-competitive effect for consumers, with lower prices. Note that this reduction in prices is independent of any efficiency gains resulting from the avoidance of the double marginalization problem or any other merger-specific efficiencies. Thus, we can identify that the cause of this price reduction is solely due to the presence of the *network internalization effect* that a platform-Superstar merger in two-sided markets presents.

Under non-exclusivity, instead, market competition follows Section 5: platforms' profits do not react to the presence of a merged entity as the total consumer demand is a constant and does not depend on prices. In turn, the indirect network externality, γ^S, does not play any role. Consistently with the baseline model, the decision to offer a contract to a rival platform hinges upon both the rent extraction and the fierceness of the platform

[22]For instance, the NHMG reports that "*a decision of the merged entity to restrict access to its inputs reduces the competitive pressure exercised on remaining input suppliers, which may allow them to raise the input price they charge to non-integrated downstream competitors* (NHMG 2008, para 38)". As a consequence, final consumer price rises in the market.

competition. Notably, this happens if $\gamma^S \leq \tilde{\gamma}^{vi}$, whereby $\tilde{\gamma}^{vi}$ is implicitly characterized by the following expression:

$$\tilde{\gamma}^{vi} = \frac{\Pi_1^*(0) + \Pi_2^*(0) - 2\Pi^*(1,1)}{1 - D_1(0)}.$$

By comparing the critical values of γ^S, we can state the following proposition.

Proposition 5. *Unless the difference in demand at the favored platform between the vertical merger case and under vertical separation is very large, the merged entity (platform-Superstar) has more incentives to offer non-exclusive contracts than under vertical separation, as $\tilde{\gamma}^{vi} < \tilde{\gamma}$.*

Proof. See Appendix A.7. □

The result in Proposition 5 stems from the increased competitive pressure on prices that indirect network externalities exert under exclusivity. In Appendix A.7, we show that, unless the difference in demand at the favored platform becomes very large, the reduction in price associated to vertical integration dominates the associated increase in demand. This induces the Superstar to opt for non-exclusivity more often.[23]

Importantly, this result contrasts the traditional understanding that vertical mergers increase the risk of input foreclosure. The intuition behind this result is the following. Under exclusivity, the merged entity internalizes the network benefit the Superstar obtains and, hence, lowers its prices relative to the pre-merger case. This price reduction also lowers the price of the rival further reducing its profit in the exclusive deals case relative to the vertical separation case. As a result, rejecting the non-exclusive contract becomes very costly for the *unfavored* platform.

Instead, when non-exclusive contracts arise, prices and profits do not change in the two regimes (*i.e,* vertical merger and vertical separation). Indeed, while $\Pi^*(1,1) = \Pi^*(1)$ does not change, $\Pi_2^*(0)$ decreases relative to $\Pi_2^*(0,1)$, and so the merged entity extracts more from offering a contract to the rival relative to when the Superstar and the platform are independent. This rent extraction arising from the internalization of the network externalities makes non-exclusivity more lucrative relative to vertical separation. This is particularly the case when the difference in demand at the favored platform between a vertical merger and vertical separation is not too large, then the reduction in price is too high due to the network externalities. In this case, then non-exclusive contracts occur more often.

Note that these results apply in the presence of two essential factors, which require due diligence by antitrust enforcers. First, the *identification of indirect network externalities* when defining a market, as these exert competitive pressure on both platforms. Second, *exclusivity should not lead to market tipping* and, indeed, input foreclosure should not prevent the rival platform from attracting consumers and some small firms. Third, absent indirect network externalities there would be no effect of a vertical merger. This is because

[23] Note that the requirement that the demand difference is not too large is not very stringent. Carroni et al. (2019) demonstrate that this happens under a uniform distribution of consumer preferences. Under any distribution $F(\cdot)$ with a higher mass of consumers located around zero, the difference in demand would be smaller.

in our model we only have fixed payments between the platform(s) and the Superstar, and so an increase in final prices would not occur.

5.5. One-sided market vs. Two-sided market

Current theories of harms related to input foreclosure stemming from exclusive dealing and vertical mergers were originated in a framework without indirect network externalities. In this subsection, we compare our main results with those emerging in a traditional one-sided market.

Table 2 presents a summary of the main results when indirect network externalities are absent ($\gamma^S = 0$ and $\theta = 0$) and when present ($\gamma^S > 0$, and $\theta > 0$). The former case characterizes a one-sided market model in which the Superstar acts as an input supplier to either one or both platforms. Fringe firms are absent and the Superstar does not make any ancillary revenues ($\gamma^S = 0$).

First, consider the optimal contracts in Proposition 2. It is immediate to see how much the equilibrium contract choice crucially depends on γ^S. When sufficiently large, a non-exclusive contract drives the platform to reach the entire market as ancillary revenues become prominent. Suppose, instead, $\gamma^S = 0$, and so the Superstar only makes revenues through the contract. It is, then, straightforward to see that $\gamma^S = 0 < \tilde{\gamma}^S$ always. As a result, the Superstar always sets an exclusive contract, through which she can extract all surplus generated by the asymmetry in the market. As a result, the Superstar will never find it optimal to opt for a non-exclusive contract. This case is, hence, out-of-equilibrium. Note also that this result is reminiscent of that of Montes et al. (2019), who found that exclusive contracts always arise in the data broker industry.

Second, consider the welfare impact of exclusive dealing in a traditional framework in which platforms are sole distributors of the Superstar. In this case, as fringe firms are absent, we consider only the effect on consumer surplus. We note that exclusivity entails a higher price than under non-exclusivity. This is also the case in our two-sided market framework. However, the price set on the consumer side is discounted by the strength of the indirect network externalities. In a one-sided market, consumers do not get such a discount and do not enjoy higher surplus due to the entry of additional fringe firms ($\theta = 0$). As a consequence, an exclusive contract turns out to be detrimental to consumers. This result is of paramount relevance for policy-makers and justifies the general reluctance and skepticism associated with exclusive dealing. However, when introducing indirect network externalities, these conclusions might not always be supported.

Third, absent indirect network externalities, our model always leads to exclusivity not only under vertical separation but also under vertical integration. This is because, when $\gamma^S = 0$, downstream profits under vertical integration and vertical separation are the same, so that exclusivity always arises. This is detrimental for consumers as, relative to non-exclusivity, the price charged by the merged entity is higher when choosing exclusivity.

Setting	Contract choice	Impact on FS	Impact on CS	Contract choice with a vertical merger
One-sided market	Exclusive, always	Absent	Negative	Exclusive, always
Two-sided market	Exclusive for $\gamma^S < \tilde{\gamma}^S$	Exclusive increases fringe surplus	Positive if large θ	Exclusive for $\gamma^S < \tilde{\gamma}^{vi}$, with $\tilde{\gamma}^{vi} < \tilde{\gamma}^S$

Table 2: Comparison

For one-sided market, we consider the case in which the firms on the fringe are absent and the Superstar and consumers do not benefit from positive indirect network externalities when interacting with consumers ($\theta, \gamma^S = 0$). For two-sided market, we refer to the case in which firms on the fringe are present, consumers and the Superstar benefit from indirect network externalities ($\theta, \gamma^S > 0$). FS stands for the total surplus for fringe firms. CS stands for total consumer surplus.

6. Discussion

The above results are robust to more complex scenarios. We now discuss several alternative model specifications and relax those assumptions which may seem too stringent. First, we discuss the coordination problem, which is typical of two-sided markets. Then, we introduce the presence of multihoming consumers, followed by a variation of the model with two Superstars. Next, we argue that our results do not change when accounting for an elastic demand function with differentiated platforms. Finally, we also discuss how the trade-off holds when platforms set a price to both sides of the market.

6.1. Coordination Problem

The scenario proposed so far is also well suited to explain the contractual decisions of a Superstar entering a market in which there are already inherited and symmetric market shares. In the latter case, exclusive dealing would stimulate switching decisions on the *favored* platform. As in any model with network externalities (*e.g.,* Caillaud & Jullien 2003, Hagiu 2006, Damiano & Li 2007, Jullien 2011, Markovich & Yehezkel 2019, Biglaiser & Crémer 2020), this also entails a coordination problem.

Throughout the paper, we select an equilibrium compatible with sequential decisions as in Hagiu (2006). In such a setup, the typical "chicken-egg" problem is solved by letting sellers (fringe firms) move earlier than buyers, reducing the coordination problem to the sole decision of the "chicken". As discussed by Hagiu (2006), such a framework well suits most software and videogame platforms wherein developers and game sellers join platforms before buyers, for example, for technological reasons such as product development.

To go deeper in the coordination issues that can arise in the presence of simultaneous moves on both sides, one shall note that if consumers believe that a sufficiently large number of other consumers and firms will follow the Superstar, then the market can eventually tip. For instance, a device to solve this coordination problem is grouping homogeneous users as in Markovich & Yehezkel (2019). This would help an efficient platform to drive a less efficient focal rival out of the market.[24] In our framework, the pivotal agent is the Superstar, which is on the firm side of the market.

As coordination issues are relevant for their policy implications in the presence of market tipping, in what follows, we discuss the impact of exclusivity on welfare in the limit case the *favored* platform conquers (almost) the entire market. To see how, it is useful to consider the limit of consumer welfare when the cutoff m^* is very close to the upper bound of the distribution. In this case, all consumers patronize the *favored* platform, further entailing more entry of fringe firms.

When this is the case $F(m^*) = 1$, and so $D_2^*(0,1) = 0$, $\bar{N} = 1 \times N_1(1,0) = \Lambda(\gamma \cdot 1)$ and $\bar{p} = 1 \times p_1(1,0)$. As $N^*(1,1) = \Lambda(\gamma/2)$, then the expression in (5) - the difference in consumer surplus with exclusivity as compared to a situation of non-exclusivity - becomes equal to:

$$\Delta CS_{m^* \to \overline{m}} = \theta[\Lambda(\gamma \cdot 1) - \Lambda(\gamma/2)] - [p_1^*(1,0) - p^*(1,1)] - \int_0^{\overline{m}} mf(m)dm.$$

Using prices in Lemma 1 and 2, we then have:

$$\Delta CS_{m^* \to \overline{m}} = \theta[\Lambda(\gamma) - \Lambda(\gamma/2)] + \gamma\theta[\lambda(\gamma) - \lambda(\gamma/2)] - [\frac{1}{f(\overline{m})} - \frac{1}{2f(0)}] - \int_0^{\overline{m}} mf(m)dm.$$

One can easily see the same trade-off as in the benchmark model without market tipping applies. The first term is positive and captures the consumer benefit from the agglomeration of fringe firms on one platform. The second term is positive too, and captures the price-reducing effect of network externalities. The third and fourth terms represent the consumer loss due to market tipping. Specifically, the third term relates to the direct effect on prices (via consumer preferences), while the fourth is the preference mismatch (which is at its highest level).

In turn, the above result suggests that a tipping scenario towards the *favored* platform may eventually lead to efficiency gains in terms of indirect network effects. On the negative side, however, consumers may bear the high costs of preference mismatch and the higher direct effect on prices. As the network externalities get more substantial, the efficiency gains from market tipping outweigh the consumer welfare losses and, hence, exclusivity can be welfare-enhancing. Clearly, this represents an extreme case in which (almost) market tipping - while keeping the market structure unchanged - arises with a high price under exclusivity.

6.2. Asymmetric Platforms

In the benchmark model, we assumed ex-ante symmetric platforms and we considered the incentives for the Superstar to join either one or both. In the real-world, however, platforms can be ex-ante asymmetric. This is particularly relevant when considering the competition between an incumbent and an entrant platform. To provide some insights

[24]The concept of focality is used to model favorable beliefs for a platform in the market. Halaburda & Yehezkel (2013) propose a model in which sellers and buyers are uncertain about the value of new technology and one competing platform enjoys favorable beliefs as compared to the rival.

on how our results would fit this market configuration, let us consider an asymmetric inherited market, in which some consumers were not joining their preferred platform if everything else was symmetric. In this case, the Superstar faces three choices.

First, she can offer a non-exclusive contract and join both platforms. In this case, patterns of platform dominance would not change in response to the decision of the Superstar and the market would remain asymmetric.

Second, the Superstar has the option to join the incumbent and, in the limit, lead to market tipping. Alike a non-exclusive contract, the Superstar can ensure the largest market reach but she can extract surplus from the competitive edge granted to the dominant platform in terms of agglomeration of consumers and small firms. Notably, this exclusive contract might be considered anti-competitive as changing the market structure.

Third, if the Superstar is exclusive on the small platform, our problem resembles that of Markovich & Yehezkel (2019) but with heterogeneous consumers. Heterogeneity implies that the Superstar might be able to overturn market dominance but would hardly generate market tipping. In comparison with the second case, although the Superstar does not reach all consumers, she can extract a higher surplus with the exclusive contract, because the mass of migrating consumers is more important. Notably, this contractual choice would be pro-competitive for the economy. Such an effect would be similar to what discussed by Lee (2013), in which exclusive contracts in the videogame industry helped entrants to gain market shares and foster competition.

Indeed, the decision of the Superstar will be determined on the basis of the trade-off between market reach and rent extraction and, differently from our baseline model, exclusivity on the dominant (entrant) platform leads to smaller (larger) rent extraction.

6.3. Two Superstars

An interesting extension of our benchmark model relates to the contracting decisions of multiple Superstars. Let us first discuss the case in which the Superstars make their decision simultaneously. In this case, the presence of multiple Superstars reduces the surplus they can extract as the marginal value they create on a platform is now reduced. In turn, this puts a platform in a better position *vis-à-vis* the Superstar(s).

For simplicity, let us consider two Superstars denoted by $S \in \{A, B\}$, each providing consumers with additional value of ϕ_S. The contractual setup is the same as in the main model and its microfoundation provided in Appendix B.1. This may lead to nine possible market outcomes, as described by the table below (Table 3), where i, j identifies the platform(s) with which the contract is struck.

From a direct comparison of profits in the different scenarios, we can state the following lemma.

Lemma 5. *Given that a Superstar S' signs an exclusive contract with platform i, Superstar S never signs an exclusive contract with platform $j \neq i$.*

Proof. See Appendix A.8. □

To grasp the intuition, consider the optimal response of B given the choice of A. If A signs an exclusive contract with platform 1, B can either opt for a non-exclusive deal or

		B		
		i	j	ij
A	i	$(\Pi_A^{i,i}, \Pi_B^{i,i})$	$(\Pi_A^{i,j}, \Pi_B^{i,j})$	$(\Pi_A^{i,ij}, \Pi_B^{i,ij})$
	j	$(\Pi_A^{j,i}, \Pi_B^{j,i})$	$(\Pi_A^{j,j}, \Pi_B^{j,j})$	$(\Pi_A^{j,ij}, \Pi_B^{j,ij})$
	ij	$(\Pi_A^{ij,i}, \Pi_B^{ij,i})$	$(\Pi_A^{ij,j}, \Pi_B^{ij,j})$	$(\Pi_A^{ij,ij}, \Pi_B^{ij,ij})$

Table 3: Superstar profits

sign an exclusive contract with the platform winning the auction. Lemma 5 tells that if the auction was run by Superstar B is won by platform 2, then the optimal strategy of Superstar B is always to be available non-exclusively on both platforms. This is because the reduction of asymmetries makes the surplus to be extracted sufficiently low, thereby rendering this alternative dominated by non-exclusivity. To see why, consider that the gain from the presence of B on platform 2, ϕ_B, is directly pitted against ϕ_A when consumers choose between platforms. As a result, the market outcome is consistent with that in our primary model, depicting a trade-off between rent extraction and large customer reach.

Proposition 6. *In the presence of two Superstars making simultaneous choices, the equilibrium contract choices are symmetric. Specifically,*

1. *when* $\gamma^S < \tilde{\gamma}^S_{AB} \equiv \max\{\tilde{\gamma}^S_B, \tilde{\gamma}^S_A\}$, *there exist two Nash equilibria in which both Superstars sign an exclusive contract with the same platform;*
2. *when* $\gamma^S > \hat{\gamma}^S_{AB} \equiv \min\{\hat{\gamma}^S_A, \hat{\gamma}^S_B\}$, *there exists an equilibrium in which both Superstars are available non-exclusively.*

Proof. See Appendix A.8. □

Proposition 6 shows that for a large γ^S, the Superstars' equilibrium choice is to reach the entire audience. For a sufficiently small γ^S, instead, platform competition and the rent extraction effect are sufficiently intense. As such, exclusivity on the same platform denotes the optimal decision. The highlighted mechanism is reminiscent of what presented in Proposition 2.

These results present a scenario in which Superstars' decisions are self-reinforcing. A lack of coordination would harm them by neutralizing the externalities they create in the market. Note that as the number of Superstars increases, the platforms are better off because of a coordination problem. If Superstars were able to coordinate and behave like common entity (*e.g.,* a label in the music industry), then the latter would be able to extract and share all the value created. However, because Superstars make simultaneous choices, each Superstar only collects her marginal value created conditional on the other Superstar's decision. This marginal value decreases in the number of Superstars and this results from the indirect competition between Superstars that are otherwise independent in their own decision.

Our model can only partially reproduce the reality, in which often different Superstars opt for exclusive deals with different platforms. In our setup, platforms are considered ex-ante symmetric. In the real world, exclusivity decisions are made sequentially and, thus, platforms are inherently asymmetric at any point in time. As a consequence, it can well be that the value that the second Superstar creates to the disadvantaged platform is higher than the one designed to the *favored*, as already discussed in Section 6.2. Moreover, this would be in line with situations in which a Superstar decides to bet on the future growth of a platform which is not currently the market leader (*e.g.,* Superstar artists moving to Apple Music).

6.4. Multihoming Consumers

In most markets, consumer multihoming is quite common, and platforms have overlapping market shares. However, if the same consumers and firms are on the same platform, the previous equilibrium contract choices might not survive: a non-exclusive contract might turn out being more likely as, when consumers multihome, their switching behavior gets less relevant for both platforms and fringe firms.[25] In this section, we provide an analysis of this case and show that results are not so straightforward.

In this variation, we characterize the utility, u^m, of a multihoming consumer as follows:

$$u^m = v + \phi \max\{g_1, g_2\} + \theta \max\{N_1, N_2\} - (p_1 + p_2). \tag{6}$$

Note that when consumers multihome, there is no longer a preference mismatch ($m = 0$). This is because they receive an extra-value for going to their preferred platform that adequately compensates the cost of going to the rival one. Moreover, we assume that the benefit of consumer joining a platform, v, is only obtained once and not duplicated. The same happens when interacting with the same firms or with the Superstar. This implies having access to $\max\{N_1, N_2\}$ firms.[26]

Thus, consumers' decision is between multihoming and singlehoming. Regardless of the Superstar's exclusivity, consumers make their decision based on their preference $m/2$. When they affiliate to their preferred platform, $m/2$ is a benefit rather than the cost, and its absolute value enters positively in the utility function. Therefore, we compare u_1 to u^M for any $m < 0$ and u_2 to u^M for any $m > 0$. It follows that an agent with a relative preference to platform i is never indifferent between joining platform j and multihoming. This implies that $u_1 > u^M$ when

$$m < m_1^*(g_1, g_2) := 2(\phi \min\{0, g_1 - g_2\} + \theta \min\{N_1 - N_2, 0\} + p_2), \tag{7}$$

[25] This is also discussed by recent studies, in which multiple interactions with the same consumers generate decreasing returns for the opposite side of the market, where there are advertisers, content providers, or sellers (Ambrus et al. 2016, Athey et al. 2016, Calvano & Polo 2020, D'Annunzio & Russo 2019, Anderson et al. 2018). Multihoming on both the consumer and content provider side is also discussed by Choi (2010), Choi et al. (2017).

[26] This is a plausible assumption as consumers do not benefit differently from interacting with the same firms twice. However, when considering a less restrictive case, in which multihoming potentially gives rise to as much as 2ϕ and $2\min\{N_1, N_2\}$, this will only be a scale effect on the utilities and will not change qualitatively results and intuitions.

and, similarly, $u_2 > u^M$ when

$$m > m_2^*(g_2, g_1) := 2(\phi \max\{0, g_1 - g_2\} + \theta \max\{N_1 - N_2, 0\} - p_1). \tag{8}$$

The total demand for platform 1 is $D_1 = F(m_2^*)$, and this is constituted of $D_1^{sh} = F(m_1^*)$ singlehomers, whereas the remaining consumers multihome. In the same manner, we determine the total demand of platform 2, which is $D_2 = 1 - F(m_1^*)$, of which $D_2^{sh} = 1 - F(m_2^*)$ is the demand from singlehoming consumers.

Note that the demand for a platform does not change when moving from the situation of non-exclusivity to that of exclusivity on the rival platform. Indeed, the demand for platform i is determined by the decision of the consumer indifferent between multihoming and singlehoming on the rival. The latter is not affected by the presence of the Superstar, which is guaranteed in both options. What changes, instead, is the demand of the rival platform, as multihoming always guarantees access to the Superstar, whereas singlehoming ensures it only in the case of non-exclusivity.

To fix ideas, consider a situation in which the Superstar opts for non-exclusivity ($g_1 = g_2$) and a symmetric scenario in which $N_1 = N_2$. Then, the two cutoffs m_1^* and m_2^* depend only on prices, as they boil down to:

$$m_1^*(1,1) = 2p_2 \text{ and } m_2^*(1,1) = -2p_1. \tag{9}$$

Now, consider the case in which the Superstar goes exclusively on 1 (*i.e.*, $g_1 = 1$ and $g_2 = 0$) and, consequently, $N_1 > N_2$. Plugging them into the critical values, we finally obtain:

$$m_1^*(1,0) = 2p_2 \text{ and } m_2^*(0,1) = 2(\phi + \theta(N_1 - N_2) - p_1). \tag{10}$$

This determines the following result.

Proposition 7. *There exists a cutoff*

$$\tilde{\gamma}^M = \frac{\Pi_1^{M*}(1,0) - \Pi_1^{M*}(0,1)}{1 - D_1^M(1,0)}$$

such that non-exclusive contracts are chosen in equilibrium if, and only if, $\gamma^S \geq \tilde{\gamma}^M$. *Else, exclusive contracts are chosen.*

Proof. See Appendix A.9. □

Proposition 7 shows that the central insights of the baseline model also hold when consumers multihome. In this case, however, the fact that the Superstar goes exclusively on platform i only affects the consumer choice between multihoming and singlehoming on platform j. This is a relevant difference relative to the baseline model. Platform i has less incentive to accept an exclusive contract as the resulting gain generates less demand expansion making the threat of exclusivity with the rival less severe. However, under non-exclusivity, the threat of exclusivity with the rival is absent. To this end, the non-exclusive agreement must be reached for free. These two forces go towards opposite directions and the cutoff under which exclusive dealing arises moves accordingly.

6.5. Elastic Demand and Partial Market Coverage

In our model, we assume full market coverage. However, the possibility to expand the total demand, through a reduction in price or by increasing consumer utility, clearly results into a larger consumer surplus. In the baseline model, which represents a generalized Hotelling setup, this is not possible. In this subsection, we discuss how our results go through in a model with demand expansion.

Suppose that the Superstar signs an exclusive contract with platform 1. The latter has an edge over its rival and can charge a higher price $p_1(1,0)$. However, as the price differential $p_1(1,0)-p_2(0,1)$ is smaller than the surplus generated by the Superstar, there is a demand expansion relative to when a non-exclusive contract is signed. In a model with elastic demand, this also implies an expansion of the aggregate market demand, which further increases the magnitude of the surplus generation on the other side of the market.

Suppose, instead, that the Superstar offers a non-exclusive contract to both platforms. Unlike our baseline model in which the price with a non-exclusive contract is the same as in the absence of the Superstar, in a model with elastic demand this is not the case. The reason is that the Superstar creates a demand expansion and a subsequent increase in the equilibrium prices. However, in the non-exclusive case the price increase is constrained due to competition between the two platforms, whereas this constraint is less important with exclusive contracts.

As there is a demand expansion in both contractual arrangements, the choice of the Superstar would be again based on the trade-off between the access to the largest possible audience and the rent extraction associated with exclusivity. This suggests that our main insights are qualitatively similar also when relaxing the full market coverage assumption.

6.6. Two-sided Pricing

In most cases, platforms set a price on both sides of the market. In the music industry, artists are remunerated by platforms like Spotify and Tidal. In the app market, developers pay an annual fee to have their account, and so in many other markets. In what follows, we consider a scenario in which platform i sets a duple of prices $\{l_i, p_i\}$ to maximize profits, where p_i is the price set on the consumer side and l_i is the one on the fringe.

To shed some light in this respect, we make an example with uniform distributions of functions $F(\cdot)$ and $\Lambda(\cdot)$. We focus on the case in which consumers pay a positive price, whereas the price on the fringe can either be positive or negative depending on the relative size of indirect network externalities. Even though these firms are now influenced by the price/subsidy when joining the market, the Superstar's decision remains affected only by the fierceness of the downstream competition, namely how many consumers the Superstar can move. When ancillary revenues on the fringe are small relative to consumers' indirect network externalities, small firms are subsidized ($l_i < 0$) for the externality they create. Under exclusivity, the response of any small firm to additional consumer switching from the *unfavored* to the *favored* platform is less reactive. So, the *favored* platform subsidizes the fringe even more. In the opposite case, consumers are more valuable for the fringe. As a result, the platform extracts more surplus by charging them a higher price under exclusivity.

Hence, exclusivity entails a direct effect on the consumer side and an indirect one on the fringe. By subsidizing or charging the latter, the platform mainly manages the size of the feedback effect due to indirect network externalities. The direct effect on the consumer side instead continues to only hinge upon platform differentiation. So, exclusivity emerges in equilibrium when consumers are more responsive, and non-exclusivity emerges otherwise. For details, see Appendix A.10.

7. Concluding Remarks

Exclusive contracts are commonly observed in different markets. This article studies the rationale behind the emergence of these contracts in markets with network externalities and the potential anti- or pro-competitive effects of such choices.

We find that exclusivity emerges as a profitable contractual choice when platform competition is more severe because consumers are very responsive to the presence of the Superstar. This effect is further magnified by the two-sidedness of the market as the *favored* platform becomes more appealing for a large mass of firms, with some zerohomers and multihomers becoming singlehomers. These results are robust to several extensions and variations and allow for a comparison of market interactions in the presence and the absence of indirect network externalities.

There is supportive evidence of spillover effects created by top-rated agents on small firms in different industries. In the music industry, the presence of Superstars can generate positive and remunerative spillovers on small artists in the form of content discovery through playlists. In the same vein, the mobile app market can be exposed to the positive spillover generated by the Superstars. For instance, Ershov (2018) provides evidence of demand-discovery and entry of new developers triggered by Superstar apps. While these spillovers highlight the role of superstars, exclusivity in this market is rare. In light of our model, this may depend on a strong differentiation between Google Play and Apple Store. More related to our model's testable implications, in the e-sport market, exclusive contracts with Superstars helped platforms gain market shares agglomerating both viewers and streamers. Specifically, anecdotal evidence shows that when Richard Tyler Blevins (a.k.a. Ninja) left Twitch for a very lucrative exclusive contract with Mixer, the latter experienced a boost in its app downloads and other streamers (such as Michael Grzesiek, a.k.a. Shroud) moved to Mixer as well. However, this was not sufficient to make Mixer become a dominant platform as it was shut-down in June 2020.

Testable implications are also provided in other sectors and industries. In the supply-chain industry, an agent offering patent rights for a technology that enhances consumer experience may either sign an exclusive licensing contract or non-exclusive licensing contracts. We conjecture that the manufacturer winning the exclusive right would attract more consumers as well as a larger cluster of ancillary suppliers to that product. This may result in cheaper production costs enhancing further a manufacturing firm's market power *vis-à-vis* the rival. The contractual choice will again depend on the possibility for the Superstar to extract surplus and generate sufficient demand expansion.

In the same vein, this article can also provide insights into the cloud platform market with open-source developers. This market features the co-existence of large firms (*e.g.,* VMware and Red Hat) and smaller open-source software developers. We conjecture that an exclusive deal between a big player and one clouding platform (*e.g.,* Amazon, IBM) may induce more small developers to offer exclusives as well.

Finally, we observe that our model can be suitable to explain the recent dynamics in the economics job market where the European Economic Association (EEA) and the Allied Social Science Association (ASSA) allow interactions between job market candidates and recruiters. In 2019, the most prestigious European departments (*e.g., Bocconi, EUI, LSE, Oxford, Pompeu Fabra, TSE*) announced to recruit only in the European job market. Although there were no monetary agreements between these universities and the founders of the EJM - European economic Job Market, after the announcement of the even, other departments followed suit announcing to recruit only in the EJM (*e.g., Bristol, Edinburgh*) and no longer in both. Using our framework, we might conjecture that some (European) candidates joined the EJM only and more departments, previously not participating in the market, joined the EJM as now having the possibility to meet more candidates in that occasion.

Policy Implications. This article yields several policy implications for markets characterized by (positive) indirect network externalities. These are discussed below.

Policy Implication no.1: Theory of harm needs adaptation to two-sided markets. Indirect network externalities do matter. Our results suggest that exclusive dealing between a premium agent and platform(s) is not necessarily bad for welfare. Because of network effects, an exclusive contract might become the first-best choice in the industry, thereby creating value for fringe firms and final consumers. These results, hence, suggest that antitrust enforcers should be cautious when applying traditional one-sided theories of harm not initially designed for two-sided markets. Instead, we suggest that policymakers should strongly consider the impact of indirect network externalities. Our results only hold in the presence of competition in the platform market.

Policy Implication no.2: Banning exclusive dealing may lead to unintended effects. Policy measures leading to a ban on exclusive dealing are undoubtedly detrimental to fringe firms who benefit from positive spillover of exclusivity from large firms. Potentially, consumers might be negatively impacted by a ban on exclusive contracts. Our results recommend policymakers to be circumspect when trying to correct for the apparent harm caused by exclusive contracts.

Policy Implication no.3: Competition drives exclusivity. Our results suggest that exclusive dealing in two-sided markets does not necessarily have an anti-competitive motive. Instead, the motive may be to create efficiencies: attracting consumers to the Superstar's exclusive presence, enabling a surplus to be extracted by the Superstar with an exclusive contract. Thus, policies devoted to sustaining fiercer competition in the market may strike with eventual policy goals of limiting the extent of exclusive arrangements. For instance, facilitating switching behaviors, through data portability or removing switching costs, eventually may increase competitive pressure by lowering consumer attachment to their preferred platform and, in turn, lead to more exclusivity.

Policy Implication no.4: Due diligence when assessing vertical mergers with network

effect.
Traditional theory associates two potential harmful effects of vertical mergers on the competition. First, a vertical merger increases the likelihood of anti-competitive conducts, such as input foreclosure. Second, when input foreclosure occurs, consumer prices are expected to increase. These concerns are discussed in the NHMG of the European Commission. In contrast, this work shows that, when network effects are at stake, the opposite holds. First, input foreclosure (through exclusive supply) is likely to be lower under vertical integration than under vertical separation. Second, if input foreclosure (exclusive contracts) occurs, consumer prices are lower than under vertical separation as the merged entity internalizes the network effect of the Superstar. These findings are in direct conflict with the current understanding based on traditional theory originated in one-sided markets and suggest that policymakers should conduct due diligence when assessing mergers with indirect network effects. Remarkably, these results are sensitive to the existence of market competition. When scrutinizing vertical mergers in markets with network effects, policymakers should ensure that the competition remains sustainable and market tipping is ruled out. Specifically, if vertical integration or exclusivity leads the market to tip, the outcome would be identical to that of foreclosure and should be deemed as anti-competitive. In this, the presence of multiple non-integrated Superstars might create sufficient competitive pressure on the merged entity.

References

Abito, J. M. & Wright, J. (2008), 'Exclusive dealing with imperfect downstream competition', *International Journal of Industrial Organization* **26**(1), 227–246.

Adachi, T. & Tremblay, M. J. (2019), 'Bargaining in two-sided markets', *Available at SSRN 3388383* .

Aghion, P. & Bolton, P. (1987), 'Contracts as a barrier to entry', *American Economic Review* **77**(3), 388–401.

Ambrus, A., Calvano, E. & Reisinger, M. (2016), 'Either or both competition: A" two-sided" theory of advertising with overlapping viewerships', *American Economic Journal: Microeconomics* **8**(3), 189–222.

Anderson, S. P., Foros, Ø. & Kind, H. J. (2018), 'Competition for advertisers and for viewers in media markets', *The Economic Journal* **128**(608), 34–54.

APA (2019), 'Annual Sales Survey. Audio Publishers Association'.

Armstrong, M. (1999), 'Competition in the pay-tv market', *Journal of the Japanese and International Economies* **13**(4), 257–280.

Armstrong, M. (2006), 'Competition in two-sided markets', *The RAND Journal of Economics* **37**(3), 668–691.

Armstrong, M. & Wright, J. (2007), 'Two-sided markets, competitive bottlenecks and exclusive contracts', *Economic Theory* **32**(2), 353–380.

Athey, S., Calvano, E. & Gans, J. S. (2016), 'The impact of consumer multi-homing on advertising markets and media competition', *Management Science* **64**(4), 1574–1590.

Belleflamme, P. & Peitz, M. (2019), 'Platform competition: Who benefits from multihoming?', *International Journal of Industrial Organization* **64**, 1–26.

Bernheim, B. D. & Whinston, M. D. (1998), 'Incomplete contracts and strategic ambiguity', *American Economic Review* pp. 902–932.

Biglaiser, G., Calvano, E. & Crémer, J. (2019), 'Incumbency advantage and its value', *Journal of Economics & Management Strategy* **28**(1), 41–48.

Biglaiser, G. & Crémer, J. (2020), 'The value of incumbency when platforms face heterogeneous customers', *American Economic Journal: Microeconomics. Forthcoming* .

Bolton, P. & Whinston, M. D. (1993), 'Incomplete contracts, vertical integration, and supply assurance', *The Review of Economic Studies* **60**(1), 121–148.

Bourreau, M., Hombert, J., Pouyet, J. & Schutz, N. (2011), 'Upstream competition between vertically integrated firms', *The Journal of Industrial Economics* **59**(4), 677–713.

Caillaud, B. & Jullien, B. (2003), 'Chicken & egg: Competition among intermediation service providers', *RAND Journal of Economics* pp. 309–328.

Calvano, E. & Polo, M. (2020), 'Strategic differentiation by business models: Free-to-air and pay-tv', *The Economic Journal* **130**(625), 50–64.

Carroni, E., Madio, L. & Shekhar, S. (2019), 'Superstars in two-sided markets: exclusives or not?', *CESifo Working Papers No. 7853* .

Choi, J. P. (2010), 'Tying in two-sided markets with multi-homing', *The Journal of Industrial Economics* **58**(3), 607–626.

Choi, J. P., Jullien, B. & Lefouili, Y. (2017), 'Tying in two-sided markets with multihoming: Corrigendum and comment', *The Journal of Industrial Economics* **65**(4), 872–886.

Damiano, E. & Li, H. (2007), 'Price discrimination and efficient matching', *Economic Theory* **30**(2), 243–263.

D'Annunzio, A. (2017), 'Vertical integration in the tv market: Exclusive provision and program quality', *International Journal of Industrial Organization* **53**, 114–144.

D'Annunzio, A. & Russo, A. (2019), 'Ad networks, consumer tracking, and privacy', *Management Science, Forthcoming* .

De Meza, D. & Selvaggi, M. (2007), 'Exclusive contracts foster relationship-specific investment', *The RAND Journal of Economics* **38**(1), 85–97.

Doganoglu, T. & Wright, J. (2010), 'Exclusive dealing with network effects', *International Journal of Industrial Organization* **28**(2), 145–154.

Ershov, D. (2018), 'Competing with superstars in the mobile app market', *NET Institute Working Paper* .

Fudenberg, D. & Tirole, J. (2000), 'Customer poaching and brand switching', *RAND Journal of Economics* pp. 634–657.

Fumagalli, C. & Motta, M. (2006), 'Exclusive dealing and entry, when buyers compete', *American Economic Review* **96**(3), 785–795.

Fumagalli, C., Motta, M. & Persson, L. (2009), 'On the anticompetitive effect of exclusive dealing when entry by merger is possible', *The Journal of Industrial Economics* **57**(4), 785–811.

Fumagalli, C., Motta, M. & Rønde, T. (2012), 'Exclusive dealing: investment promotion may facilitate inefficient foreclosure', *The Journal of Industrial Economics* **60**(4), 599–608.

Gould, E. D., Pashigian, B. P. & Prendergast, C. J. (2005), 'Contracts, externalities, and incentives in shopping malls', *Review of Economics and Statistics* **87**(3), 411–422.

Hagiu, A. (2006), 'Pricing and commitment by two-sided platforms', *The RAND Journal of Economics* **37**(3), 720–737.

Hagiu, A. & Lee, R. S. (2011), 'Exclusivity and control', *Journal of Economics & Management Strategy* **20**(3), 679–708.

Halaburda, H. & Yehezkel, Y. (2013), 'Platform competition under asymmetric information', *American Economic Journal: Microeconomics* **5**(3), 22–68.

IFPI (2019), 'Ifpi global music report 2019. state of the industry'.

Innes, R. & Sexton, R. J. (1994), 'Strategic buyers and exclusionary contracts', *The American Economic Review* pp. 566–584.

Ishihara, A. & Oki, R. (2017), 'Exclusive content in two-sided markets', *Mimeo* .

Jehiel, P. & Moldovanu, B. (2000), 'Auctions with downstream interaction among buyers', *The RAND Journal of Economics* pp. 768–791.

Johnen, J. & Somogyi, R. (2019), 'Deceptive products on platforms', *NET Institute Working Papers* .

Jullien, B. (2011), 'Competition in multi-sided markets: Divide and conquer', *American Economic Journal: Microeconomics* **3**(4), 186–220.

Karle, H., Peitz, M. & Reisinger, M. (2020), 'Segmentation versus agglomeration: Competition between platforms with competitive sellers', *Journal of Political Economy* **128**(6).

Kourandi, F., Krämer, J. & Valletti, T. (2015), ‘Net neutrality, exclusivity contracts, and internet fragmentation’, *Information Systems Research* **26**(2), 320–338.

Lee, R. S. (2013), ‘Vertical integration and exclusivity in platform and two-sided markets’, *American Economic Review* **103**(7), 2960–3000.

Lee, R. S. (2014), ‘Competing platforms’, *Journal of Economics & Management Strategy* **23**(3), 507–526.

Lentzner, J. (1977), ‘The antitrust implications of radius clauses in shopping center leases’, *University of Detroit Journal of Urban Law* **55**, 1.

Markovich, S. & Yehezkel, Y. (2019), ‘Group hug: Platform competition with user-groups’, *NET Institute Working Paper* .

Montes, R., Sand-Zantman, W. & Valletti, T. (2019), ‘The Value of Personal Information in Online Markets with Endogenous Privacy’, *Management Science* **65**(3), 1342–1362.

NHMG (2008), ‘Guidelines on the assessment of non-horizontal mergers under the Council Regulation on the control of concentrations between undertakings. European Commission. Official Journal of the European Union. 2008/c 265/07)’.

Nocke, V. & Rey, P. (2018), ‘Exclusive dealing and vertical integration in interlocking relationships’, *Journal of Economic Theory* **177**, 183–221.

Ordover, J. A., Saloner, G. & Salop, S. C. (1990), ‘Equilibrium vertical foreclosure’, *The American Economic Review* pp. 127–142.

Pashigian, B. P. & Gould, E. D. (1998), ‘Internalizing externalities: the pricing of space in shopping malls’, *The Journal of Law and Economics* **41**(1), 115–142.

Pouyet, J. & Trégouët, T. (2018), ‘Vertical mergers in platform markets’, *Unpublished manuscript* .

Rasch, A. & Wenzel, T. (2013), ‘Piracy in a two-sided software market’, *Journal of Economic Behavior & Organization* **88**, 78–89.

Rasmusen, E. B., Ramseyer, J. M. & Wiley Jr, J. S. (1991), ‘Naked exclusion’, *The American Economic Review* pp. 1137–1145.

Rey, P. & Tirole, J. (2007), ‘A primer on foreclosure’, *Handbook of industrial organization* **3**, 2145–2220.

Rochet, J.-C. & Tirole, J. (2003), ‘Platform competition in two-sided markets’, *Journal of the European Economic Association* **1**(4), 990–1029.

Rochet, J.-C. & Tirole, J. (2006), ‘Two-sided markets: a progress report’, *The RAND Journal of Economics* **37**(3), 645–667.

Salinger, M. A. (1988), ‘Vertical mergers and market foreclosure’, *The Quarterly Journal of Economics* **103**(2), 345–356.

Segal, I. R. & Whinston, M. D. (2000), ‘Exclusive contracts and protection of investments’, *RAND Journal of Economics* pp. 603–633.

StreamLab (2018), ‘Live Streaming Q3’18 Report, https://blog.streamlabs.com/live-streaming-q318-report-40-of-twitch-using-slobs-pubg-popularity-on-the-decline-mixer-fb923cdbd70’.

Weeds, H. (2016), ‘Tv wars: Exclusive content and platform competition in pay tv’, *The Economic Journal* **126**(594), 1600–1633.

Appendix A.

A.1. Proof of Lemma 1

We derive the optimal price and resulting demand for any given value of g_1 and g_2. For ease of exposition, let us state the demand functions on both sides of the market:

$$D_1 = F(m^*(g_1, g_2)), \qquad D_2 = 1 - F(m^*(g_1, g_2)). \tag{A-1}$$

$$N_1 = \Lambda(\gamma D_1^*), \qquad N_2 = \Lambda(\gamma D_2^*).$$

First, we derive the effect of price changes on demand for a given platform i, which is defined as follows:

$$\frac{\partial D_i}{\partial p_i} = f(g_i, g_j)\Big[\theta\Big(\frac{\partial N_i}{\partial p_i} - \frac{\partial N_j}{\partial p_i}\Big) - 1\Big], \tag{A-2}$$

where:

$$\begin{aligned}\frac{\partial N_i}{\partial p_i} - \frac{\partial N_j}{\partial p_i} =& \gamma\Big[\lambda(\gamma D_i^*)\frac{\partial D_i}{\partial p_i} + \lambda(\gamma D_j^*)\frac{\partial D_i}{\partial p_i}\Big] \\ =& \gamma\frac{\partial D_i}{\partial p_i}\Big[\lambda(\gamma D_i^*) + \lambda(\gamma D_j^*)\Big],\end{aligned} \tag{A-3}$$

Substituting (A-3) into (A-2) and rearranging the right-hand side (RHS) and the left-hand side (LHS), the effect of a price change on demands is given by:

$$\frac{\partial D_i}{\partial p_i} = -\frac{f(g_i, g_j)}{[1 - f(g_i, g_j)\theta\gamma(\lambda(\gamma D_i^*) + \lambda(\gamma D_j^*))]} = \frac{\partial D_j}{\partial p_j}. \tag{A-4}$$

Next, consider the first-order conditions (FOCs) resulting from the platforms' profit maximization, then

$$\frac{\partial \Pi_i}{\partial p_i} = D_i + p_i\frac{\partial D_i}{\partial p_i} = 0 \Leftrightarrow p_i = -\frac{D_i}{\frac{\partial D_i}{\partial p_i}}. \tag{A-5}$$

Plugging (A-4) and (A-1) into (A-5), we get the following best-responses, which implicitly characterize prices in Lemma 1:

$$\begin{aligned} p_1(m^*) &= \frac{F(m^*)}{f(m^*)} - F(m^*)\gamma\theta[\lambda(\gamma D_1) + \lambda(\gamma D_2)], \\ p_2(m^*) &= \frac{(1 - F(m^*))}{f(m^*)} - (1 - F(m^*))\gamma\theta[\lambda(\gamma D_1) + \lambda(\gamma D_2)].\end{aligned}$$

A.2. Proof of Lemma 2

Consider the problem faced by platform i when the Superstar is absent or negotiates non-exclusive contract, *i.e.*, $g_1 = g_2 = g \in \{1, 0\}$. As discussed, we focus on the symmetric scenario in which consumers believe that the market will be equally split between the platforms at equal prices. Hence, from the FOCs, we have:

$$\begin{aligned}\frac{\partial \Pi_1}{\partial p_1} =& D_1(g,g) + p_1\Big[-\frac{f(g,g)}{1-f(g,g)\gamma\theta(\lambda(\gamma D_1^*)+\lambda(\gamma D_2^*))}\Big],\\ \frac{\partial \Pi_2}{\partial p_2} =& D_2(g,g) + p_2\Big[-\frac{f(g,g)}{1-f(g,g)\gamma\theta(\lambda(\gamma D_1^*)+\lambda(\gamma D_2^*))}\Big].\end{aligned}$$

We focus on the symmetric equilibrium. Hence, by imposing $p_1 = p_2$, then $D_1^* = D_2^* = F(g,g) = F(m^* = 0) = 1/2$ and, as a result, $N_1^* = N_2^*$. The equilibrium prices are:

$$\begin{aligned}p_1^* = p_2^* =& \frac{F(0)}{f(0)}[1 - f(0)\gamma\theta(\lambda(\gamma D_1^*) + \lambda(\gamma D_2^*))]\\ =& \frac{1}{2f(0)} - \gamma\theta\lambda(\gamma/2),\end{aligned}$$

given that $F(0,0) = 1/2$ and $\lambda(\gamma D_1^*) + \lambda(\gamma D_2^*) = 2\lambda(\gamma/2)$. To conclude the proof, note that all active firms multihome, $N_1^* = N_2^* = \Lambda(\gamma/2)$. All the others, zerohome.

A.3. Proof of Lemma 3

Consider an exclusive contract between the Superstar and platform 1 ($g_1 = 1, g_2 = 0$) and let us isolate the role of the Superstar from any coordination in beliefs for consumers and fringe firms. From the FOCs of the platforms, we have:

$$\begin{aligned}\frac{\partial \Pi_1}{\partial p_1} =& D_1(1,0) + p_1\Big[-\frac{f(1,0)}{1-f(1,0)\gamma\theta(\lambda(\gamma D_1)+\lambda(\gamma D_2))}\Big],\\ \frac{\partial \Pi_2}{\partial p_2} =& D_2(0,1) + p_2\Big[-\frac{f(1,0)}{1-f(1,0)\gamma\theta(\lambda(\gamma D_1)+\lambda(\gamma D_2))}\Big].\end{aligned}$$

To fully study the effect on demands and prices, we should consider that a consumer with preference m is willing to go to platform 1 if $u_1(1,0) > u_2(0,1)$. To see whether $p_1(1,0) > p_2(0,1)$, and, as a consequence, $D_1(1,0) > D_2(0,1)$ for any $\phi > (p_1 - p_2)$, we must look at the effect of ϕ on prices. Hence, taking the total derivative of the FOCs, we get:

$$\begin{aligned}\frac{d^2\Pi_1}{dp_1 d\phi} =& \frac{\partial^2\Pi_1}{\partial p_1^2}\frac{\partial p_1}{\partial \phi} + \frac{\partial^2\Pi_1}{\partial p_1\partial\phi} + \frac{\partial^2\Pi_1}{\partial p_1\partial p_2}\frac{\partial p_2}{\partial\phi} = 0\\ \frac{d^2\Pi_2}{dp_2 d\phi} =& \frac{\partial^2\Pi_2}{\partial p_2\partial p_1}\frac{\partial p_1}{\partial \phi} + \frac{\partial^2\Pi_2}{\partial p_2\partial\phi} + \frac{\partial^2\Pi_2}{\partial p_2^2}\frac{\partial p_2}{\partial\phi} = 0.\end{aligned}$$

By solving the above system of equations, we get:

$$\begin{aligned}\frac{\partial p_1}{\partial\phi} =& \Big\{\frac{\partial^2\Pi_1}{\partial p_1\partial\phi}\frac{\partial^2\Pi_2}{\partial p_2^2} - \frac{\partial^2\Pi_2}{\partial p_2\partial\phi}\frac{\partial^2\Pi_1}{\partial p_1\partial p_2}\Big\}\Phi^{-1}\\ \frac{\partial p_2}{\partial\phi} =& \Big\{\frac{\partial^2\Pi_1}{\partial p_1^2}\frac{\partial^2\Pi_2}{\partial p_2\partial\phi} - \frac{\partial^2\Pi_1}{\partial p_1\partial\phi}\frac{\partial^2\Pi_2}{\partial p_2\partial p_1}\Big\}\Phi^{-1},\end{aligned} \tag{A-6}$$

where $\Phi \equiv \frac{\partial^2\Pi_2}{\partial p_2 \partial p_1}\frac{\partial^2\Pi_1}{\partial p_1 \partial p_2} - \frac{\partial^2\Pi_1}{\partial p_1^2}\frac{\partial^2\Pi_2}{\partial p_2^2} < 0$ and $sign\left(\frac{\partial^2\Pi_2}{\partial p_2^2}\right) = sign\left(\frac{\partial^2\Pi_1}{\partial p_1^2}\right) < 0$ to ensure concavity. Further investigation is, instead, required for the terms in the numerator. We proceed as follows.

(i) Show that $\frac{\partial p_1}{\partial \phi} > 0$ and $\frac{\partial p_2}{\partial \phi} < 0$. Let us consider $\frac{\partial^2\Pi_1}{\partial p_1 \partial \phi}$ and $\frac{\partial^2\Pi_2}{\partial p_2 \partial \phi}$, which are determined as follows:

$$\begin{aligned} \frac{\partial^2\Pi_1}{\partial p_1 \partial \phi} =& f(m^*)\frac{\partial m^*}{\partial \phi} + p_1 \frac{\partial X}{\partial m}\frac{\partial m^*}{\partial \phi}, \\ \frac{\partial^2\Pi_2}{\partial p_2 \partial \phi} =& - f(m^*)\frac{\partial m^*}{\partial \phi} + p_2 \frac{\partial X}{\partial m}\frac{\partial m^*}{\partial \phi}, \end{aligned} \tag{A-7}$$

where

$$X = -\frac{f(m^*)}{1 - f(m^*)\gamma\theta[\lambda(\gamma D_1) + \lambda(\gamma D_2)]} < 0$$

and X increases in m by Assumption 1. By considering the effect of ϕ on m^* for given prices p_1 and p_2, we obtain the following results:

$$\frac{\partial m^*}{\partial \phi} = 1 + \theta\left(\frac{\partial N_1}{\partial \phi} - \frac{\partial N_2}{\partial \phi}\right),$$

and

$$\frac{\partial N_1}{\partial \phi} = \lambda(\gamma D_1)\gamma f(m^*)\frac{\partial m}{\partial \phi}, \qquad \frac{\partial N_2}{\partial \phi} = -\lambda(\gamma D_2)\gamma f(m^*)\frac{\partial m}{\partial \phi}.$$

Solving the above system of equations, we then get:

$$\frac{\partial m^*}{\partial \phi} = \frac{1}{1 - \theta\gamma f(m^*)[\lambda(\gamma D_1) + \lambda(\gamma D_2)]}$$

and

$$\frac{\partial N_1}{\partial \phi} = \frac{\lambda(\gamma D_1)\gamma f(m^*)}{1 - \theta\gamma f(m^*)[\lambda(\gamma D_1) + \lambda(\gamma D_2)]}, \qquad \frac{\partial N_2}{\partial \phi} = -\frac{\lambda(\gamma D_2)\gamma f(m^*)}{1 - \theta\gamma f(m^*)[\lambda(\gamma D_1) + \lambda(\gamma D_2)]}.$$

It follows that $\frac{\partial m^*}{\partial \phi} > 0$, $\frac{\partial N_1}{\partial \phi} > 0$, and $\frac{\partial N_2}{\partial \phi} < 0$. This proves that $\frac{\partial^2\Pi_1}{\partial p_1 \partial \phi} > 0$ by simply substituting $\frac{\partial m^*}{\partial \phi} > 0$ into (A-7). Moreover, $\frac{\partial^2\Pi_2}{\partial p_2 \partial \phi} < 0$ if $-f(m^*) + p_2\frac{\partial X}{\partial m} < 0$, which is a sufficient condition to ensure concavity of Π_2.

By exploiting $\frac{\partial m^*}{\partial \phi} = \frac{\partial m^*}{\partial p_2} = -\frac{\partial m^*}{\partial p_1}$, we also have:

$$\frac{\partial^2\Pi_1}{\partial p_1 \partial p_2} = \frac{\partial^2\Pi_1}{\partial p_1 \partial \phi} > 0, \qquad \frac{\partial^2\Pi_2}{\partial p_1 \partial p_2} = -\frac{\partial^2\Pi_2}{\partial p_2 \partial \phi} > 0.$$

Using the above expressions, we also have:

$$\begin{aligned}\frac{\partial^2 \Pi_1}{\partial p_1^2} &= -\frac{\partial^2 \Pi_1}{\partial p_1 \partial \phi} + X = -\frac{\partial^2 \Pi_1}{\partial p_1 \partial p_2} + X,\\ \frac{\partial^2 \Pi_2}{\partial p_2^2} &= \frac{\partial^2 \Pi_2}{\partial p_2 \partial \phi} + X = -\frac{\partial^2 \Pi_2}{\partial p_1 \partial p_2} + X.\end{aligned} \tag{A-8}$$

Plugging into (A-6), we then have:

$$\begin{aligned}\frac{\partial p_1}{\partial \phi} &= \frac{\partial^2 \Pi_1}{\partial p_1 \partial \phi} X \Phi^{-1} > 0,\\ \frac{\partial p_2}{\partial \phi} &= \frac{\partial^2 \Pi_2}{\partial p_2 \partial \phi} X \Phi^{-1} < 0.\end{aligned} \tag{A-9}$$

which then implies that $\frac{\partial p_1}{\partial \phi} - \frac{\partial p_2}{\partial \phi} > 0$, as we show below:

$$\frac{\partial p_1}{\partial \phi} - \frac{\partial p_2}{\partial \phi} = \Phi^{-1} X \Big[\frac{\partial^2 \Pi_1}{\partial p_1 \partial \phi} - \frac{\partial^2 \Pi_2}{\partial p_2 \partial \phi}\Big] > 0 \tag{A-10}$$

(ii) To see whether also the following condition is satisfied, we take $1 > \frac{\partial p_1}{\partial \phi} - \frac{\partial p_2}{\partial \phi} > 0$ from A-10, we must check whether the denominator Φ is larger in absolute values than the numerator. Hence,

$$\frac{\partial^2 \Pi_1}{\partial p_1^2}\frac{\partial^2 \Pi_2}{\partial p_2^2} - \frac{\partial^2 \Pi_2}{\partial p_2 \partial p_1}\frac{\partial^2 \Pi_1}{\partial p_1 \partial p_2} > \left(\frac{\partial^2 \Pi_2}{\partial p_2 \partial \phi} - \frac{\partial^2 \Pi_1}{\partial p_1 \partial \phi}\right) X,$$

simplifying, we get the following expression:

$$X\left(X - \frac{\partial^2 \Pi_1}{\partial p_1 \partial p_2} - \frac{\partial^2 \Pi_2}{\partial p_1 \partial p_2}\right) > \left(\frac{\partial^2 \Pi_2}{\partial p_2 \partial \phi} - \frac{\partial^2 \Pi_1}{\partial p_1 \partial \phi}\right) X,$$

As $\frac{\partial^2 \Pi_2}{\partial p_2 \partial \phi} = -\frac{\partial^2 \Pi_2}{\partial p_2 \partial p_1}$ and $\frac{\partial^2 \Pi_1}{\partial p_1 \partial \phi} = \frac{\partial^2 \Pi_1}{\partial p_2 \partial p_1}$, then the above expression simplifies to:

$$X^2 > X,$$

which is always true as $X < 0$ and the term within the squared brackets is negative. Hence, in (A-10), the denominator is larger than the numerator and it proves that $0 < \frac{\partial p_1}{\partial \phi} - \frac{\partial p_2}{\partial \phi} < 1$.

(iii) Given (i) and (ii), the equilibrium demand $D_1(m^*)$ increases. Formally, we have:

$$\frac{\partial D_1(m^*)}{\partial \phi} = f(m^*)\Big[1 + \theta\gamma \frac{\partial D_1(m^*)}{\partial \phi}[\lambda(\gamma D_1) + \lambda(\gamma D_2)] - \left(\frac{\partial p_1}{\partial \phi} - \frac{\partial p_2}{\partial \phi}\right)\Big],$$

which can be rearranged as:

$$\frac{\partial D_1(m^*)}{\partial \phi}\Big[1 - f(m^*)\theta\gamma[\lambda(\gamma D_1) + \lambda(\gamma D_2)]\Big] = f(m^*)\Big[1 - \Big(\frac{\partial p_1}{\partial \phi} - \frac{\partial p_2}{\partial \phi}\Big)\Big].$$

Hence, the effect of ϕ on the demand of the *favored* platform 1 is:

$$\frac{\partial D_1(m^*)}{\partial \phi} = \frac{f(m^*)\Big[1 - \Big(\frac{\partial p_1}{\partial \phi} - \frac{\partial p_2}{\partial \phi}\Big)\Big]}{1 - f(m^*)\theta\gamma[\lambda(\gamma D_1) + \lambda(\gamma D_2)]} > 0.$$

Note that, under non-exclusivity, demands do not respond to ϕ and $\frac{\partial D_1(1,1)}{\partial \phi} = 0$.

A.4. Proof of Corollary 1

Let us define the following term,

$$\boldsymbol{\Xi} = \left[\frac{(p_1(1,0) - p_2(0,1))(1 - D_1(1,0)) + (\Pi_1^*(1,0) + \Pi_1^*(0,1) - 2\Pi_1^*(1,1))}{(1 - D_1(1,0))^2}\right].$$

Note that $D_i(0,1) = 1 - D_i(1,0)$ for $i \in \{1,2\}$. Moreover, $p_1(1,0) > p_1(0,1)$. Consider how the critical value $\tilde{\gamma}^S$ in Proposition 2 changes with ϕ,

$$\frac{\partial \tilde{\gamma}^S}{\partial \phi} = \frac{\partial F(1,0)}{\partial \phi}\boldsymbol{\Xi} > 0.$$

The above comparative static is positive as $\frac{\partial F(1,0)}{\partial \phi} = f(m^*(1,0))(N_1(1,0) - N_2(0,1)) > 0$ where $N_1(1,0) > N_2(0,1) > 0$. Hence, in the relevant parameter space, $\tilde{\gamma}^S$ increases as ϕ increases.

Now, consider how the critical value $\tilde{\gamma}^S$ in Proposition 2 changes with θ,

$$\frac{\partial \tilde{\gamma}^S}{\partial \theta} = \frac{\partial F(1,0)}{\partial \theta}\boldsymbol{\Xi} > 0.$$

Again, the above expression is positive as

$$\frac{\partial F(1,0)}{\partial \theta} = f(m^*(1,0))(D_1(1,0) - D_2(0,1)) > 0.$$

As a result, $\tilde{\gamma}^S$ increases as θ increases.

Finally, consider how the critical value changes with γ, then

$$\frac{\partial \tilde{\gamma}^S}{\partial \gamma} = \frac{\partial F(1,0)}{\partial \gamma}\boldsymbol{\Xi},$$

where

$$\frac{\partial F(1,0)}{\partial \gamma} = f(m^*(1,0))\theta\Big(\frac{\partial N_1(1,0)}{\partial \gamma} - \frac{\partial N_2(0,1)}{\partial \gamma}\Big) > 0.$$

Note that the above expression is positive as $\frac{\partial N_1(1,0)}{\partial\gamma} - \frac{\partial N_2(0,1)}{\partial\gamma} = \lambda(\gamma D_1(1,0))D_1(1,0) - \lambda(\gamma D_2(0,1))D_2(0,1) > 0$ as $D_1(1,0) > D_2(0,1)$ and $\lambda^{'}(\cdot) > 0$.

This implies that the likelihood of an exclusive contract increases with ϕ, θ, γ. This concludes the proof.

A.5. Proof of Proposition 3

Consider now the surplus of fringe firms, that we define as $F(g_1, 2_2)$. Under non-exclusivity, we have:

$$FS_1(1,1) = FS_1(1,1) = FS(1,1) = \int_0^{\gamma/2} [(\gamma - 2k)\lambda(k)]dk.$$

Consider now the fringe surplus with an exclusive contract on platform 1. First, we consider the surplus of firms who join the non-favored platform (*i.e.,* $k \in [0, \gamma D_2^*)$):

$$FS_2(0,1) = \int_0^{\gamma D_2^*} [(\gamma D_2^* - k)\lambda(k)]dk.$$

Consider now the surplus of firms joining the platform with the exclusive contract. Some of these firms singlehome, whereas others multihome, so their surplus is as follows:

$$FS_1(1,0) = \int_0^{\gamma D_1^*} [(\gamma D_1^* - k)\lambda(k)]dk.$$

Total surplus under exclusivity is the sum of the two above expressions:

$$FS(1,0) = \int_0^{\gamma D_2^*} [(\gamma D_2^* - k)\lambda(k)]dk + \int_0^{\gamma D_1^*} [\lambda(k)(\gamma D_1^* - k)]dk.$$

Compare now the gain/loss generated by exclusivity, then $\Delta FS = FS(1,0) - FS(1,1)$, which can then be rewritten as:

$$\Delta FS = \int_0^{\gamma D_2^*} [(\gamma D_2^* - k)\lambda(k)]dk + \int_0^{\gamma D_1^*} [(\gamma D_1^* - k)\lambda(k)]dk - \int_0^{\gamma/2} [(\gamma - 2k)\lambda(k)]dk. \tag{A-11}$$

To show that there is a gain from exclusivity, it suffices to show that $\Delta FS > 0$. We note that (A-11) can be rewritten as follows:

$$\begin{aligned}\Delta FS &= \int_0^{\gamma D_2^*} [(\gamma - 2k)\lambda(k)]dk + \int_{\gamma D_2^*}^{\gamma D_1^*} [(\gamma D_1^* - k)\lambda(k)]dk - \int_0^{\gamma/2} [(\gamma - 2k)\lambda(k)]dk, \\ &= \int_{\gamma D_2^*}^{\gamma D_1^*} [(\gamma D_1^* - k)\lambda(k)]dk - \int_{\gamma D_2^*}^{\gamma/2} [(\gamma - 2k)\lambda(k)]dk,\end{aligned}$$

which can be further simplified as:

$$\Delta FS = \int_{\gamma/2}^{\gamma D_1^*} [(\gamma D_1^* - k)\lambda(k)]dk - \int_{\gamma D_2^*}^{\gamma/2} [(\gamma D_2^* - k)\lambda(k)]dk.$$

Integration by parts imply:

$$\Delta FS = \int_{\gamma/2}^{\gamma D_1^*} \Lambda(k)dk - \int_{\gamma D_2^*}^{\gamma/2} \Lambda(k)dk - \Big(\Lambda(k)(\gamma D_2^* - k)\Big)_{\gamma D_2^*}^{\gamma/2} + \Big(\Lambda(k)(\gamma D_1^* - k)\Big)_{\gamma/2}^{\gamma D_1^*},$$

and, hence,

$$\Delta FS = \int_{\gamma/2}^{\gamma D_1^*} \Lambda(k)dk - \int_{\gamma D_2^*}^{\gamma/2} \Lambda(k)dk. \tag{A-12}$$

Note that $\Delta FS > 0$ if, and only if, $\int_{\gamma/2}^{\gamma D_1^*} \Lambda(k)dk - \int_{\gamma D_2^*}^{\gamma/2} \Lambda(k)dk > 0$. Using the Simpson's Rule to approximate the value of the integrals, it follows

$$\int_{\gamma/2}^{\gamma D_1^*} \Lambda(k)dk \simeq \frac{\Delta x}{3}[y_0 + 4y_1 + 2y_2 + 4y_3 + ... + y_n],$$

where n be an even number, $\Delta x = (\gamma D_1^* - \gamma/2)/n$, $y_0 = \Lambda(\gamma/2 + \Delta x)$, $y_1 = \Lambda(\gamma/2 + 2\Delta x)$, $y_2 = \Lambda(\gamma/2 + 3\Delta x)$, and so on and so forth. Similarly,

$$\int_{\gamma D_2^*}^{\gamma/2} \Lambda(k)dk \simeq \frac{\Delta x'}{3}[y_0' + 4y_1' + 2y_2' + 4y_3' + ... + y_n'],$$

with $\Delta x' = (\gamma/2 - \gamma D_2^*)/n$, $y_0' = \Lambda(\gamma D_2^* + \Delta x')$, $y_1' = \Lambda(\gamma D_2^* + 2\Delta x')$, $y_2' = \Lambda(\gamma D_2^* + 3\Delta x')$, and so on and so forth. Indeed, we can rewrite (A-12) as:

$$\frac{\Delta x}{3}[y_0 + 4y_1 + 2y_2 + 4y_3 + ... + y_n] - \frac{\Delta x'}{3}[y_0' + 4y_1' + 2y_2' + 4y_3' + ... + y_n'] \tag{A-13}$$

Knowing that $\gamma D_1^* - \gamma/2 = \gamma/2 - \gamma D_2^*$ as $\frac{\partial N_1^*}{\partial \phi} = -\frac{\partial N_2^*}{\partial \phi}$, we then have:

$$\frac{\Delta x'}{3}\Big[(y_0 - y_0') + 4(y_1 - y_1') + 2(y_2 - y_2') + 4(y_3 - y_4') + ... + (y_n - y_n')\Big],$$

where $(y_0 - y_0') = \Lambda(\gamma/2 - \gamma D_2^*) > 0$, and

$$(y_1 - y_1') = \Lambda\Big[\frac{\gamma}{2} + \frac{2}{n}\Big(\gamma D_1^* - \frac{\gamma}{2}\Big)\Big] - \Lambda\Big[\gamma D_2^* + \frac{2}{n}\Big(\frac{\gamma}{2} - \gamma D_2^*\Big)\Big] > 0,$$

$$(y_2 - y_2') = \Lambda\Big[\frac{\gamma}{2} + \frac{3}{n}\Big(\gamma D_1^* - \frac{\gamma}{2}\Big)\Big] - \Lambda\Big[\gamma D_2^* + \frac{3}{n}\Big(\frac{\gamma}{2} - \gamma D_2^*\Big)\Big] > 0,$$

and so on and so forth. As a result, (A-13) is positive and this proves that $\Delta FS > 0$.

A.6. Proof of Proposition 4

First, consider when the Superstar is non-exclusive, *i.e.*, $g_1 = g_2 = 1$. Consumer surplus on platform 1 is:

$$CS_1(1,1) = \int_{\underline{m}}^{0} [(v + \phi + \theta N_1^*(1,1) - p_1^*(1,1) - m/2)] f(m) dm.$$

Integration by parts implies that the above expression is equivalent to

$$CS_1(1,1) = \frac{1}{2}[v + \phi + \theta N_1^*(1,1) - p_1^*(1,1)] + \int_{\underline{m}}^{0} \frac{F(m)}{2} dm,$$

as $F(0) = 1/2$ and $F(\underline{m}) = 0$. Using the same reasoning, consumer surplus on platform 2 is:

$$CS_2(1,1) = \frac{1}{2}[v + \phi + \theta N_2^*(1,1) - p_2^*(1,1) + \overline{m}] - \int_{0}^{\overline{m}} \frac{F(m)}{2} dm.$$

Knowing that, under symmetry, $p_1^*(1,1) = p_2^*(1,1)$, $N_2^* = N_1^* = \Lambda(\gamma/2)$, $F(m^*) = F(0) = 1/2$, and $\int_0^{\overline{m}} \frac{F(m)}{2} dm = -\int_{\underline{m}}^{0} \frac{F(m)}{2} dm$, then total consumer is equal to

$$CS(1,1) = v + \phi + \theta\Lambda(\gamma/2) - p^*(1,1) + \overline{m}/2 \tag{A-14}$$

where $p^*(1,1) := p_1^*(1,1) = p_2^*(1,1)$. It is immediate to note that the presence of the Superstar increases consumer welfare, as $CS(1,1)$ increases with ϕ.

Second, consider how consumer surplus varies with exclusivity in platform 1. The consumer surplus on platform 1 is:

$$CS_1(1,0) = \int_{\underline{m}}^{0} [v + \phi + \theta N_1^*(1,0) - p_1^*(1,0) - m/2] f(m) dm + \int_{0}^{m^*} [v + \phi + \theta N_1^*(1,0) - p_1^*(1,0) - m/2] f(m) dm.$$

Simplifying, we get

$$CS_1(1,0) = \int_{\underline{m}}^{m^*} \frac{F(m)}{2} dm + [v + \phi + \theta N_1^*(1,0) - p_1^*(1,0) - m^*/2] F(m^*).$$

Similarly, consumer surplus on platform 2 is equal to:

$$CS_2(0,1) = \int_{m^*}^{\overline{m}} [v + \theta N_2^*(0,1) - p_2^*(0,1) + m/2] f(m) dm,$$

which can be expressed as follows:

$$CS_2(0,1) = (1 - F(m^*)[v + \theta N_2^*(0,1) - p_2^*(0,1)] + \frac{1}{2}(\overline{m} - m^* F(m^*)) - \int_{m^*}^{\overline{m}} \frac{F(m)}{2} dm.$$

Summing up $CS_1(1,0)$ and $CS_2(0,1)$, total consumer surplus under exclusivity, which we denote by $CS(1,0)$, is:

$$CS(1,0) = \frac{1}{2}\Big[\int_{\underline{m}}^{m^*} F(m)dm - \int_{m^*}^{\overline{m}} F(m)dm\Big] + [v + \phi + \theta N_1^*(1,0) - p_1^*(1,0) - m^*/2]F(m^*)$$
$$+ (1 - F(m^*))[v + \theta N_2^*(0,1) - p_2^*(0,1)] + \frac{1}{2}(\overline{m} - m^* F(m^*)). \tag{A-15}$$

As $F(\cdot)$ is symmetric around 0, the value of $\overline{m} - m^*$ is equal to the value of $m^* - \overline{m}$. By exploiting this argument, we have

$$\int_{\underline{m}}^{m^*} F(m)dm - \int_{m^*}^{\overline{m}} F(m)dm \equiv \int_{\underline{m}}^{m^*-\overline{m}} F(m)dm + \int_{m^*-\overline{m}}^{m^*} F(m)dm - \int_{m^*}^{\overline{m}} F(m)dm.$$

We note that the first and the third terms on the RHS cancel out. The second term can further be simplified by exploiting symmetry of $F(.)$ around 0. Hence, the above expression can be rewritten as follows:

$$\int_{m^*-\overline{m}}^{m^*} F(m)dm = \int_{m^*-\overline{m}}^{0} F(m)dm + \int_{0}^{m^*} F(m)dm = 2\int_{0}^{m^*} F(m)dm.$$

Using the above simplification, consumer surplus under exclusivity in (A-15) can be rewritten as follows:

$$CS(1,0) = \int_0^{m^*} F(m)dm + [v + \phi + \theta N_1^*(1,0) - p_1^*(1,0) - m^*/2]F(m^*)$$
$$+ (1 - F(m^*))[v + \theta N_2^*(0,1) - p_2^*(0,1)] + \frac{1}{2}(\overline{m} - m^* F(m^*)). \tag{A-16}$$

Impact of exclusivity on CS on platform 1. To compare the consumer surplus in the two regimes, denote $\Delta CS_1 = CS_1(1,0) - CS_1(1,1)$ the net gain (loss) from exclusivity for consumers in platform 1. This is as follows,

$$\Delta CS_1 = \int_{\underline{m}}^{m^*} \frac{F(m)}{2}dm + [v + \phi + \theta N_1^*(1,0) - p_1^*(1,0) - \frac{m^*}{2}]F(m^*)$$
$$- \frac{1}{2}[v + \phi + \theta N_1^*(1,1) - p_1^*(1,1)] - \int_{\underline{m}}^{0} \frac{F(m)}{2}dm.$$

Simplifying, we get:

$$\Delta CS_1 = \int_0^{m^*} \frac{F(m^*)}{2}dm + (F(m^*) - \frac{1}{2})[v + \phi + \theta N_1^*(1,0)F(m^*) - \frac{N_1^*(1,1)}{2}]$$
$$- [p_1^*(1,0)F(m^*) - \frac{p_1^*(1,1)}{2}] - \frac{m^* F(m^*)}{2}.$$

To study the sign ΔCS_i, we know that $\Delta CS_1 = 0$ at $\phi = 0$. In this case, there is no value for the Superstar and consumer surplus in the two regimes is the same. To show that consumers on platform 1 increase their surplus under exclusivity, *i.e.,* $\Delta CS_1 > 0$, it is sufficient to show that $\forall \phi > 0 \ \frac{\partial \Delta CS_1}{\partial \phi} > 0 \implies \frac{\partial CS_1(1,0)}{\partial \phi} > \frac{\partial CS_1(1,1)}{\partial \phi}$. We know that $\frac{\partial CS_1(1,1)}{\partial \phi} = 1/2$. Similarly, we can verify the effect of ϕ on ΔCS_1 as follows:

$$\begin{aligned}\frac{\partial CS_1(1,0)}{\partial \phi} =& \frac{\partial}{\partial \phi}\int_{\underline{m}}^{m^*} \frac{F(m^*)}{2} dm + [v + \phi + \theta N_1^*(1,0) - p_1^*(1,0) - \frac{m^*}{2}] f(m^*)\frac{\partial m^*}{\partial \phi} \\ & + F(m^*)[1 + \theta \frac{\partial N_1^*(1,0)}{\partial \phi} - \frac{\partial p_1^*(1,0)}{\partial \phi} - \frac{1}{2}\frac{\partial m^*}{\partial \phi}]\end{aligned} \tag{A-17}$$

Note that, using the Leibniz's Rule, the first term is equal to $F(m^*)\frac{\partial m^*}{\partial \phi}$, which is larger than 1/2 as $F(m^*) > 1/2$.

Moreover, as the remaining terms are positive and $\frac{\partial m^*}{\partial \phi} = \frac{1}{1-\theta\gamma f(m^*)(\lambda(\gamma D_1^*)+\lambda(\gamma D_2^*))} > 1$, it follows that that $\frac{\partial \Delta CS_1}{\partial \phi} > 0$. Indeed, consumer surplus on the platform with an exclusive contract increases.

Impact of exclusivity on CS on platform 2. Consider now the consumer surplus on platform 2,

$$\begin{aligned}\Delta CS_2 =& (1 - F(m^*)(v + \theta N_2^*(0,1) - p_2^*(0,1)) + \frac{1}{2}(\overline{m} - m^* F(m^*)) - \int_{m^*}^{\overline{m}} \frac{F(m^*)}{2} dm \\ & - \frac{1}{2}(v + \phi + \theta N_2^*(1,1) - p_2^*(1,1) + \overline{m}) + \int_0^{\overline{m}} \frac{F(m)}{2} dm,\end{aligned}$$

which can be simplified as follows:

$$\begin{aligned}\Delta CS_2 =& \int_0^{m^*} \frac{F(m)}{2} dm - \frac{1}{2}\Big(m^* F(m^*) - \overline{m}\Big) - v\Big(F(m^*) - \frac{1}{2}\Big) - \frac{\phi}{2} + \\ & \theta((1 - F(m^*))N_2^*(0,1) - \frac{N_2^*(1,1)}{2}) - ((1 - F(m^*)p_2^*(0,1) - \frac{p_2^*(1,1)}{2}).\end{aligned}$$

Note that, at $\phi = 0$, we have $\Delta CS_2 = 0$. Indeed, if $\frac{\partial \Delta CS_2}{\partial \phi} < 0$, then consumer surplus on platform 2 under exclusivity decreases. Note that this happens as long as $\frac{\partial CS_2(0,1)}{\partial \phi} < 1/2$, as $\frac{\partial CS_2(1,1)}{\partial \phi} = 1/2$. Consider now the effect of ϕ on $CS_2(0,1)$ and, using the Leibniz's Rule for $\int_{m^*}^{\overline{m}} \frac{F(m)}{2} dm$, then:

$$\begin{aligned}\frac{\partial CS_2(0,1)}{\partial \phi} =& [\theta \frac{\partial N_2(0,1)}{\partial \phi} - \frac{\partial p_2^*(0,1)}{\partial \phi}](1 - F(m^*)) \\ & - f(m^*)\frac{\partial m^*}{\partial \phi}[v + \theta N_2^*(0,1) - p_2^*(0,1) + \frac{m^*}{2}].\end{aligned}$$

The second expression in the above equation is always negative. Suppose the first expression is negative, then it is straightforward that $\Delta CS_2 < 0$. Instead, suppose that the first expression is positive this implies that $|\frac{\partial p_2^*(0,1)}{\partial \phi}| > |\theta \frac{\partial N_2(v)}{\partial \phi}|$. Moreover, if $\theta \frac{\partial N_2(0,1)}{\partial \phi} - \frac{\partial p_2^*(0,1)}{\partial \phi} \in [0,1]$, then the entire first term is lower than 1/2 and, indeed,

$\Delta CS_2 < 0$. Finally, taking into account that fact that $1 > |\frac{\partial p_1^*(1,0)}{\partial \phi}| > |\frac{\partial p_2^*(0,1)}{\partial \phi}|$. Because $1 - F(m^*) < 1/2$, the expression, $[\theta \frac{\partial N_2(0,1)}{\partial \phi} - \frac{\partial p_2^*(0,1)}{\partial \phi}](1 - F(m^*))$ is lower than $1/2$. This proves that $\Delta CS_2 < 0$: as a result, consumers on platform 2 are worse-off with exclusivity on platform 1.

Impact of exclusivity on total CS. To provide a complete analysis of the impact of exclusivity on total consumer surplus, we proceed as follows.

Denote $\Delta CS = CS(1,0) - CS(1,1)$, where $CS(1,0)$ and $CS(1,1)$ are determined by (A-15) and (A-14), respectively. Then, the net effect of exclusivity on consumer surplus is:

$$\begin{aligned}\Delta CS = &\int_0^{m^*} F(m)dm + [v + \phi + \theta N_1^*(1,0) - p_1^*(1,0) - m^*/2]F(m^*)\\ &+ (1 - F(m^*))[v + \theta N_2^*(0,1) - p_2^*(0,1)] + \frac{1}{2}(\overline{m} - m^* F(m^*))\\ &- [v + \phi + \theta\Lambda(\gamma/2) - p^*(1,1)] - \overline{m}/2.\end{aligned}$$

We note that the above expression can also be rearranged as follows. Denote by $\bar{N} = F(m^*)N_1(1,0) + (1 - F(m^*))N_2(0,1)$ and $\bar{p} = F(m^*)p_1(1,0) + (1 - F(m^*))p_2(0,1)$, and define the preference mismatch as

$$\begin{aligned}pref\_mism &= \int_{m^*}^{\overline{m}} \frac{m}{2} f(m)dm - \int_{\underline{m}}^{m^*} \frac{m}{2} f(m)dm + \int_{\underline{m}}^{0} \frac{m}{2} f(m)dm - \int_0^{\overline{m}} \frac{m}{2} f(m)dm\\ &= \left(\int_{m^*}^{\overline{m}} \frac{m}{2} f(m)dm - \int_0^{\overline{m}} \frac{m}{2} f(m)dm\right) - \left(\int_{\underline{m}}^{m^*} \frac{m}{2} f(m)dm - \int_{\underline{m}}^{0} \frac{m}{2} f(m)dm\right)\\ &= \left(-\int_0^{m^*} \frac{m}{2} f(m)dm\right) - \left(\int_0^{m^*} \frac{m}{2} f(m)dm\right) = -\int_0^{m^*} m f(m)dm\end{aligned}$$

Using the above, we then have the same expression we used in (5) and which helps the reader to understand the effects at stake:

$$\Delta CS = \underbrace{\theta[\overline{N} - N^*(1,1)]}_{\Delta \text{ externalities}} - \underbrace{\phi D_2^*(0,1)}_{\text{prevented access}} - \underbrace{[\overline{p} - p^*(1,1)]}_{\Delta \text{ prices}} - \underbrace{\int_0^{m^*} m f(m)dm}_{\text{preference mismatch}},$$

where $\bar{N} = F(m^*)N_1(1,0) + (1 - F(m^*))N_2(0,1)$ and $\bar{p} = F(m^*)p_1(1,0) + (1 - F(m^*))p_2(0,1)$ are the expected mass of firms and the expected prices under exclusivity, respectively. Similarly, $N^*(1,1) = \Lambda(\gamma/2)$ represents the number of firms under non-exclusivity, whereas $D_2^*(0,1) = (1 - F(m^*))$ the actual number of consumer affiliating on platform 2.

A.7. Proof of Proposition 5

As $\tilde{\gamma}(\gamma^S)$, we cannot directly compare the two cutoffs. Let $\Delta\pi^S(\cdot)$ the profit differential under-non exclusivity relative to exclusivity. Denote $\Delta\pi^S = \Pi^S(1,1) - \Pi^S(1,0)$, the profit differential under vertical separation and $\Delta\pi^{S,vi} = \Pi_1^S(1) - \Pi_1^S(0)$, these terms can also be expressed as follows:

$$\Delta\pi^S = \gamma^S(1 - D_1(1,0)) + 2\Pi^*(1,1) - \Pi_1^*(1,0) - \Pi_1^*(0,1)$$
$$\Delta\pi^{S,vi} = \gamma^S(1 - D_1(0)) + 2\Pi^*(1,1) - \Pi_1^*(0) - \Pi_2^*(0).$$

Clearly, whenever $\Delta\pi^S < \Delta\pi^{S,vi}$, exclusivity is less likely to arise in the vertical-integration case. In order to understand when this happens, let us proceed by steps:

1. Notice that when $\gamma^S = 0$, $\Delta\pi^{S,vi} = \Delta\pi^S < 0$, because the downstream prices and the profits under vertical integration are equal to the ones under vertical separation (and there is no scope for non-exclusivity).

2. Point 1 implies that it is sufficient to show that $0 < \frac{\partial\Delta\pi^S}{\partial\gamma^S} < \frac{\partial\Delta\pi^{S,vi}}{\partial\gamma^S}$ to prove our statement.

3. Notice also that $\frac{\partial\Delta\pi^S}{\partial\gamma^S} = 1 - D_1(1,0)$, given that the downstream demands, prices and profits are not affected by γ^S in the vertical separation case.

4. Then notice that:

$$\begin{aligned}\frac{\partial\Delta\pi^{S,vi}}{\partial\gamma^S} &= 1 - D_1(0) - \gamma^S\frac{\partial D_1(0)}{\partial\gamma^S} - \frac{\partial\Pi_1^*(0)}{\partial\gamma^S} - \frac{\partial\Pi_2^*(0)}{\partial\gamma^S} \\ &= 1 - D_1(0) - \left[\gamma^S\frac{\partial D_1(0)}{\partial p_2} + p_1\frac{\partial D_1(0)}{\partial p_2}\right]\frac{\partial p_2}{\partial\gamma^S} + p_2\frac{\partial D_1(0)}{\partial p_1}\frac{\partial p_1}{\partial\gamma^S} \\ &= 1 - D_1(0) + \frac{\partial D_1(0)}{\partial p_1}\left[(\gamma^S + p_1)\frac{\partial p_2}{\partial\gamma^S} + p_2\frac{\partial p_1}{\partial\gamma^S}\right]. \end{aligned} \tag{A-18}$$

5. Finally, the derivatives of optimal prices with respect to γ^S are:

$$\frac{\partial p_1}{\partial\gamma^S} = -\frac{\frac{\partial^2\Pi_2^*(0)}{\partial p_2^2}\frac{\partial^2\Pi_1^*(0)}{\partial p_1\partial\gamma^S}}{\zeta} < \frac{\partial p_2}{\partial\gamma^S} = \frac{\frac{\partial^2\Pi_1^*(0)}{\partial p_1\partial\gamma^S}\frac{\partial^2\Pi_2^*(0)}{\partial p_1\partial p_2}}{\zeta} < 0,$$
$$\text{where } \zeta = \frac{\partial^2\Pi_1^*(0)}{\partial p_1^2}\frac{\partial^2\Pi_2^*(0)}{\partial p_2^2} - \frac{\partial^2\Pi_1^*(0)}{\partial p_1\partial p_2}\frac{\partial^2\Pi_2^*(0)}{\partial p_1\partial p_2} > 0.$$

   Plugging into (A-18), we get:

$$\frac{\partial\Delta\pi^{S,vi}}{\partial\gamma^S} = 1 - D_1(0) + \frac{\frac{\partial D_1(0)}{\partial p_1}\frac{\partial^2\Pi_1^*(0)}{\partial p_1\partial\gamma^S}}{\zeta}\left[(\gamma^S + p_1)\frac{\partial^2\Pi_2^*(0)}{\partial p_1\partial p_2} - p_2\frac{\partial^2\Pi_2^*(0)}{\partial p_2^2}\right].$$

6. Exploiting $\frac{\partial D_1}{\partial p_1} = \frac{\partial^2\Pi_1^*(0)}{\partial p_1\partial\gamma^S} := Y$ and $\frac{\partial^2\Pi_1^*(0)}{\partial p_1^2} = -\frac{\partial^2\Pi_1^*(0)}{\partial p_1\partial p_2} + Y$ and $\frac{\partial^2\Pi_1^*(0)}{\partial p_1^2} = -\frac{\partial^2\Pi_1^*(0)}{\partial p_1\partial p_2} + Y$, we can notice that:

$$\zeta = Y\left(Y - \frac{\partial^2\Pi_1^*(0)}{\partial p_1\partial p_2} - \frac{\partial^2\Pi_2^*(0)}{\partial p_1\partial p_2}\right) > Y^2,$$

then, simplifying further we get:

$$\frac{\partial \Delta \pi^{S,vi}}{\partial \gamma^S} = 1 - D_1(0) + \underbrace{\frac{Y^2}{\zeta}}_{<1}\left[\underbrace{(\gamma^S + p_1 + p_2)\frac{\partial^2 \Pi_2^*(0)}{\partial p_1 \partial p_2}}_{>0} - p_2 Y\right] > 0$$

7. Next, we show the conditions under which $\frac{\partial \Delta \pi^{s,vi}}{\partial \gamma^S} - \frac{\partial \Delta \pi^{s}}{\partial \gamma^S} > 0$

$$\frac{\partial \Delta \pi^{s,vi}}{\partial \gamma^S} - \frac{\partial \Delta \pi^{s}}{\partial \gamma^S} = \underbrace{D_1(1,0) - D_1(0)}_{<0} + \frac{Y^2}{\zeta}\left[\underbrace{(\gamma^S + p_1 + p_2)\frac{\partial^2 \Pi_2^*(0)}{\partial p_1 \partial p_2}}_{>0} - p_2 Y\right] > 0$$

We denote the difference in exclusive demand between the two cases as $\Delta D := D_1(0) - D_1(1,0)$ and show that if $\Delta D < \frac{Y^2}{\zeta}\left[\underbrace{(\gamma^S + p_1 + p_2)\frac{\partial^2 \Pi_2^*(0)}{\partial p_1 \partial p_2}}_{>0} - p_2 Y\right]$, then exclusive deals are less likely under a vertical merger.

Therefore, we can conclude the following:

$$\frac{\partial \Delta \pi^{s,vi}}{\partial \gamma^S} - \frac{\partial \Delta \pi^{s}}{\partial \gamma^S} > 0 \text{ if } \Delta D < \frac{Y^2}{\zeta}\left[\underbrace{(\gamma^S + p_1 + p_2)\frac{\partial^2 \Pi_2^*(0)}{\partial p_1 \partial p_2}}_{>0} - p_2 Y\right]$$

Carroni et al. (2019) demonstrate that the condition above is always fulfilled under a uniform distribution of consumer preferences. Under any distribution $F(\cdot)$ with a larger mass of consumers located around zero, this would be verified *a fortiori*.

A.8. Two Superstars

Let us consider two Superstars $S \in \{A, B\}$ generating a consumer benefit ϕ_S. The timing of the game is similar as in the main model. We follow the same contractual setup as in the main model and as described in Appendix B.1. First, the Superstars auction their exclusive presence and sign an exclusive contract with the winning platform. Then, the Superstars can unilaterally renegotiate the contract opting for a non-exclusive one at a lower tariff. Indeed, there are nine possible outcomes in the market as shown by Table 3. A symmetric choice equilibrium is characterized by a situation in which either both Superstars, A and B, sign an exclusive contract with the same platform or they both renegotiate the contract towards a non-exclusive one. A comparison of profits allows us to prove Lemma 5 and Proposition 6.

Proof of Lemma 5. When Superstar A renegotiates the contract and B is exclusive on platform 1, A's profits are as follows:

$$\Pi_A^{12,1} = \gamma^S \cdot 1 + \underbrace{\Pi_1^{12,1} - \Pi_1^{2,1}}_{T_{A,1}^{12,1}} + \underbrace{\Pi_2^{12,1} - \Pi_2^{1,1}}_{T_{A,2}^{12,1}},$$

where $T_{A,i}^{ij,1}$ is the maximal tariff that platform i would be willing to be pay to accept the non-exclusive contract.

Differently, the profit of Superstar A without renegotiation when platform 2 wins the auction is:

$$\Pi_A^{2,1} = \gamma^S D_2^{2,1} + \underbrace{\Pi_2^{2,1} - \Pi_2^{1,1}}_{T_{A,2}^{2,1}},$$

where analogously to before $T_{A,2}^{2,1}$ is the maximal bid of platform 2 under exclusivity. Comparing profits, we then verify that

$$\begin{aligned}\Pi_A^{12,1} - \Pi_A^{2,1} &= \gamma^S \cdot 1 + \Pi_1^{12,1} - \Pi_1^{2,1} + \Pi_2^{12,1} - \Pi_2^{1,1} - (\gamma^S D_2^{2,1} + \Pi_2^{2,1} - \Pi_2^{1,1}) \\ &= \gamma^S + \Pi_1^{12,1} + \Pi_2^{12,1} - (\gamma^S D_2^{2,1} + \Pi_1^{2,1} + \Pi_2^{2,1}) > 0.\end{aligned}$$

The above expression is positive because $\Pi_1^{12,1} + \Pi_2^{12,1}$ is analogous to the total profits of platforms when B is exclusive on 1. On the other hand, the expression $\Pi_1^{2,1} + \Pi_2^{2,1}$ is the sum of the platforms' profit when B is exclusive on 1. Note that the network effects are dampened as fewer consumers would migrate to the platform hosting the Superstar, *i.e.,* $m^* := \phi_A - \phi_B + \theta(N_1 - N_2) - (p_1 - p_2)$. Thus, the industry profits are lower and so also the surplus extracted by the Superstar, *i.e.,* $\Pi_A^{12,1} - \Pi_A^{2,1} > 0$. As a result, $\Pi_A^{2,1}$ is dominated by $\Pi_A^{12,1}$. Analogously, $\Pi_B^{1,2}$ is dominated by $\Pi_B^{1,12}$. In what follows, we thus consider only renegotiation when the two auctions are won by different platform. This concludes the proof of Lemma 5.

Proof of Proposition 6. In this proof, we first look for the conditions under which the exclusive contract symmetric choice equilibrium exists. Then, we look for the conditions under which a non-exclusive contract symmetric choice equilibrium exists.

Exclusive contracts symmetric choice equilibrium. For exclusivity on the same platform to be an equilibrium, we need to verify when $\Pi_A^{i,i} > \Pi_A^{ij,i}$ and the same for platform B given A chooses exclusivity on i.

The profit of A when exclusive on platform 1 and B is exclusive on 1 as well is given as

$$\Pi_A^{1,1} = \gamma^S D_1^{1,1} + \underbrace{\Pi_1^{1,1} - \Pi_1^{2,1}}_{T_{A,1}^{1,1}},$$

where $T_{A,1}^{1,1}$ is the optimal bid of platform 1 in the auction launched by Superstar A.

Comparing the profits in the two cases, $\Pi_A^{1,1}$ and $\Pi_A^{12,1}$, we then obtain

$$\begin{aligned}\Pi_A^{1,1} - \Pi_A^{12,1} &= \gamma^S D_1^{1,1} + \Pi_1^{1,1} - \Pi_1^{2,1} - (\gamma^S \cdot 1 + \Pi_1^{12,1} - \Pi_1^{2,1} + \Pi_2^{12,1} - \Pi_2^{1,1}) \\ &= \gamma^S (D_1^{1,1} - 1) + \Pi_1^{1,1} + \Pi_2^{1,1} - (\Pi_1^{12,1} + \Pi_2^{12,1})\end{aligned}$$

The above expression is positive when $\gamma^S < \hat{\gamma}_A^S := \frac{\Pi_1^{1,1}+\Pi_2^{1,1}-(\Pi_1^{12,1}+\Pi_2^{12,1})}{1-D_1^{1,1}}$. Similarly, we can obtain the analogous expression for B as $\gamma^S < \hat{\gamma}_B^S := \frac{\Pi_1^{1,1}+\Pi_2^{1,1}-(\Pi_1^{1,12}+\Pi_2^{1,12})}{1-D_1^{1,1}}$. As a result, there exists a symmetric equilibrium in which both Superstars sign an exclusive contract with platform 1 for any $\gamma^S < \min\{\hat{\gamma}_A^S, \hat{\gamma}_B^S\}$.

Non-Exclusivity as the symmetric choice equilibrium. For renegotiation by both Superstars to emerge in equilibrium, we need $\Pi_A^{12,12} > \max\{\Pi_A^{1,12}, \Pi_A^{2,12}\}$ and the same for platform B. The profit of Superstar A being non-exclusive given B is non-exclusive is given as:

$$\Pi_A^{12,12} = \gamma^S \cdot 1 + \underbrace{\Pi_1^{12,12} - \Pi_1^{2,12}}_{T_{A,1}^{12,12}} + \underbrace{\Pi_2^{12,12} - \Pi_2^{1,12}}_{T_{A,2}^{12,12}} = \gamma^S \cdot 1 + 2(\Pi^{12,12} - \Pi_1^{2,12}).$$

The second expression in the above equation exploits the symmetry of the platforms i.e., $\Pi_1^{12,12} = \Pi_2^{12,12} = \Pi^{12,12}$ and $\Pi_1^{2,12} = \Pi_2^{1,12}$. The profit of Superstar A when exclusive on platform 1 and B has renegotiated the contract towards a non-exclusive one is given as:

$$\Pi_A^{1,12} = \gamma^S D_1^{1,12} + \underbrace{\Pi_1^{1,12} - \Pi_1^{2,12}}_{T_{A,1}^{1,12}}.$$

Similarly, Superstar $A's$ profit when signing and exclusive contract with platform 2 given B has renegotiated the contract towards a non-exclusive one is:

$$\Pi_A^{2,12} = \gamma^S D_2^{2,12} + \underbrace{\Pi_2^{2,12} - \Pi_2^{1,12}}_{T_{A,2}^{2,12}}.$$

Comparing profits in the two cases, $\Pi_A^{12,12}$ and $\Pi_A^{1,12}$, we can verify that:

$$\Pi_A^{12,12} - \Pi_A^{1,12} = \gamma^S \cdot 1 + 2\Pi^{12,12} - \Pi_1^{2,12} - \gamma^S D_1^{1,12} - \Pi_1^{1,12}.$$

Note that the above expression is positive for $\gamma^S > \tilde{\gamma}_{A,1}^S := \frac{2\Pi^{12,12}-\Pi_1^{2,12}-\Pi_1^{1,12}}{1-D_1^{1,12}}$. By analogy, the critical threshold when A is exclusive on platform 2 and B is non-exclusive is equal to $\gamma^S > \tilde{\gamma}_{A,2}^S := \frac{2\Pi^{12,12}-\Pi_2^{1,12}-\Pi_2^{2,12}}{1-D_2^{2,12}}$. Given the symmetry of the platforms, we then observe that $\tilde{\gamma}_{A,2}^S = \tilde{\gamma}_{A,1}^S = \tilde{\gamma}_A^S$.

Similarly, Superstar B renegotiates the contract and offers a non-exclusive contract when Superstar A does the same as long as

$$\gamma^S > \tilde{\gamma}_B^S := \frac{2\Pi^{12,12} - \Pi_2^{12,1} - \Pi_2^{12,2}}{1 - D_2^{12,2}}.$$

Thus, for any $\gamma^S > \max\{\tilde{\gamma}_A^S, \tilde{\gamma}_B^S\}$, we get the symmetric choice equilibrium with non-exclusivity.

From the above, it is easy to see that $\hat{\gamma}_A^S > \tilde{\gamma}_B^S$ and $\hat{\gamma}_B^S > \tilde{\gamma}_A^S$. Moreover, if $\phi_A > \phi_B$, we have $\hat{\gamma}_A^S > \hat{\gamma}_B^S$ and vice-versa. Notice that when $\max\{\tilde{\gamma}_A^S, \tilde{\gamma}_B^S\} > \min\{\hat{\gamma}_A^S, \hat{\gamma}_B^S\}$, an equilibrium may fail to exist.

A.9. Proof of Proposition 7

Consider equations (9) and (10). It is easy to notice that the profit of platform 2 does not change in response to the decision of the Superstar, as for any p_2, we have:

$$\Pi_2(1,1) = p_2(1 - F(m_1^*(1,1)) = p_2(1 - F(m_1^*(1,0)),$$

This also implies that the optimal profits in the two cases are the same, i.e., $\Pi_2^{M*}(0,1) = \Pi_2^{M*}(1,1)$. This equality has an important implication for the Superstar, as the non-exclusive offer of its product to platform 2 is profit equivalent to the exclusivity on the rival platform. As a consequence, no positive payment can be asked, as the maximal tariff $T_2^M(1,1)$ cannot be higher than $\Pi_2^{M*}(1,1) - \Pi_2^{M*}(0,1)$ for platform 2 to accept the offer. Hence, $T_2^M(1,1) = 0$ and, exploiting symmetry, also $T_1^M(1,1) = 0$. As a result, the profit of the Superstar under non-exclusivity is:

$$\gamma^S + T_2^M(1,1) + T_1^M(1,1) = \gamma^S. \tag{A-19}$$

Differently, platform 1 always gains a higher demand with $g_1 = 1$ and $g_2 = 0$. Moreover, for any price p_1, we have:

$$\underbrace{p_1 F(m_2^*(1,0))}_{\Pi_1(0,1)} = \underbrace{p_1 F(m_2^*(1,1))}_{\Pi_1(1,1)} < \underbrace{p_1 F(m_2^*(0,1))}_{\Pi_1(1,0)},$$

because $F(\cdot)$ is increasing and $m_2^*(1,0) = m_2^*(1,1)) < m_2^*(0,1)$. This also implies that the optimal profits in the two cases are such that $\Pi_1^{M*}(1,0) > \Pi_1^{M*}(1,1) = \Pi_1^{M*}(0,1)$. This implies that the maximal tariff that can be charged to platform 1 is $T_1^M(1,0) = \Pi_1^{M*}(1,0) - \Pi_1^{M*}(0,1)$. Therefore, the maximal Superstar profit in this case is:

$$\gamma^S D_1^M(1,0) + T_1^M(1,0) = \gamma^S D_1^M(1,0) + \Pi_1^{M*}(1,0) - \Pi_1^{M*}(1,1). \tag{A-20}$$

Comparing (A-19) with (A-20), we get the cutoff in Proposition 7.

A.10. Two-sided pricing

For the variation with two-sided pricing, we follow the same approach as in Section A.6, with a uniform distribution of consumers and firms and the associated density of 1. A singlehoming fringe firm on platform i obtains $\gamma \cdot D_i - k - l_i$, where l_i is the price paid by the small firms to access the platform. For $l_i < 0$, these firms are subsidized. A multihoming small firm gets $\gamma - 2k - l_i - l_j$. Platform $i's$ profits absent the Superstar are $\Pi_i(0, g_j) = p_i D_i(0, g_j) + l_i N_i$. When platform i hosts the Superstar, profits are $\Pi_i(1, g_j) = p_i D_i(1, g_j) + l_i N_i - T_i(1, g_j)$. To ensure concavity and rule out market tipping, we assume $0 < \phi < 1/2(3 - \gamma^2 - 2\gamma\theta - \theta^2)$, and $4 - \gamma^2 - 6\gamma\theta - \theta^2 > 0$. We then solve the game backwards. In the third stage, consumer demands become:

$$D_i(g_i, g_j) = \frac{1}{2} + \frac{\theta(l_i - l_j) + (p_j - p_i) + \phi(g_i - g_j)}{2(1 - \gamma\theta)}, \qquad D_j(g_j, g_i) = 1 - D_i(g_i, g_j)$$

By anticipating future market shares, in the second stage, platforms have the following best replies for $i, j \in \{1, 2\}$, with $i \neq j$,

$$\begin{aligned} p_i(p_j, l_j) &= \frac{(2 - \gamma(\gamma + 3\theta))(1 + 2(p_j + l_j\theta - \gamma\theta + \phi(g_i - g_j))}{2(4 - \gamma^2 - 6\gamma\theta - \theta^2)}, \\ l_i(l_j, p_j) &= \frac{(\gamma - \theta)(1 - 2(p_j + l_j\theta - \gamma\theta + \phi(g_i - g_j))}{2(4 - \gamma^2 - 6\gamma\theta - \theta^2)} \end{aligned}$$

We now identify the equilibrium outcomes in the two contractual regimes. First, consider when the platform offers a non-exclusive contract ($g_i = g_j = g = 1$), platforms are symmetric and prices are symmetric as well, such that $p^*(1,1) := p_1^*(1,1) = p_2^*(1,1) = 1/2 - \gamma(\gamma + 3\theta)/4$ for consumers and $l^*(1,1) := l_1^*(1,1) = l_2^*(1,1) = (\gamma - \theta)/4$ for the fringe. Demands are given by $D_1^*(1,1) = D_2^*(1,1) =: 1/2$ and $N^*(1,1) := N_1^*(1,1) = N_2^*(1,1) = (\gamma + \theta)/4$. Second, consider when the Superstar offers an exclusive contract to platform $1(g_1 = 1$ and $g_2 = 0)$, equilibrium prices on the consumer side are:

$$p_1^*(1,0) = p^*(1,1)\left(1 + \frac{2\phi}{\eta}\right), \qquad p_2^*(0,1) = p^*(1,1)\left(1 - \frac{2\phi}{\eta}\right).$$

Equilibrium prices on the fringe are:

$$l_1^*(1,0) = l^*(1,1)\left(1 + \frac{2\phi}{\eta}\right), \qquad l_2^*(0,1) = l^*(1,1)\left(1 - \frac{2\phi}{\eta}\right),$$

where $\eta := 3 - \gamma^2 - 4\gamma\theta - \theta^2 > 0$. It can be easily seen that $p_1^*(1,0) > p^*(1,1) > p_2^*(0,1) > 0$. When $\gamma > \theta$, the price for the firms on the fringe is positive and increases with the value generated by the Superstar. When $\gamma < \theta$, fringe firms are subsidized and the subsidy increases with the Superstar. Regardless of the pricing strategy, there is agglomeration of fringe firms on the *favored* platform in the same vein as in the main paper. Specifically,

$$N_1^*(1,0) = N^*(1,1)\left(1 + \frac{2\phi}{\eta}\right), \qquad N_2^*(0,1) = N^*(1,1)\left(1 - \frac{2\phi}{\eta}\right)$$

with $N_1^*(1,0) > N^*(1,1) > N_2^*(0,1)$ as in Proposition 1. The contract in the two regimes follows the same reasoning as in the main model. Under exclusivity, Superstar's profit is $\Pi^S(1,0) = \frac{\gamma^S}{2} + \frac{\phi(4 - \gamma^2 + 2\gamma^S - 6\gamma\theta - \theta^2)}{2\eta}$. In the case of non-exclusive deals, Superstar's profit is

$\Pi^S(1,1) = \gamma^S + \frac{\phi(4-\gamma^2-6\gamma\theta-\theta^2)(\eta-\phi)}{2\eta^2}$. Hence, the Superstar offers an exclusive deal whenever $\gamma^S < \tilde{\gamma}^S$, where:

$$\tilde{\gamma}^S \equiv \frac{(4-\gamma^2-6\gamma\theta-\theta^2)\phi^2}{\eta(\eta-2\phi)}.$$

Else, she renegotiates the contract and offers a non-exclusive contract to both platforms. The mechanism behind this result is identical to that in Proposition 2.

Appendix B.

B.1. Microfoundation of the contractual setting

One way to micro-found our contractual stage is to nest the possibility to contract a non-exclusive contract in a model á la Ordover et al. (1990).Starting from the fact that the Superstar has all bargaining power *vis-à-vis* the platforms, we assume that she offers an exclusive contract with the following clauses: the payment of a fixed tariff for exclusivity and the possibility of unilateral renegotiation. The renegotiation implies the possibility for the Superstar to offer a non-exclusive contract at a strictly lower tariff.

The timing would be as follows. In the first step, the Superstar provides exclusivity by means of as a second-price sealed-bid auction as in Jehiel & Moldovanu (2000). This is similar to the bidding stage as in Ordover et al. (1990). At the end of the first step, the winning platform, without loss of generality platform 1, wins the auction and commits to the payment of $T_1(1,0)$. In the second step, the Superstar has the opportunity to offer a non-exclusive contract to platform 2 and then, conditional on acceptance, renegotiate the contract with platform 1 as well. This contractual mechanism is outcome-equivalent to that used by Montes et al. (2019) between firms and data brokers.

Let us first consider the case in which the Superstar unilaterally renegotiates the contract with platform 1 in the last step by offering a tariff $T_1(1,1)$. To be incentive-compatible, platform 1 should prefer profits with the non-exclusive contract, $\Pi_1^*(1,1) - T_1(1,1)$, to the outside option, which is $\Pi_1^*(0,1)$ given that platform 2 has accepted the offer in order to be in this node of the game. Therefore, the optimal tariff offered to platform 1 is

$$T_1(1,1)^* = \Pi_1^*(1,1) - \Pi_1^*(0,1).$$

Going one step backward, the optimal offer of the Superstar to platform 2 is equal to $T_2(1,1)^* = \Pi_2^*(1,1) - \Pi_2^*(0,1)$. This is because platform 2 faces the choice of accepting such a contract (being left with profit $\Pi_2^*(1,1)$) or rejecting the contract letting the Superstar be exclusive on platform 1 (which implies receiving profit $\Pi_2^*(0,1)$). Note that given symmetry, $T_1^*(1,1) = T_2^*(1,1)$. As a result, renegotiation will let the Superstar obtain the following profits:

$$\Pi^S(1,1) = \gamma^S + 2[\Pi^*(1,1) - \Pi^*(0,1)] = \gamma^S + 2[\Pi^*(1,1) - \Pi^*(0,1)].$$

Moving to the first step, let us analyze the exclusive offers. From the perspective of platform 1, there are two cases (subgames). First, anticipating the Superstar renegotiation, the outside option of rejecting the exclusive contract will be $\Pi_1^*(1,1) - T_1^*(1,1) = \Pi_1^*(0,1)$, *i.e.,* the profit obtained by accepting a non-exclusive future offer. Second, anticipating the absence of renegotiation, the outside option of rejecting the contract is, $\Pi_1^*(0,1)$, *i.e.,* the profit obtained when the rival platform accepts the exclusive offer.

Note that the two cases are identical. Thus, the Superstar solves the following problem:

$$\begin{aligned} &\max_{T_1(1,0)} \Pi^S(1,0) = \gamma^S \cdot D_1(1,0) + T_1(1,0) \\ &\text{subject to } \Pi_1^*(1,0) - T_1(1,0) \geq \Pi_1^*(0,1), \end{aligned}$$

where $\Pi_1^*(g_1, g_2)$ is the equilibrium gross profit of platform 1. Note that the participation constraint simply maps the value generated by the Superstar on the platform, *i.e.,* $\Pi_1^*(1,0) - \Pi_1^*(0,1)$. The larger this value, the larger the tariff that the Superstar can collect. As a result, the Superstar sets

$$T_1(1,0) = \Pi_1^*(1,0) - \Pi_1^*(0,1),$$

such that platform 1's participation constraint is binding. Indeed, the profits of the Superstar when exclusivity emerges are:

$$\Pi^S(1,0) = \gamma^S D^*(1,0) + \Pi^*(1,0) - \Pi^*(0,1).$$

It easy to see that renegotiation will occur if, and only, if $\Pi^S(1,1) > \Pi^S(1,0)$ and this leads to the main result presented in Proposition 2.

B.2. Example with a uniform distribution of preferences.

To further corroborate our findings, we provide a short example with a uniform distribution of preferences.[27] We make following simplifying assumptions:

1. Consumers are uniformly distributed according to their preferences $m \sim \mathcal{U}(-1/2, 1/2)$ and the associated density function is 1.

2. The fringe firms are uniformly distributed according to their outside option as $k \sim \mathcal{U}(0,1)$ with the associated density of 1.

These two simplifications, along with $\gamma < 1$, help us provide intuitions.

Exclusivity on platform 1. Following the benchmark model, we find that platforms set a price equal to

$$p_1^*(1,0) = \frac{1}{2} - \gamma\theta + \frac{1}{3}\phi > p_2^*(0,1) = \frac{1}{2} - \gamma\theta - \frac{1}{3}\phi$$

and the associated demands are $D_1^*(1,0) = \frac{\phi}{3(1-2\gamma\theta)}$ and $D_2^*(0,1) = 1 - D_1^*(1,0)$. The number of firms on each platform is $N_1^*(1,0) = \gamma D_1^*$ and $N_2^*(0,1) = \gamma D_2^*$, with $N_1^*(1,0) > N_2^*(0,1)$. The associated platform profits are

$$\Pi_1(1,0)^* - T_1(1,0) = \frac{(2\phi + 3(1-2\gamma\theta))^2}{36(1-2\gamma\theta)} - T_1(1,0) \text{ and } \Pi_2^*(0,1) = \frac{(2\phi - 3(1-2\gamma\theta))^2}{36(1-2\gamma\theta)}$$

with and without an exclusive contract. The optimal contract tariff is equal to $T_1^*(1,0) = \frac{2\phi}{3}$ and the Superstar obtains $\Pi^S(1,0) = \gamma^S D_1^* + T_1^*(1,0)$. Total consumer surplus is:

$$CS(1,0) = v + \frac{1}{8}\phi\Big(9 + \frac{\phi}{(1-2\gamma\theta)^2}\Big) + \frac{3\gamma\theta}{2} - \frac{3}{8}.$$

[27] For detailed intuitions, there is an analogous model in an older version of the with a Hotelling set-up with consumers located uniformly on the interval $[0,1]$. See Carroni et al. (2019).

Non-exclusivity of the Superstar. The platforms set equilibrium prices equal to

$$p^* = p_1^*(1,1) = p_2^*(1,1) = \frac{1}{2} - \gamma\theta$$

and obtain $D_1^*(1,1) = D_2^*(1,1) = \frac{1}{2}$, with $N_1^*(1,1) = N_2^*(1,1) = \gamma/2$. Platform profits are given as $\Pi_i^* = \frac{1-2\gamma\theta}{4}$.

The non-exclusive tariff is given as $T^*(1,1) = T_1^*(1,1) = T_2^*(1,1) = \phi\frac{3-5\gamma\theta-\phi}{9(1-2\gamma\theta)}$ and the Superstar obtains $\Pi^S(1,1) = \gamma^S + 2T^*(1,1)$. The resulting total consumer surplus is given as

$$CS(1,1) = v + \phi + \frac{3\gamma\theta}{2} - \frac{3}{8}.$$

Exclusive contracts vs. Non-exclusive contracts In what follows, we show that by comparing profits, $\Pi^S(1,0) > \Pi^S(1,1)$ if, and only if, $\gamma^S \leq \tilde{\gamma}^S$ where $\tilde{\gamma}^S =: \frac{4\phi^2}{3(3-2\phi-6\gamma\theta)}$ Thus, this resembles the critical value in Proposition 2. To ensure concavity and rule out market tipping, we assume that $\phi < \frac{3}{2}$ and $\theta < \frac{3-2\phi}{\gamma^S}$.

Consumer surplus comparison Comparing consumer surplus in the two contractual regimes,

$$\Delta CS = CS(1,0) - CS(1,1) = \frac{1}{18}\phi\Big(-9 + \frac{\phi}{(1-2\gamma\theta)^2}\Big),$$

which is positive for $\theta > \frac{1}{2\gamma} - \frac{\sqrt{\frac{\phi}{\gamma^2}}}{6} > 0$ and $\phi < 1/4$. This result confirms Proposition 4. Indeed, there exists a parameter range for which exclusivity is offered by the Superstar and this is welfare-enhancing.

Welfare-enhancing exclusivity. Exclusivity is welfare-enhancing when the following conditions are jointly satisfied:

$$\theta > \frac{1}{2\gamma} - \frac{\sqrt{\frac{\phi}{\gamma^2}}}{6} > 0, \quad \phi < 1/4, \quad \gamma^S \leq \frac{4\phi^2}{3(3-2\phi-6\gamma\theta)}.$$

One can easily check that this interval of parameters is a non-empty set. Hence, we confirm that our results hold under the uniform distribution case.