Platform duality and network externalities*

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The dual role of gatekeeping platforms has attracted the attention of policy-makers worldwide. In this paper, we rationalize the incentive of a platform to enter in direct competition with third parties with a product bundle. When network externalities are absent, the platform adopts a dual role and competes with third parties in most cases and this benefits user. When network externalities are present, platform duality emerges less often. Duality reduces prices while fragmenting demand across services and reducing the network benefits. When network externalities are large, the total impact of duality on consumers is negative even if prices fall. This paper suggests that ignoring the role of network externalities might bias any meaningful analysis in favor of duality.

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1. Introduction

A digital gatekeeper is a platform that "can control access by a group of users to some goods or another group of user" (Alexiadis & de Streel 2020). Indeed, it provides third parties crucial access to consumers and regulates the functioning of the entire ecosystem. An increasingly common feature of gatekeeping platforms is their *dual mode*, that is, they are both competitors of third parties and regulators of their ecosystem. For example, Apple provides third parties (e.g., Spotify) access to its users and, at the same time, offers competing services (e.g, Apple Music). Similarly, Amazon is both a marketplace and a reseller (e.g., Amazon Basics), directly competing with independent sellers.

Their role as gatekeepers and competitors to third parties, has placed some platforms in the eye of the storm (ACCC 2019, Crémer et al. 2019, Furman et al. 2019, CMA 2020, US House Judiciary Committee 2020). Some commentators have argued, for instance, that by operating as essential facilities, gatekeepers have the ability, and in some cases, the incentive, to foreclose third parties. Such general concerns have been further buttressed by the spate of ongoing investigations and complaints against alleged anti-competitive practices such as self-preferencing.[1] A potential solution often advocated is the ex-ante regulation of the gatekeeper entry ranging from detailed market investigations to an outright ban in the entry of gatekeepers. This was, for instance, the proposal circulated in US policy circles and sponsored by Elizabeth Warren, who famously remarked "You Don't Get To Be The Umpire And Have A Team".[2]

However, most of the focus of the ongoing policy discussions concerns the post-entry alleged anti-competitive strategies employed by gatekeepers and not, instead, the platform dual role in itself. It is generally understood that gatekeeper entry (in the product space of third parties) stimulates competition and benefits consumers if not accompanied by anti-competitive conduct. From the perspective of a policymaker, it is not obvious whether stricter ex-ante regulation of gatekeeper entry, which might protect third parties, ultimately benefit or hurt consumers. This conundrum arises from the current understanding of the competitive effects rooted in markets without network effects. In such markets, movements in prices hold full responsibility in explaining the impact on consumers.[3] However, digital markets often feature the presence of large network ex-

[1] See Case AT.39740 Google Search (Shopping) and the ongoing proceedings against Amazon (See case AT.40462 Amazon Marketplace) and Apple (See cases AT.40437 Apple - App Store Practices (music streaming) and AT.40652 Apple - App Store Practices (e-books/audiobooks).

[2] See Vox.com, 'Elizabeth Warren's really simple case for breaking up Big Tech', April 22, 2019. Available at: https://www.vox.com/policy-and-politics/2019/4/22/18511860/elizabeth-warren-cnn-town-hall-tech

[3] See Vox.com, 'The push to break up Big Tech, explained', May 3, 2019. Available at: https://www.vox.com/recode/2019/5/3/18520703/big-tech-break-up-explained

ternalities and, hence, effects may be more ambiguous.[4] Accounting for the presence of such externalities may provide answers to the dilemma faced by policymakers pressured to revise the current guidelines (e.g., the EU Digital Services Act). In this paper, we show that in markets with network externalities, if a platform enters in competition with third parties, consumers might be worse off even if the price they pay falls. Indeed, in the presence of interlinked demand, traditional antitrust might lead to serious errors (Evans & Schmalensee 2008).

To this end, we present a model in which a platform allows consumers interact with third party applications. The gatekeeper applies an ad valorem fee on third parties' revenues. It is common, for digital platforms such as Apple, Google, Tencent, to levy a commission fee on third parties amounting to 15% to 30% of the revenues collected from in-app purchases. We assume that third parties offer services in seemingly unrelated markets and, hence, are monopolist in their product segment. There are three groups of consumers: the first group is a group of *singleuse* consumers, who only value one type of service (e.g., music-on-demand); the second group of *singleuse* consumers only value the other type of service (e.g., gaming-on-demand); the third group features the presence of *multiuse* consumers that derive utility from both services. Users in each group derive utility from standalone access to the service and from the presence of network externalities associated with a service.

We consider two scenarios. In the first one, the platform is a mere intermediary between consumers and third parties and only collects a commission fee from the latter. In the second one, the platform also develops its own product services competes with third parties and we show that its preferred way is by offering a product bundle.[5] While this may ensure a direct stream of revenues, it also spurs competition and depresses third parties' revenues, and so reducing how much the platform can collect from them.

We find that the gatekeeper prefers to offer a bundle of services when the (ad-valorem) fee levied on the third parties is small enough. In this case, the gatekeeper does not internalize a sufficiently large portion of third parties' revenues and, therefore, it prefers to open a direct channel to sell services to consumers and compete with third parties. Interestingly, entry becomes less likely the larger the network externalities. This is because large network externalities create additional utility to consumers and lead to an increase in the revenues of third parties. When the platform is a mere intermediary, it can collect a share of these additional revenues. On the contrary, when the platform

[4]Users generally prefer services other users subscribe, generating direct network externalities (e.g., playlists, better recommender systems), or services with large catalogs, generating cross-side network externalities.

[5]For instance, in 2020, Apple introduced Apple One, a product bundle consisting of music- and streaming-on-demand services.

competes with third parties, consumers are fragmented across services and, hence, the gatekeeper sets a lower bundle price, rendering gatekeeper entry relatively less appealing.

From the consumer perspective, we first show the well known result that, in the absence of network externalities, gatekeeper entry is pro-competitive, hence, is always better for consumers. Differently from existing studies, this is due not only to the competitive effect that gatekeeper entry entails but also to the elimination of the *Cournot effect* that arises in markets with complementarities. Without entry, third parties are monopolist in their respective market but the presence of multiuse consumers generates complementarity which leads to higher prices. The entry of the gatekeeper in the market with a bundle of services eliminates such a problem as third parties only attract singleuse consumers.

When network externalities are present, things slightly change. On the one hand, the Cournot effect is larger; on the other hand, consumers derive additional utility from using the same service. In this case, the entry of the gatekeeper eliminates the Cournot effect while exerting more competitive in the market. However, these positive effects for consumers should be weighed against loss in consumer benefit due to fragmentation of demand across services When network externalities are sufficiently small, gatekeeper entry benefits consumers because the consumers' gains from reduced price outweigh reduced gains from agglomeration. However, when network externalities are large, consumers' gains from more competition are lower than the reduced benefit stemming from the fragmentation of demand across services. Hence, consumers are worse off with entry even if prices fall.

This paper proves the existence of situations in which more competition in a platform ecosystem, spurred by the gatekeeper's dual role, might end up damaging consumers. To curb this negative effect on consumer surplus, we discuss several policy measures. First, we find that controlling the ad valorem fee, by introducing a *price cap* or by prohibiting excessive commission fees ex-post (e.g., art. 102(a) of the TFEU), might stimulate more duality and, hence, would not solve the problem. Second, we discuss how both a *laissez-faire regime* and an *outright ban on duality*, including structural separation, might not exclude that consumers are hurt. Finally, we discuss how interoperability or a safe harbor approach might protect consumers.

The outline of the paper is as follows. In the next section, we present our contribution to the related literature. In Section 3, we present the model, whereas in Section 4 the main analysis is developed. In Section 5, we discuss the generality of our results, whereas policy implications are discussed in Section 6. Section 7 provides concluding remarks.

2. Related Literature

There is a vast literature on the economics of platforms and their role as managers of network externalities. Starting from the seminal works of Caillaud & Jullien (2003), Rochet & Tirole (2003), and Armstrong (2006), this literature has generally emphasized the role of network externalities, arising within and across sides, in shaping market conditions.[6] Due to the ongoing antitrust proceedings, this literature has recently focused on economic impact of platform duality.[7]

However, both the empirical and theoretical literature has not found conclusive evidence of the effects of platform entry in competition with third parties on economic outcomes.[8] For example, Wen & Zhu (2019) studied how, facing an entry threat from a platform, Android app developers which are more vulnerable to the entry threat of Google reduced their innovation effort, increased their app prices, and eventually shifted their effort to new or unaffected markets. Zhu & Liu (2018) studied the entry of Amazon into the product space of third-party sellers, finding that sellers pull their products from the marketplace. A similar *negative* impact was found by He et al. (2020), who showed that when the platform's owner enters in competition with third parties, demands for the latter decrease because of a significant reduction in their offline demand. Other empirical studies have, instead, highlighted some positive effects. For example, Foerderer et al. (2018) found that the decision of Google to release Google Photos in 2015 and enter the market of all-purpose apps for organizing, editing, and sharing digital photographs, spurred major updates from existing apps. In a study concerning Facebook's integration of Instagram, Li & Agarwal (2017) found that while third party apps observed a reduction in demand, with large heterogeneity between small and large apps, the total demand for the photo-sharing application ecosystem increased.

The theoretical literature did not find an unambiguous response too. Some studies found that platform entry in competition with third parties have pro-competitive effects. For example, Hagiu et al. (2020) found that platform duality might be welfare-enhancing because of its pro-competitive effect, helping consumers to save shopping costs and limiting third parties' pricing. In turn, an outright on platform duality could be harmful to consumers. Similar pro-competitive effects are documented by Dryden et al. (2020), Etro (2020) and Tremblay (2020). More related to the entry decision analyzed in ours, Tremblay (2020) identified conditions for the gatekeeping platform to offer products as

[6] For a recent survey on platforms and competition policy, see Jullien & Sand-Zantman (2020).

[7] Other closely related papers relate to ability of platforms to steer consumers towards some products (Hagiu & Jullien 2011, 2014, De Corniere & Taylor 2014, 2019, Gilbert 2020) and to the platform decision to be resellers, marketplace, or both (Hagiu & Spulber 2013, Hagiu & Wright 2015).

[8] For a survey on recent empirical studies, see e.g., Zhu (2019).

well, but the entry decision depends on its category-specific cost-advantage compared to third party sellers and the type of fee strategy implemented.

These positive effects should be balanced against the negative effects, such as foreclosure or reduction in product variety. For example, Padilla et al. (2020) considered a dynamic framework to understand the incentive of a platform to abuse its gatekeeper role by privileging its own products. They found that the incentive to foreclose third parties arise when the gatekeepers face saturated demand and this may be detrimental to consumers. Anderson & Bedre Defolie (2020) focused on the decision of a platform to act as a reseller or be 'hybrid', competing therefore with third party sellers. They found that a hybrid model might lead to a reduction in consumer surplus when the platform's quality increases. This effect arises because the platform increases commission fees, so reducing seller participation and, hence, hurting consumers.

We differ from these studies in several dimensions. Above all, we study how the presence of network externalities is key in understanding the economic impact of platform duality. Our results entail both the presence of harm and benefits for consumer and the benefits of platform dual role tend to disappear as network externalities get larger, thus hurting both third parties and consumers.[9] A second difference is in the presence of a segment of consumers (multiuse consumers) that link together seemingly unrelated markets. When the platform is passive, this complementarity generates the typical Cournot effect with prices above the monopoly level. The platform can eliminate such inefficiency with its entry into the market. Third, gatekeeper entry arises with a bundle of products, which is a novel strategy a platform can adopt to segment the different markets.

Related to the latter points, our work is also linked to the literature on complementary goods and bundling strategies. Most studies focused on monopolistic setting and/or bundling as a price-discrimination device (Adams & Yellen 1976, Schmalensee 1982, McAfee et al. 1989, Whinston 1989, Seidmann 1991). Carbajo et al. (1990) showed that bundling can be an effective strategy to avert Bertrand-like competition as it segments the market and induces rivals to price less aggressively. In our framework, the gatekeeper finds it optimal to enter the product space of third parties, segment the market, and remove the inefficiency associated with the Cournot effect.[10]

[9] The relevance of network externalities is also discussed in a recent study by Carroni et al. (2020). The authors found that, contrary to conventional wisdom, exclusive contracts do not always arise in two-sided markets and can even be welfare-enhancing. The paper also found that vertical integration leads to less exclusivity compared to a situation of vertical separation, thereby suggesting caution in understanding competitive forces and incentives to foreclose in these markets.

[10] Alternatives to remove the Cournot effect are mergers. For instance, Choi (2008) studied mergers and bundling in complementary markets and showed that when a merger occurs, the merged entity prefers to price more aggressively compared to the pre-merger scenario, whereas the price of its standalone components increase post-merger. The reason lies in the presence of the "pricing ex-

This result shares some similarities with Armstrong & Vickers (2019), who showed that entry in a duopoly market by an additional firm might induce fierce competition on contestable consumers such that firms retreat on their captive base by charging higher prices. In our framework, however, the presence of the Cournot effect creates the conditions for which gatekeeper entry leads third parties to retreat on their singleuse market and freely set lower yet monopoly prices.

3. The Model

Consider a gatekeeping platform, A, that hosts third party applications generating value for consumers. The latter can be, for instance, mobile applications operating as multi-sided platforms, such as Spotify, Epic Games. For the sake of exposition, let us assume that there are only two of these third party applications, and these are identified by $i = 1, 2$. We assume that they operate in unrelated markets. For instance, a third party app 1 operates in the music-streaming industry (e.g., Spotify), whereas the other, 2, operates in the gaming industry (e.g., Epic Games).

We study two scenarios. In the first one (passive platform), the platform only acts as an intermediary and lets third parties serve users. The gatekeeping platform, A levies a uniform ad-valorem fee, β, on the revenues made by the third party applications.[11]

The profit of the gatekeeping platform is then given as follows:

$$\Pi_A = \beta \sum_{k=1}^{2} \Pi_k \equiv \Pi_A^{NE},$$

where Π_i for $i \in 1, 2$ denotes the profit made by the third party i. For the sake of notation, we use the superscript $\{NE\}$ to denote the scenario in which the gatekeeper acts as a mere hosting platform.

In the alternative scenario (active platform), the gatekeeper adopts a dual role: it acts as an intermediary and also offers a product bundle competing against the two third party

ternalities" typically arising with complementary products when firms compete and which are fully internalized by the merged entity if a merger occurs.

[11]Platforms such as Apple develop ecosystems that include a variety of third party applications and, therefore, for any given platform the revenue-sharing agreement can be considered as exogenous. Such a setup is quite in line with the current business model of Apple that collects a 30% cut from in-app. A similar policy has been announced in September 2020 by Google. However, rare exceptions exist in the presence of platforms with market power, such as Amazon, that can negotiate special treatment. See e.g., The Verge, July 30, 2020: https://www.theverge.com/2020/7/30/21348108/apple-amazon-prime-video-app-store-special-treatment-fee-subscriptions

applications.[12] For instance, in 2020 Apple introduced Apple One, a bundle of products that includes Apple Arcade, a gaming service, and Apple Music, its streaming-music leg. In this case, the platform's profits are obtained via two channels: the revenue sharing agreement with third parties and the direct sale to consumers. More specifically, the profit of the gatekeeper is

$$\Pi_A = \beta \sum_{k=1}^{2} \Pi_k + p_A D_A \equiv \Pi_A^E,$$

where D_A is the number of users subscribing to the bundle offered by the platform, and p_A the subscription price the platform charges for the bundle. For tractability, we assume that the services offered by the platform in the latter case are not different in terms of intrinsic quality provided from those services offered by the third parties. Similarly, we assume that the platform can imitate third parties' services at no cost.[13]

Third parties. Third parties' applications operate in seemingly unrelated markets and make revenues by charging a price p_i for $i \in 1, 2$ to consumers. Their gross profits are given by

$$\Pi_i = p_i D_i \text{ for } i \in 1, 2,$$

where D_i denotes the number of consumers subscribing to their services. As the gatekeeper levies an ad-valorem fee on the revenues β, their net profits are equal to $(1-\beta)\Pi_i$.

Consumers. We assume that there are three groups of consumers. First, some singleuse consumers derive utility, $u_1(\cdot)$, from the services offered only in the market wherein platform 1 operates. Second, some singleuse consumers derive utility, $u_2(\cdot)$, from the services offered in the market wherein platform 2 operates. Finally, there are multiuse consumers that derive utility, $u_{12}(\cdot)$ from subscribing to both third parties $i = 1, 2$. This assumption allows us to disentangle the impact of these two types of demands, i.e., multiuse demand and singleuse demand, on the pricing strategies of third parties and the gatekeeper (when relevant). In each group, consumers subscribe to a platform if they obtain net positive utility, $u_k(\cdot) \geq 0$ for $k \in \{1, 2, 12\}$.

We assume that, within each consumer group, consumers are distributed according to the intrinsic utility (v) they derive from subscribing to a service. We denote it by $v \sim \mathcal{U}(0, 1)$, and assume it to be uniformly distributed within each market. Such a

[12] Bundling two products allows the platform to solve the Cournot effect and represents a profitable strategy to avoid Bertrand-like competition. More details are provided in the pricing decision stage.

[13] Introducing a sunk cost would not affect the bundle price in any case, but it would restrict the region of parameters in which entry occurs.

simplifying assumption, which implies symmetry in the value generated across markets, has the nice feature of ensuring tractability, without significant loss of generality.

To use a service, users pay a subscription price p_i to the selected third party and benefit from the interactions with other users using the same service.[14] These users can be on the same side or on the other side of the market.[15] Indeed, other than the intrinsic utility services generate for its users, the net utility a consumer obtains by subscribing to a service also depends on the externalities other users generate. For example, gamers benefit from playing with and against other gamers. Likewise, listeners gain if other listeners are on the same platforms as this (directly) contributes to the creation of user-generated playlists. We capture such network externalities arising within a group of users with the parameter θ_i, with $\theta_i \neq \theta_j$ for $j \neq i$. To ensure an interior solution and concavity in profits, we assume: $0 \leq \theta_1 < \min\{\frac{2-3\theta_2}{6-8\theta_2}, \frac{2-6\theta_2}{3-8\theta_2}\} < 1$ and $0 \leq \theta_2 < 1$.

The utility of a singleuse consumer of type v when subscribing to platform i is

$$u_i(v) = v + \theta_i D_i - p_i.$$

The utility of a multiuse consumer of type v is equal to

$$u_{ij}(v) = 2v + \sum_{k=1}^{2} \Big[\theta_k D_k - p_k\Big].$$

If instead a bundle of services is also offered by the platform, multiuse users obtain

$$u_A(v) = 2v + \theta_1 D_A + \theta_2 D_A - p_A,$$

where D_A is the total number of multiusers subscribing to the bundle of services offered by the platform and p_A is the bundle price.

For given prices, singleuse consumers subscribe to a third party application if, and only if, they derive a (weakly) positive utility such that:

$$u_i(v) > 0 \implies v > v_i := p_i - \theta_i D_i.$$

[14]For an analysis on how same-side network effects impact prices, see Shekhar (2020), who showed that an increase in same-side network externality depresses the price even in a competitive setting.

[15]Note that our setting can also be viewed as a two-sided setting with unitary network benefit on the content provider side. For instance, the third party applications can be proper two-sided platforms matching content providers (e.g., artists and gamers) with their subscribers. In this case, the cross-group benefit of consumers would still be denoted by θ_i, while the cross-group benefit of the content providers by $\phi = 1$.

A multiuse consumer instead subscribes to the two services if

$$u_{ij}(v) > 0 \implies v > v_{ij} := \frac{\sum_{k=1}^{2}\left[p_k - \theta_k D_k\right]}{2}.$$

Likewise, multiuse consumers should never find it optimal to behave like singleuse consumers and subscribe to one third party only. This implies that the following condition should be satisfied $u_{ij}(v) > u_i(v)$, for any $i = 1, 2$.

When the gatekeeper enters the multiuse market with a bundle price p_A, if it takes over the market, the consumers that subscribe to the bundle are characterized by:

$$u_A(v) > 0 \implies v > v_A := \frac{p_A - D_A(\theta_1 + \theta_2)}{2}.$$

The gatekeepers takes over the multiuse segment if consumers prefer the bundle at price p_A to the individual components at price p_i, that is if $u_A(v) > u_1(v) + u_2(v)$ and to each app individually, that is if $u_A(v) > u_i(v)$ for $i = 1, 2$.

In turn, the demand for each third party, which comprises both the singleuse and multiuse consumers it attracts, is given as follows:

$$D_i = \underbrace{1 - F(v_i)}_{\text{singleuse consumers}} + \underbrace{1 - F(v_{ij})}_{\text{multiuse consumers}}, \qquad \forall i = 1, 2.$$

Under duality, the gatekeeper gets the following demand

$$D_A = 1 - F(v_A).$$

Timing. The timing is as follows. In the first period, the gatekeeper decides whether to be active, and provides a bundle of services to consumers competing with third parties, or be passive letting only third parties offer services to consumers. In case the gatekeeper enters, it sets a bundle price p_A and acts as a price leader. In the second period after observing gatekeeper entry decision, third party applications set simultaneously and non-cooperatively their subscription prices, p_1 and p_2, to consumers. Finally, in the third period, for each group of consumers, v is drawn and consumers decide which service subscribe to. The equilibrium concept is the Subgame Perfect Nash Equilibrium. [16]

[16] The assumption that the gatekeeper acts as a price leader when entering the market ensures that equilibrium in pure strategy always exists. Such an assumption is reasonably justified by the fact that the platform is a gatekeeper and, hence, in the position to influence significantly third parties strategies. A similar assumption is also made in a recent paper by Gaudin & White (2020).

4. Analysis

In what follows, we derive the demands for the services in the two continuation games we consider. Then, by backward induction, we solve the main game and present equilibrium results. Finally, we study the impact of platform duality on consumer welfare.

4.1. Impact of platform entry

Passive gatekeeper. Consider the case in which the platform plays a passive role and simply mediates interactions between third parties and final consumers. In this scenario, the platform works as an essential facility for the two third parties and earns a share β of their revenues.

In the second period, the third parties set the subscription price to consumers to maximize their prices. Prices are implicitly determined by solving simultaneously the following first-order conditions:

$$\frac{\partial \Pi_1}{\partial p_1} = D_1 + p_1 \frac{\partial D_1}{\partial p_1} = 0 \tag{1}$$

$$\frac{\partial \Pi_2}{\partial p_2} = D_2 + p_2 \frac{\partial D_2}{\partial p_2} = 0. \tag{2}$$

By solving (1) and (2) simultaneously, equilibrium price set by platform i are given as

$$p_i^* = \frac{1}{2}\left(\frac{5 - 8\theta_i}{64\theta_i\theta_j - 48\theta_i - 48\theta_j + 35} + 1\right) \text{ for } i \neq j \in 1, 2.$$

One can easily observe that at these prices, a multiuse consumer is always better off by subscribing to both services instead of one service only. Interestingly, even if both third party applications are operating as monopolists in independent markets, their respective demands are linked by the multiuse consumers. In particular, their presence implies that $\frac{\partial D_j}{\partial p_i} < 0$, meaning that the price charged by i depresses the demand for product j i.e. if third party i increases its price, multiuse consumers are ready to pay less for product j. In other words, third parties exert a negative externality on each other, a phenomenon that is know as *Cournot complementarity* or, alternatively *Cournot effect*. However, third parties fail to take this negative externality into account and end up charging prices that are too high compared to join profit maximization.

To fix ideas, suppose third parties set prices maximizing the third parties' total profit (and these also maximizing the gatekeeper's profit $\beta(\Pi_1 + \Pi_2)$. In this case, the equilibrium prices are found by solving the following expressions, for $i, j = 1, 2$, $i \neq j$:

$$\frac{\partial \Pi_i + \Pi_j}{\partial p_i} = D_i + p_i \frac{\partial D_i}{\partial p_i} + +p_j \frac{\partial D_j}{\partial p_i} = 0. \tag{3}$$

Optimal prices are equal to $p_i^{*,joint} = {}^1\!/_2$ and the prices charged by third parties are higher compared to this benchmark level: $p_i^* > {}^1\!/_2$. Lemma 1 formally establishes the presence of a Cournot effect.

Lemma 1. *Third parties would increase their profits by jointly decreasing their prices.*

Does the presence of network externality exacerbate the Cournot effect? To understand this, we first provide some comparative statics on the optimal prices. Then, we discuss the impact of network externalities on the composite price that multiuse consumers pay.

Lemma 2. *The equilibrium prices set by third party i decreases in θ_i and increases in θ_j, with ${}^{\partial p_i^*}\!/_{\partial \theta_j} > |{}^{\partial p_i^*}\!/_{\partial \theta_i}|$. Network externalities exacerbate the Cournot effect.*

Proof. See Appendix. □

The above lemma presents twofold results. First, the price that singleuse consumers pay decreases in the network externalities arising for such a service. The intuition is as follows. The larger the benefits consumers obtain when other peers join the service, the more valuable each additional consumer becomes and therefore third parties lower the equilibrium price to be more attractive. This rationalizes the reduction of p_i^* in θ_i.

Second, p_i^* always increases in the marginal benefit of consumers affiliating with the other third party, i.e., θ_j. The mechanism is as follows: as p_j^* decreases when θ_j increases, there is an expansion in the number of consumers joining j in the singleuse segment in which it operates alone. Because of network benefits, the expansion of this turf also creates surplus in the multiuse segment and, because of the interlinked demand, a positive externality in the other singleuse segment in which third party i operates alone. As more utility is generated in this segment, third party i can increase its price p_i^*.

As a result, when θ_j increases, p_j^* increases too because of three reinforcing effects arising from (i) a lower price offered by third party j; (ii) an increase in the total mass of multiuse consumers (increased Cournot complementarity); and (iii) an increase in the value of singleuse on third party j due to spillover of network benefits due to point (ii). As we formally show in the Appendix, such an effect is larger than the former we described, i.e., ${}^{\partial p_i^*}/_{\partial\theta_j} > |{}^{\partial p_i^*}/_{\partial\theta_i}|$. In turn, this drives the increase in the composite price $p_1^* + p_2^*$ paid by multiuse consumers and exacerbates the Cournot effect.

Although multiuse use consumers pay more, their demand increases too with the network externalities. This is because the composite price increases at a slower rate than the benefits obtained because of more consumers in the singleuse segment and the resultant positive spillover in the multiuse segment. Hence, $\frac{\partial v_{ij}}{\partial\theta_i} < 0$ for $i, j \in 1, 2$ and $j \neq i$.

Let us now focus on the gross profit of the third parties, which is given as

$$\Pi_i^{NE*} = \frac{16(3-4\theta_j)(\theta_i(8\theta_j-7)-6\theta_j+5)^2}{(\theta_i(4\theta_j-3)-3\theta_j+2)(16\theta_i(4\theta_j-3)-48\theta_j+35)^2} \text{ for } i \neq j \in 1, 2.$$

From the above expression, one can verify that third parties' profits always increase with any network externalities. The following statement can be written.

Proposition 1. *The profit of the third parties always increases in the network externalities, i.e.* $\frac{\partial\Pi_i^{NE*}}{\partial\theta_k} > 0$ *for* $i, k \in 1, 2$.

To shed some light regarding the above result, let us first consider how profits of the third party i change when its subscribers benefit more from interactions with other subscribers of the same service. Hence,

$$\frac{\partial\Pi_i^{NE*}}{\partial\theta_i} = \underbrace{\frac{\partial p_i^*}{\partial\theta_i}}_{-} D_i + p_i^* \underbrace{\frac{\partial D_i}{\partial\theta_i}}_{+} > 0. \tag{4}$$

First, an increase in θ_i leads to a reduction in price, p_i^*, (Lemma 2). Second, an increase in θ_i leads to higher demand both from the respective singleuse and multiuse consumers. The overall impact is positive.

Consider now how profits of the third party i change when network externalities at the other third party, j, increase. Hence,

$$\frac{\partial\Pi_i^{NE*}}{\partial\theta_j} = \underbrace{\frac{\partial p_i}{\partial\theta_j}}_{+} D_i + p_i \underbrace{\frac{\partial D_i}{\partial\theta_j}}_{+} > 0. \tag{5}$$

One can observe two effects. First, because of an increase of p_i^* (Lemma 2). Second, because of an increase in the total market reach of third party i. As discussed, such a result arises because of cross-segment spillovers: a higher p_i^* leads to an increase (reduction) in singleuse consumers when θ_i is sufficiently large (small), and such an effect should be added to the positive increase in the number of active multiuse consumers. The total effect on consumers' demand at platform i is positive.

Indeed, two seemingly independent services (and markets) are linked together by the presence of multiuse consumers and, therefore, any increase in network effects end up creating a positive spillover for both the third parties. As the gatekeeper is passive, it simply collects a share of the surplus generated by third parties, larger network externalities end up benefiting the platform as well.

Active gatekeeper. Consider now the continuation game in which the gatekeeper enters with a bundle that includes both services at a bundle price p_A. Indeed, by offering a bundle of services, the gatekeeper is in direct competition with the third parties in the multiuse consumer segment. Three cases can arise. First, the platform is not able to capture any consumer demand for a given price p_A. Second, the platform shares the market of multiuse consumers with third parties. Third, the platform sets a price such that it attracts all the multiuse demand.

In what follows, we first show that the gatekeeper never offers individual services. Then, we focus on the most interesting case in which the gatekeeper enters the market offering a bundle of services. This represents the dominant strategy for the gatekeeper, conditional on entry. To see why, suppose the gatekeeper enters the market by offering individual prices for consumers that value the product in each market.

Lemma 3. *Suppose the gatekeeper has a dual role. If its services are unbundled, it obtains zero profits and prefers not to enter the market.*

The proof is intuitive and sketched as follows. As the gatekeeper acts as a price leader, as in Gaudin & White (2020), any standalone price set by the gatekeeper is observed by the third parties, who can therefore adjust their pricing strategy and undercut the gatekeeper. This will, in turn, be anticipated by the gatekeeper and only a zero price can be sustained. In other words, a Bertrand-like competition with third parties takes place and this depresses both the direct revenues obtained by the gatekeeper and the revenues obtained by charging third parties a commission fee. In turn, offering a bundling is a dominant strategy as long as it can yield (weakly) positive profits. This result is reminiscent of Carbajo et al. (1990) who showed how bundling can be a profitable strategy to induce rivals to act less aggressively in the market. Thus, if the gatekeeping platform were to enter the market unbundling the two services, such a choice would be payoff-dominated by the no-entry choice. Indeed, as the gatekeeper does not find it profitable to be active by charging two separate prices for the two services, we consider only the case in which the platform offers a bundle.

To identify the optimal bundle price, we proceed by searching for a price, p_A, that deters unilateral deviation from the third parties' monopoly price. In other words, we study whether market segmentation can indeed be an equilibrium. Suppose third parties set monopoly prices $(p_1^*, p_2^*) = (1/2, 1/2)$. To be an equilibrium, p_A should make any third party indifferent between serving only singleuse consumers and serving both singleuse and multiuse consumers. The following lemma identifies such equilibrium price.

Lemma 4. *There exists a unique equilibrium in pure strategy, p_A^*, such that the gatekeeper serves multiuse consumers and third parties serve the singleuse consumers in their respective markets:*

$$p_A^* := 1+\min\left\{\frac{1}{12-16\theta_2} - \frac{1}{4}\sqrt{\frac{\theta_1(13-16\theta_2)+4\theta_2(11-4\theta_2)-25}{(\theta_1-1)(3-4\theta_2)^2}}, \frac{1}{12-16\theta_1} - \frac{1}{4}\sqrt{\frac{-4\theta_1(4\theta_1+4\theta_2-11)+13\theta_2-25}{(3-4\theta_1)^2(\theta_2-1)}}\right\},$$

which is decreasing in the network externalities i.e., $\frac{\partial p_A^*}{\partial \theta_k} < 0$ for $k \in 1, 2$. In equilibrium, third parties set monopoly prices $p_i^* = 1/2$.

Proof. See Appendix. □

With its entry in the market with a bundle, the gatekeeper fully separates the two seemingly unrelated markets and induces third parties to set monopoly prices. In turn, the Cournot effect resulting from the interdependence between the singleuse and multiuse segments disappear and third parties retreat on the singleuse segments.

One shall also note that p_A^* decreases in the network externalities. The reason is that when network externalities increase, every additional consumer becomes more valuable to third parties. So, to attract them, third parties would adopt a more aggressive pricing strategy, which forces the gatekeeper to lower its bundle price in the first stage. Additionally, we find that on equilibrium, multiuse consumers never prefer to behave like a singleuse consumer: for a given number of users on each application and given prices, multiuse consumers obtain a larger utility by subscribing to the two services offered by the platform with the bundle rather than to one only.

As p_A^* is set to deter deviations from third parties and the latter setting monopoly prices, below what they would have otherwise set in the presence of a passive gatekeeper, platform duality has a pro-competitive effect and reduces prices.

The profit of the gatekeeper can then be expressed as follows:

$$\begin{aligned}\Pi_A^{E*} &= D_A^* p_A^* + \beta(\Pi_1^* + \Pi_2^*) \\ &= \frac{\frac{64(3-2\theta_i)\theta_i-71}{\theta_i+\theta_j-2} + \frac{(4\theta_i-3)X}{\theta_i+\theta_j-2} + \frac{6-8\theta_i}{\theta_j-1}}{8(3-4\theta_i)^2} - \frac{\beta(\theta_i+\theta_j-2)}{4(\theta_i-1)(\theta_j-1)},\end{aligned} \tag{6}$$

where $X := \sqrt{-4\theta_i(4\theta_i+4\theta_j-11)+13\theta_j-25/(3-4\theta_i)^2(\theta_j-1)}$ and $\Pi_i^* = 1/4(1-\theta_i)$.

To shed some light about the role of network externalities, let us decompose their (positive) impact the profit of the gatekeeper as follows:

$$\frac{\partial \Pi_A^{E*}}{\partial \theta_i} = \underbrace{\frac{\partial p_A}{\partial \theta_i}}_{-} D_A^* + p_A^* \underbrace{\frac{\partial D_A}{\partial \theta_i}}_{+} + \beta \left(\underbrace{\frac{\partial \Pi_i^*}{\partial \theta_i}}_{+} + \underbrace{\frac{\partial \Pi_j^*}{\partial \theta_i}}_{=0} \right) > 0 \text{ for } i \neq j \in 1, 2.$$

For any $0 \leq \beta < 1$, an increase in θ_i results in a fall of the bundle price, an ensuing rise in the demand for the bundle in the multiuse segment, as well as an increase in third party's profit resulting from demand expansion in the singleuse segment at a given monopoly price. The two positive effects on platform profit overcompensate any decrease in the revenues obtained because of a lower the bundle price. In turn, platform's profits increase with network externalities

Proposition 2. *The profit of the gatekeeper increases in the network externalities, i.e.,* $\frac{\partial \Pi_A^E}{\partial \theta_i} > 0$ *for* $i \in 1, 2$.

Proof. The proof is omitted as it immediately follows from (6). □

4.2. Entry decision

We now consider the decision of the gatekeeper in the first period of the game. To better provide intuitions about the role of network externalities, we first assume that network externalities are absent, i.e., $\theta_1 = \theta_2 = 0$, and identify the optimal strategy of the gatekeeper. Then, we relax this assumption and look at the key role of network externalities. For tractability, we assume symmetry between network externalities generated by the services provided in the market, i.e., $\theta_1 = \theta_2 > 0$.[17]

Benchmark ($\boldsymbol{\theta} = \mathbf{0}$) Suppose network externalities are absent and the platform takes a passive role. In the second stage, prices are determined by solving (1) and are equal to $p_1^* = p_2^* = 4/7$, with resulting profits $\Pi_1^* = \Pi_2^* = 24/49$. The platform obtains $\Pi_A^{NE} = \beta 48/49$ and the consumer surplus is equal to $CS^{NE} = 18/49$.

Under platform duality, the gatekeeper acts as a traditional price leader, anticipating the move of the third parties. This ensures that there exists an equilibrium in pure strategy in this subgame. Formally, one can show that the gatekeeper can efficiently segment the market and avoid unilateral deviations from the third parties. Indeed, it sets a price

[17] The corresponding results for $\theta_1 \neq \theta_2$ are available upon request.

such that it exclusively serves the multiuse consumers and this leads to the following equilibrium in pure strategy: $p_1^* = p_2^* = 1/2$ and $p_A^* = 2/3$. In turn, $D_1^* = D_2^* = 1/2$, $\Pi_1^* = \Pi_2^* = 1/4$ while the demand and profits of the gatekeeper are $D_A^* = 2/3$ and $\Pi_A^E = p_A D_A + \beta(\Pi_1^* + \Pi_2^*) \equiv 4/9 + \beta/2$. Consumer surplus is $CS^E = 25/36$. Comparing market outcomes in the two regimes, the following proposition can be stated.

Proposition 3. *Suppose $\theta = 0$. Platform duality emerges with a bundle price $p_A^* = 2/3 < p_1^* + p_2^* = 1$ for any $\beta \leq \tilde{\beta}(\theta = 0) \equiv 0.93$, leading to market segmentation. Platform duality reduces third parties' profits and increases consumer surplus. For any $\beta > \tilde{\beta}$, the gatekeeper is passive but this reduces consumer surplus.*

The above proposition highlights a pro-competitive effect of platform duality and this is channeled via the elimination of the *Cournot effect* and a direct *competitive effect* Without entry, the competition between the third party platforms is a typical Cournot complement situation (see Lemma 1). When the gatekeeper offers a bundle and serves the multiuse consumers, third parties retreat to the singleuse segment and charge a lower price, corresponding to the monopoly price. To attract the multiuse consumers and deter any profitable deviation from third parties, the gatekeeper must charge a substantially lower bundle price. Entry therefore intensifies competition in the multiuse segment and reduces the price for multiusers.

These two effects can be decomposed by referring to a hypothetical situation in which the third parties maximize their joint profit. The optimal prices are equal to $p_1^* = p_2^* = 1/2$, with resulting profits $\Pi_1^* = \Pi_2^* = 3/4$. Compared to such a situation, without the entry of the gatekeeper, prices on the singleuse segments are above their optimal level because of the Cournot effect. Similarly, with entry, the price on the multiuse segment is below its optimal level due to the competition effect. As entry decreases the price paid by all consumers, it unambiguously benefits consumers.

Profits on the singleuse segment increase due to the elimination of the Cournot complement effect, while profits on the multiuse segment decrease because of the competitive effect.[18] Entry is, however, detrimental to the third parties, as the increased profit on their singleuse segment does not compensate for the loss of the multiuse segment. For the gatekeeper, the above proposition highlights that, in the absence of network externalities, it is almost always optimal to enter the market and compete with third parties with a bundle for the multiuse demand. One shall note, however, that the critical value

[18] This suggests that aggregate profits decrease. In an additional analysis, available upon request to the authors, we show that it is not always the case and that, with three products, the aggregate profit increases after entry.

$\tilde{\beta}$ is so large that does not match the real-world ad valorem fees, which are normally defined at a market commission rate of $15 - 30\%$ as, for example, in the case of Apple.

In what follows, we show how the presence of network externalities adds up to the effects just described.

The key role of network externalities. Suppose $\theta := \theta_1 = \theta_2 > 0$. By comparing Π_A^{NE} and Π_A^{E}, we can state the following proposition.

Proposition 4. *Suppose $\theta_1 = \theta_2$. Platform duality emerges with a bundle for any*

$$\beta < \tilde{\beta}(\theta) := \frac{p_A^* D_A^*}{\sum_{i=1}^{2} \left(\Pi_i^{NE*} - \Pi_i^{E*}\right)},$$

which decreases in θ, i.e., $\frac{\partial \tilde{\beta}}{\partial \theta} < 0$.

As intuition suggests, when the gatekeeper can extract a large portion of revenues from third parties (high β), it prefers to be 'passive' and act as a mere intermediary. On the contrary, when these revenues are not large enough, creating a second channel for direct sales to consumers becomes a profitable. Such a strategy, as discussed, is implemented by offering a product bundle targeting the multiuse segment.

The above proposition also highlights that platform duality becomes less likely when network externalities increase. As emerged both under Proposition 1 and 2, network externalities increase the profits of the gatekeeper in the two scenarios. However, profits increase at a faster rate when the platform does not take an active stance. The reason is that as network externalities get larger, if the platform is passive, consumers value more each other, the third parties' profits increase (because of an overall increase in the price) and this benefits the platform. On the contrary, under platform duality, third parties' profits increase at a lower rate because network benefits are limited to the singleuse market: demand increases but the price remains fixed because of the deterrence strategy of the platform. On top of this, the platform needs to price more aggressively to induce third parties not to compete in the multiuse segment as well. In turn, this implies that, as θ increases, the likelihood of observing the gatekeeper entry falls.

Figure 1 highlights the monotonic relationship existing between $\tilde{\beta}$ and θ, with the former decreasing as the latter increases.

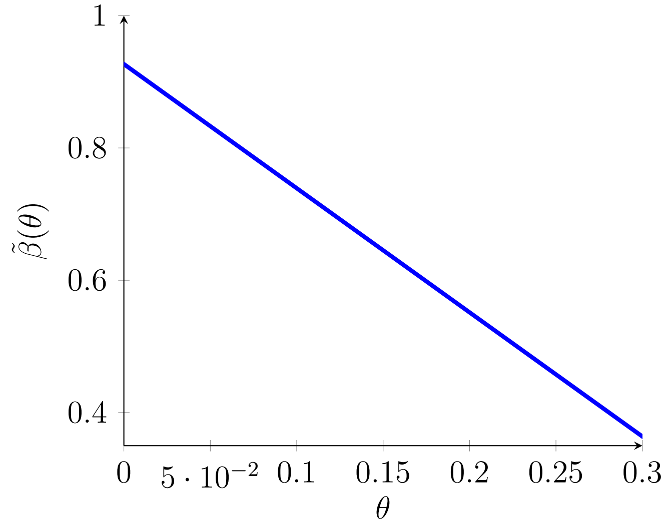


Figure 1: Critical $\tilde{\beta}(\theta)$

4.3. Implications for consumers

In this subsection, we study the welfare implications of the gatekeeper's decision. At first glance, one may think that a more active role of the gatekeeper would benefit consumers by exerting competitive pressure on third parties. This is what we observe when network externalities are absent (Proposition 3). For the ease of exposition, we relegate to the Appendix the formal analysis. In what follows, we show that platform duality does not necessarily imply an increase in consumer surplus.

Proposition 5. *Consumer surplus is higher under platform duality if, and only if, network externalities are sufficiently small, i.e.* $\theta < \tilde{\theta}$.

Proof. See Appendix. □

The above proposition compares consumer surplus in the two business regimes that the gatekeeper can adopt. When network externalities are sufficiently low, platform duality is always good news for consumers. The reason is that when the gatekeeper enters the product space of third parties, it eliminates the Cournot externality and the bundle price is very competitive (and decreasing in θ). However, as network externalities get larger, consumers derive a large benefit from the interaction with their peers. In this case, while the entry of the gatekeeper in the service provision exerts downward pressure on prices, it also fragments the presence of consumers across different alternatives. And so, when network externalities are large enough, the negative effect of consumer fragmentation across services outweighs any benefit from reduced prices.

Nevertheless, there are cases in which the decision of the gatekeeper is aligned with the interest of the consumers. This happens in two instances. First, when the network externalities and the ad-valorem fee levied on revenues are large enough, the network effects are large and the platform prefers does not offer its bundle of services. The platform prefers to be passive and earn from its revenue cut and such a choice benefits consumers. Second, when the revenue cut of the gatekeeper from third parties and the network externalities of consumers are both sufficiently small. In this case, the platform enters and competes with the third parties but the pro-competitive effect of the gatekeeper entry outweighs the negative effects that fragmentation entails (due to the small network externalities). These results are summarized below.

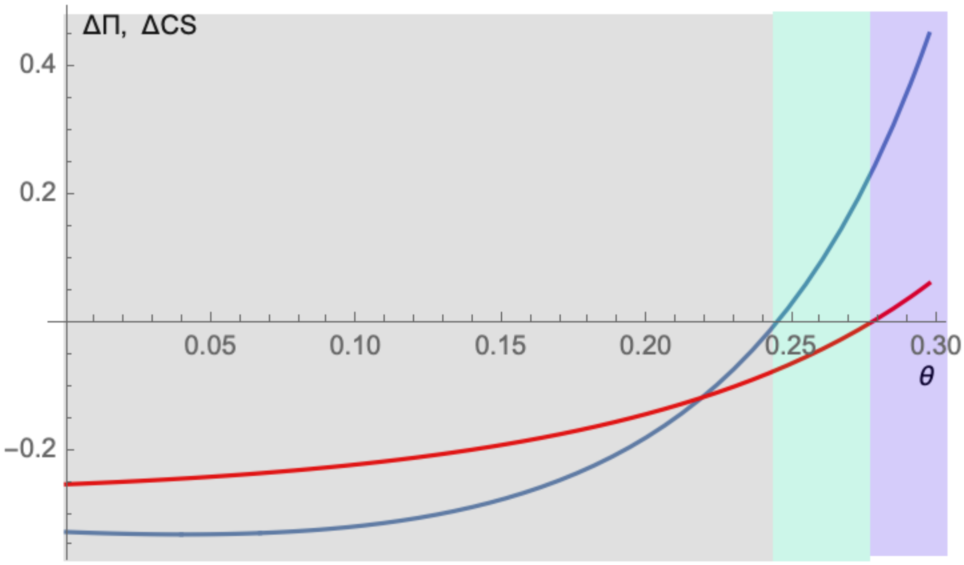
Proposition 6. *The gatekeeping platform's entry decision in the first-stage benefits consumers when*

- $\theta \geq \tilde{\theta}$ *and* $\beta \geq \tilde{\beta}$.
- $\theta < \tilde{\theta}$ *and* $\beta < \tilde{\beta}$.

Else, the gatekeeper's decision hurts consumers.

There are cases in which the decision of the platform hurts consumers. This happens when the platform takes a more active role and the network externalities are large. In this case, the pro-competitive benefit of the price reduction is outweighed by the negative impact of the consumer demand fragmentation and hence on consumers. Indeed, gatekeeper entry (dual role) hurts consumers. Another case in which the gatekeeper's (no) entry decision hurts consumers is when the network externalities are small and the platform does not enter.

Figure 2 plots the difference in consumer surplus and gatekeeper's profit if the gatekeeper is passive and active for a commission rate equal to 40%. One can note that if θ is sufficiently small the platform prefers to enter but its decision changes drastically when theta gets larger, e.g., $\theta \approx 0.28$. Consumer surplus is instead higher with the dual role of the platform when network externalities are sufficiently small, $\theta \leq 0.24$, but then as they grow, consumer surplus gets larger when the platform assumes a passive role. Indeed for $\theta \leq 0.24$, consumers and platform's interests are aligned. Likewise, interests are also aligned for $\theta \geq 0.28$, that is when the platform prefers not to offer its bundled services and consumers benefit from agglomeration. In the intermediate area ($0.24 < \theta < 0.28$), consumers would prefer a passive role of the platform but the platform chooses to be active by offering a bundle of services.



The red line identifies the difference in consumer surplus ($CS^{NE} - CS^{E}$), whereas the blue line the difference in profits ($\Pi^{NE} - \Pi^{E}$) when the gatekeeper does not enter compared to entry. The gray area identifies the area in which the platform adopts a dual role and consumers are better off. The pale-blue area identifies when the platform adopts a dual role but consumers are worse off, whereas the purple area identifies the area in which the platform takes a passive role and consumers are better off.

Figure 2: Profits and consumer surplus $\beta = 0.4$.

5. Extension

5.1. The role of multiuse consumers

In this section, we discuss how the mass of active multiuse consumers impacts our results. Multiuse consumers are those consumers that value both the products and this creates complementarity between the two seemingly independent products. The presence of this consumer demand leads to prices that are higher than the monopoly prices. By entering the product space of third parties with a bundle, the gatekeeper induces third parties to focus only on their singleuse segment and set monopoly prices, thereby eliminating the Cournot effect. When the relative mass of multiuse demand is significantly large compared to the singleuse market, the price set by each third party will also be significantly high. This will hurt both singleuse and multiuse consumers and lower total demand.

Based on our findings, we conjecture that for sufficiently large relative multiuse demand, the price-reducing effect of gatekeeper entry alongside the alleviation of the Cournot complementary effect would dominate any loss from reduced network externalities. Hence, if the gatekeeper finds it optimal to enter, such an entry decision would benefit consumers. On the contrary, in the presence of a sufficiently small relative multiuse demand, the main findings of our benchmark model would hold in full and entry might eventually hurt consumers when network externalities are sufficiently large.

6. Policy implications

In this section, we discuss three types of interventions that policymakers can follow to protect consumers. The first applies to the commission charged by the gatekeeping platforms, the second applies to the structure of their ecosystem; and the third focuses on preserving the consumer network benefits under duality.

6.1. Ex-ante and ex-post regulation of the commission fee

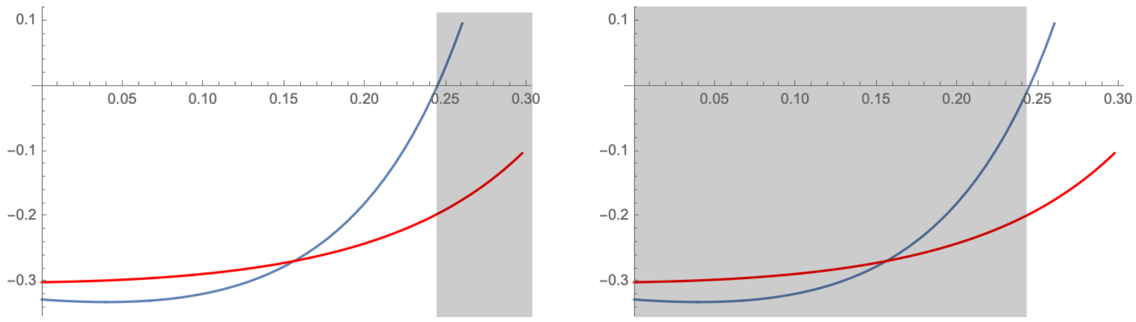
In the European Union, firms are subject to ex-post regulation by competition law. For example, art. 102(a) of the TFEU prohibits direct or indirect unfair prices by agents with a dominant position. This implies that in the market we consider, a high commission tax that may also be considered unfair, compared to the economic value provided by the gatekeeper, might result in *exploitation* and, hence, be deemed illegal. The recent *Apple v. Epic* case illustrates how the charge levied by a platform might potentially be considered excessive and how important becomes the definition of whether such a commission represents a tax or a distribution fee (Geradin & Katsifis 2020).[19] Similarly, in the US a class action antitrust case was filed in the District Court for the Northern District of California on the grounds of high prices charged by Apple to sellers.[20]

Adding to the above discussion, our results suggest that gatekeepers must tread a fine line. First, suppose policy makers adopt a classical form of ex-ante regulation, price caps, which are widely adopted for the utilities. A price cap might be imposed by policymakers on how much a gatekeeper charges third parties. Regardless of their nature, ex-ante (price cap) or ex-post (competition law) regulation entail a downward pressure on the revenues the platform makes from third parties. Our analysis suggests that a reduction of these revenues would encourage the gatekeeper to pursue new avenues to increase profits, including the adoption of a dual business model. However, such a practice might hurt consumers when network externalities are large.

[19]For more details on the *Apple vs. Epic* case, see e.g., Lexxion, September 4, 2020. 'Epic v Apple (1): introducing antitrust's latest Big Tech battle royale '. Available at: https://www.lexxion.eu/en/coreblogpost/epic-v-apple-1/

[20]See *In Re Apple & AT&TM Antitrust Litigation* filed in the United States District Court for the Northern District of California.

6.2. Ex-ante regulation of the gatekeeper ecosystem



(a) Laissez-faire (b) Structural separation

The gray area identifies the area in which consumers are worse off under laissez-fair (Panel a) and under structural separation (Panel b). The red line identifies the difference in consumer surplus ($CS^{NE} - CS^{E}$), whereas the blue line the difference in profits ($\Pi^{NE} - \Pi^{E}$).

Figure 3: Effect of ex-ante regulation on consumer surplus $\beta = 0.3$.

In this subsection, we present three types of regulations that can be applied to gatekeepers in light of their dual model. The first regime is a *laissez-faire* regime, which features no prohibition on the gatekeeper entry in adjacent markets. Indeed, platforms can assume a dual role. Second, we study a regime that features a *structural separation* of the platform's owner and its legs operating in the third party space. Indeed, this translates into the prohibition of duality. Finally, we study the effects of a *safe harbor* regime that allows duality under given conditions.

Laissez-faire. Suppose no regulation is enforced and the gatekeeper is allowed to compete with third parties whenever it finds it profitable. Consistently with the main insights from our model, the gatekeeper finds it optimal to enter the product space of third parties whenever the ad valorem fee is sufficiently low and it does so by offering a bundle of services. One can observe that such an entry can increase or reduce consumer surplus depending on the prevailing effect between the fragmentation of demand and price reduction. The gray area in Figure 3 identifies when consumers are worse off in a laissez-faire regime.

Structural separation (or ban on duality). A popular proposal, suggested in the recent report of the US House of Congress Subcommittee on Antitrust (US House Judiciary Committee 2020), and which mirrors discussion already existing in the law literature (Khan 2019), is to enforce a "structural separation remedy". Such a remedy would explicitly prohibit a dominant intermediary (gatekeeper) from operating in adjacent markets, that is those markets that put the platform in direct competition with the third parties dependent on its ecosystem. However, such a regime would hurt consumers when network externalities are either absent or small. This is because the competition effect and the elimination of the Cournot effect would outweigh demand fragmentation. The gray area in Figure 3 identifies conditions for which a ban on platform duality would make consumers worse off.

Safe harbor. A cautious policy might be the adoption of a safe harbor rule that allows the gatekeeper entry in the product space of third parties only when certain conditions are met. Duality might be allowed based on the strength of the network externalities. When network externalities are not strong enough and can be measured as below a critical level, gatekeeper entry might be considered innocuous and beneficial to consumers. In this case, the duality should be allowed under fair and non-discriminatory rules. When the strength of network effects is larger than the critical value, detailed market investigations[21], as those typically occurring in merger proceedings, might be advised. With a safe harbor provision, a critical challenge would be the identification of a measure of the network externality.

6.3. Preserving network benefits

Identifying a measure of network externality might be challenging. Our model underlines that consumers are hurt from platform duality when they are fragmented across services. A suitable way to avoid such an undesirable effect would be to preserve network externalities, allowing consumers to access their peers across services belonging to different operators.

In the jargon, such a practice is called 'interoperability' and it is a typical policy, often advocated (see Crémer et al. 2019), that allows entrants to challenge incumbents when network externalities are large. Specifically, it allows consumers to migrate their network goods onto other platforms. For instance, in the music streaming industry, these network effects can be in the form of user generated playlists available and portable across platforms. In the mobile messaging app world, this may ensure consumers the possibility to chat with friends even if they subscribe to different systems. In our scenario, a similar policy would limit, if not eliminate, the negative side of platform duality, making platform entry more aligned with the incentives of the consumers.

[21]For an interesting overview of the role of market investigation, see Fletcher (2020).

7. Concluding remarks

In recent years, the dual role of dominant platforms as infrastructure providers and competitors of third parties they host has been questioned. Most of the analyses so far suggest that (gatekeeper) entry is pro-competitive. Other concerns from policymakers and commentators have regarded the potential conflict of interest that a dual role might entail, e.g., self-preferencing, foreclosure of third parties.

In this paper, we examined the incentives of a gatekeeper to employ a dual role and studied its welfare impact. We abstracted away from any anti-competitive motives of entry and focused purely on how it impacts the network benefits enjoyed by consumers. We found that the gatekeeper entry becomes more likely when gatekeepers are unable to extract enough surplus from third parties by setting sufficiently high ad valorem fees. Moreover, entry decision becomes less likely the larger the network externalities.

Contrary to existing studies, we showed that when entry occurs, consumers are not always better off. This is because gatekeeper entry affects consumers in two opposing ways. Entry lowers prices while also reducing the extent of the benefit arising from the presence of other users on the platform. Indeed, when the network externalities are large enough, platform duality makes consumers and third parties worse off. This is because any price reduction and elimination of Cournot-related inefficiency is unable to compensate for the welfare loss caused by the fragmentation of consumers.

Our paper also provides direct policy implications. We documented that overlooking the presence of network externalities in digital markets might bias any analyses in favor of entry. Not accounting for network effects, prices hold full responsibility in explaining any consumer welfare change. However, when network effects are considered, the impact of (gatekeeper) entry on consumers is more subtle.

Our results suggest that any ex-ante regulation of the platform ecosystem, without clear economic justification, is likely to be challenged (if the burden of proof is on policymakers) and might deter innocuous and welfare-enhancing entry (if the burden of proof is on the industry). Indeed, this paper identified conditions under which entry is likely to be harmful to both third parties and consumers and suggests that accounting for the strength of network externalities in a given market is key to understanding any possible welfare impact. Likewise, other forms of ex-ante regulation (e.g., price cap) and ex-post remedy that creates downward pressure on the ad valorem fee are likely to induce more duality, and possibly hurt consumers if network externalities are large.

Appendix.

A.1. Proof of Lemma 2

Proof. From (1), equilibrium prices are as follows

$$p_i^* = \frac{1}{2}\left(\frac{5-8\theta_i}{64\theta_i\theta_j - 48\theta_i - 48\theta_j + 35} + 1\right) \text{ for } i \neq j \in 1, 2.$$

Deriving the above expression with respect to θ_i and θ_j, one can obtain the following

$$\frac{\partial p_i^*}{\partial \theta_i} = \frac{4(8\theta_j - 5)}{(16\theta_i(4\theta_j - 3) - 48\theta_j + 35)^2} < 0.$$

$$\frac{\partial p_i^*}{\partial \theta_j} = \frac{8(4\theta_i - 3)(8\theta_i - 5)}{(16\theta_i(4\theta_j - 3) - 48\theta_j + 35)^2} > 0.$$

As,

$$\frac{\partial p_i^*}{\partial \theta_j} > \left|\frac{\partial p_i^*}{\partial \theta_i}\right|,$$

then the composite price, $p_1^* + p_2^*$, increases in the network externality. Under symmetry, $\theta \equiv \theta_1 = \theta_2$, the optimal prices increase in the network externality θ.

As an increase inθ ultimately generates a higher price and equilibrium prices are already above $1/2$ (monopoly level), it follows that network externalities exacerbate the Cournot effect. □

A.2. Proof of Lemma 4

Proof. The gatekeeper sets prices to ensure that any unilateral deviation for third party applications from a monopoly price in their own respective market is not profitable.

Let us take a candidate equilibrium where both the third party applications set $p^* = 1/2$ and look at the deviation incentive of third party 1 when 2 chooses s$p^* = 1/2$.

The profit of the third party, given $p_2^* = 1/2$, is then equal to

$$\Pi_1 = p_i D_i = \frac{p_1(8\theta_2(p_1 - 1) - 6p_1 + 7)}{\theta_1(8\theta_2 - 6) - 6\theta_2 + 4}.$$

Indeed, we need to find the price p_1 such that $\Pi_1 < \Pi_1^M = \frac{1}{4(1-\theta_1)}$.

We find that, for all,

$$p_1 < \hat{p}_1 := \frac{8\theta_2 - 7}{4(4\theta_2 - 3)} - \frac{1}{4}\sqrt{\frac{-16\theta_1\theta_2 + 13\theta_1 - 16\theta_2^2 + 44\theta_2 - 25}{(\theta_1 - 1)(4\theta_2 - 3)^2}}.$$

Similarly, we get the minimum price below which third party application 2 given $p_1^* = 1/2$ does not find it profitable to enter the multiuse market as

$$p_2 < \hat{p}_2 := \frac{8\theta_1 - 7}{4(4\theta_1 - 3)} - \frac{1}{4}\sqrt{\frac{-16\theta_1^2 - 16\theta_1\theta_2 + 44\theta_1 + 13\theta_2 - 25}{(4\theta_1 - 3)^2(\theta_2 - 1)}}.$$

In both these cases, the gatekeeper sets

$$1 < p = 1/2 + \min\{\hat{p}_1, \hat{p}_2\}.$$

The above expression ensures that there is no profitable unilateral deviation for the third party application given that the rival sets the monopoly price. □

A.3. Proof of Proposition 4

Proof. The profit of the gatekeeper when it competes with the third party applications.

$$\Pi_A^E = -\frac{8\beta(3-4\theta)^2 - 4\left(-32\theta + \sqrt{\frac{25-32\theta}{(3-4\theta)^2}} + 44\right)\theta + 3\sqrt{\frac{25-32\theta}{(3-4\theta)^2}} + 59}{16(3-4\theta)^2(\theta-1)}. \tag{A-1}$$

The profit of the gatekeeper when it is passive is given as

$$\Pi_A^{NE} = -\frac{16\beta(\theta-1)(4\theta-3)}{(7-8\theta)^2(2\theta-1)} \tag{A-2}$$

Comparing profits in the two cases, we find that there exists a threshold

$$\tilde{\beta} := \frac{(7-8\theta)^2(1-2\theta)\left(16\theta(8\theta-11) + \sqrt{25-32\theta} + 59\right)}{8(3-4\theta)^2(2\theta(32\theta-55)+47)}$$

such that $\Pi_A^E - \Pi_A^{NE} \geq 0 \implies \beta \leq \tilde{\beta}$, and the opposite otherwise. □

A.4. Proof of Proposition 5

Proof. To begin with, let us consider the case when the gatekeeper is passive. Denote CS_i^{NE} the surplus of the singleuse consumers joining third party i and CS_{ij}^{NE} the surplus of the multiuse consumers that subscribe to both i and j. It follows that

$$CS_i^{NE} = \int_{v_i^{NE}}^1 (v + \theta D_1 - p_1) f(v) dv = \frac{(4\theta-3)^2}{2\left(16\theta^2 - 22\theta + 7\right)^2},$$

$$CS_{12}^{NE} = \int_{v_{ij}^{NE}}^1 (2v + \theta(D_1 + D_2) - p_1 - p_2) f(v) dv = \frac{(4\theta-3)^2}{\left(16\theta^2 - 22\theta + 7\right)^2}.$$

Consider now the consumer surplus when the gatekeeper is active, which is

$$CS_i^E = \int_{v_i^E}^1 (v + \theta D_1^{Tot} - p_1) f(v) dv = \frac{1}{8(1-\theta)^2},$$

$$
\begin{aligned}
CS_{12}^{E} &= \int_{v_{ij}^{E}}^{1} (2v + \theta(D_A + D_B) - p_A) f(v) dv \\
&= \frac{(\theta+1)\left(4\theta\left(-23\Psi + 16\theta\left(\Psi+2\right) - 48\right) + 33\Psi + 73\right)}{32(3-4\theta)^2(1-\theta)}.
\end{aligned}
$$

respectively for singleuse consumers subscribing to i and multiuse consumers subscribing to both, with $\Psi := \sqrt{\frac{25-32\theta}{(4\theta-3)^2}}$.

Call $CS^{NE} = CS_{12}^{NE} + CS_1^{NE} + CS_2^{NE}$ and $CS^E = CS_{12}^E + CS_1^E + CS_2^E$ the total consumer surplus when the gatekeeper is passive and active, respectively. By comparing the two, after tedious calculation, one can verify that there exists a threshold $\tilde{\theta}$ such that $CS^{NE} < CS^E$ if $\theta \leq \tilde{\theta} \approx 0.24$. This concludes the proof. □

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