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Platform Price Parity Clauses with Direct Sales *

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Abstract

We analyze the effects of price parity clauses in a setting where competing sellers distribute their products directly as well as through competing platforms. These clauses prevent a seller from offering its product at a lower price on other platforms or through its own direct sales channel. We show that when we account for the sellers' participation constraints, price parity clauses do not always lead to higher commissions and final prices. Instead, we find that they may simultaneously benefit all the actors (platforms, sellers and consumers), even in the absence of traditional efficiency arguments.

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1 Introduction

Price parity clauses have recently drawn a great deal of attention from competition agencies throughout the world, especially where they are used in business settings characterized by “agency” relationships between suppliers and intermediation platforms. Although traditional brick-and-mortar retailers have usually adopted a wholesale/retail model (whereby the retailer buys the product from the supplier at a given wholesale tariff and then sets the final price charged to consumers), online retail platforms have often adopted an “agency” business model, whereby the suppliers remain the owner of the goods (or services) and, thus, control the final prices, paying an output-based commission to the intermediary. In such a business model, a price parity clause is an agreement between a supplier (e.g., a hotel) and a retail platform (e.g., an online booking platform) by which the supplier commits not to sell its products or services at a lower price on any competing platform.¹

Price parity clauses have been the subject of several antitrust investigations over the past few years.² Although the main focus was on an explicit anticompetitive agreement, price parity clauses were at the heart of the investigations against Apple and leading book publishers in Europe and in the US.³ Amazon has also been the subject of several investigations by the UK Office of Fair Trading and the German Bundeskartellamt, but the cases were dropped in 2013 after Amazon announced that it would abandon the price restrictions on Amazon Marketplace across the EU. More recently, the UK Competition and Markets Authority (CMA) evaluated the competition effects of price parity clauses imposed by price comparison websites on insurance companies, as

¹Depending on the context, these agreements are sometimes referred to as “rate parity” clauses, “retail price most favored nations (MFN) clauses” or simply MFNs . However, an MFN clause often applies more generally to a seller’s “terms of trade” with its agent/retailer, and will usually cover the wholesale terms, rather than the final price.

²See Hviid (2015) for an extensive review of some of the major cases. Edelman and Wright (2015) also discuss many markets where intermediaries may impose “price coherence.”

³See the European Commission’s decisions in Case COMP/39847/E-Books (2012, 2013) and *United States v. Apple Inc.*, 952 F. Supp. 2d 638, 15 647 (S.D.N.Y. 2013).

part of its market investigation of the UK Motor Insurance Industry.⁴ Related issues have been debated in cases against payment card systems (e.g., Visa, MasterCard or American Express) in the US, Europe and many other jurisdictions. Indeed, payment systems have often used rules constraining merchants’ pricing strategies, in particular the “no surcharge rule”, preventing merchants from charging a higher price for card payments than for cash payments. As part of settlements with the US Department of Justice, Visa, MasterCard and American Express have all accepted that they can no longer impose this no-surcharge rule.⁵

A symbolic market that has been the focus of a series of antitrust investigations, notably in Europe, is the online booking platforms market. Investigations started a few years ago in the UK and Germany. In December 2013, the Bundeskartellamt reached a decision against *HRS*, a leading online travel agency (OTA) on the German market, and prohibited its price parity clauses (“best price clauses”). In December 2015, the Bundeskartellamt reached a similar decision against *Booking.com*, and an investigation of *Expedia* (*Expedia.com*, *Hotels.com*, ...) is ongoing. The Bundeskartellamt decisions prohibit all types of price parity, whether they apply to any distribution channel (wide price parity) or to only the hotels’ own websites (narrow price parity).

In a parallel investigation, the UK Office of Fair Trading (OFT) accepted, in January 2014, commitments offered by *Booking.com*, *Expedia* and the *Intercontinental Hotels Group (IHG)*. The OFT’s focus was not directly on the price parity clauses but rather on the ability of the platforms to offer discounts to final consumers (by giving back part of their commission). The accepted commitments thus concentrated on allowing platforms to offer rebates to “closed consumer groups” rather than on removing—totally or partially—the price

⁴The CMA’s decision, “Private motor insurance market investigation, Final order”, 18 March 2015 is available at: <https://www.gov.uk/cma-cases/private-motor-insurance-market-investigation>.

⁵The payment card systems are slightly more complex than online retailing platforms, as they involve merchant and issuing banks. Although the no-surcharge rule is implemented by the payment system, commissions are negotiated between the merchants and their banks. The complexity of this issue is further increased by the existence of payments between the consumers’ and the merchants’ banks (the so-called “interchange fee”).

parity clauses.⁶

Several investigations were later opened in at least six EU countries (Austria, France, Hungary, Italy, Ireland and Sweden)⁷. In April 2015, the French, Italian and Swedish competition agencies simultaneously accepted commitments offered by *Booking.com* to remove any availability requirements from their contracts and to switch from wide to narrow price parity clauses.⁸ Although it did not formally offer commitments to the competition agencies, *Expedia* followed *Booking.com* soon after by announcing that it would change its contracts in a similar fashion throughout Europe.

However, this was not the end of the cases. Following the decision by the Autorité de la Concurrence, the French government went further and imposed a law prohibiting any form of price parity (or control by the platforms) for hotel room bookings.⁹ The Austrian and Italian governments are currently proposing similar legislation to their respective parliaments.

It is interesting to observe the different approaches taken by competition authorities, with some agencies (such as the US Department of Justice) deciding to leave it up to consumers to go after potentially anticompetitive practices, some focusing on the price control aspect of the practices (as in the initial OFT case), some arguing that wide price parity clauses are likely to generate anticompetitive effects, whereas narrow price parity clauses should be allowed (as they prevent free-riding by the hotels on the services provided by the OTAs) and, finally, others deciding to ban any form of price parity. These differences in approaches may be explained by variations in market structure in different

⁶The case was later overturned by the UK Competition Appeals Tribunal. The CMA, who took over from the OFT, dropped the case in September 2015 but are “committed to 12 months of ongoing monitoring of market developments”.

⁷In October 2015, the Swiss Competition Commission prohibited the use of wide price parity clauses by *Booking.com*, *Expedia* and *HRS* but allowed them to adopt narrow price parity clauses. In September 2016, the Australian Competition and Consumer Commission accepted commitments offered by *Expedia* and *Booking.com* to amend the price and availability parity clauses in their contracts and to switch from wide to narrow price parity clauses.

⁸See Decision of 15 April 2015 by the Swedish Competition Authority in Case 596/2013.

⁹The “Loi Macron” came into force in August 2015.

geographic markets, but they may also reflect the fact that economists do not yet fully agree on the possible competitive effects of such clauses.

Irrespective of the market in which price parity clauses have been used (marketplaces, price comparison websites for insurance contracts, hotel booking platforms, . . .), competition authorities have come up with more or less the same theory of harm. According to competition agencies, price parity clauses limit competition between platforms on the level of the commissions that they charge to suppliers, and this ultimately leads to higher prices being charged to consumers.¹⁰ When platforms all impose wide price parity clauses, each supplier sells its product at the same price on all platforms (as well as directly). Then, unilaterally increasing its commission rate above the competitive equilibrium level may be profitable for a platform, because it does not run the risk of losing market share to its rivals. Therefore, it is argued that price parity clauses create an incentive for all platforms to increase their commissions—and, because higher commissions mean higher variable costs for the suppliers, this will ultimately lead to an increase in the prices charged to final consumers.¹¹

There exists an extensive body of literature on the effects of wholesale MFN clauses (i.e., price parity clauses regarding wholesale tariffs offered by a supplier to different retailers) and on price-matching (or price-beating) guarantees, dating back to the 1980s¹² However, the literature on the competitive effects of price parity clauses in agency business models is still relatively limited.

The first papers were inspired by the e-books antitrust cases. Gans (2012) considers a setting in which consumers have to join platforms (i.e., acquire a

¹⁰A second related concern is that the price parity clauses may hinder entry into the retail market. The argument is that because they effectively lock all prices at the same level, (wide) price parity clauses make it difficult for a firm to enter the market with a low-price strategy. This was indeed the main claim by plaintiff *Skoosh.com*, a low-cost OTA, in the UK case.

¹¹See Hviid (2015) and Ezrachi (2016) for more extensive reviews of the possible effects of price parity clauses and the theories developed by competition agencies in specific cases.

¹²See, among many others, Hviid (2010) or Lear (2012) for reviews of this literature.

device, such as a phone or tablet) before the prices for the applications are set.¹³ He shows that in this context, a price parity clause may help to solve a holdup problem and may be welfare increasing. Foros *et al.* (2016) focus on the choice of business format (traditional wholesale or agency models) by retailers and show that even if the platforms’ commission rates remain the same across regimes (for exogenous reasons), the use of price parity clauses may facilitate the adoption of the agency model—which, in turn, may involve higher consumer prices than the wholesale model under certain conditions.

The main theory of harm presented above can be closely related to two very recent papers. Boik and Corts (2016) analyze the effects of price parity clauses on prices and entry in a “traditional” vertical relationship model, in which a monopolist supplier sells its product through two differentiated platforms (charging constant per-unit commissions). In this context, they show that price parity clauses lead to higher commissions and higher final prices and, thus, may prevent entry by low-cost competitors. Johnson (2014) extends this model to multiple suppliers (using constant revenue-sharing rules rather than per-unit commission fees) and finds similar results. In both papers, the intuition for this anticompetitive effect of price parity clauses is identical to the theory of harm of the competition agencies. Our paper is very closely related to Boik and Corts (2016) and Johnson (2014), with two major differences: first, we allow suppliers to sell directly (through their own websites, for instance) as well as through agents; and second, we account for the suppliers’ listing decisions; that is, we do not assume that suppliers are always active on all platforms.

Rey and Vergé (2016) consider secret negotiations between multiple suppliers and multiple retailers allowing for nonlinear tariffs. Although their focus is not primarily on price parity clauses, they briefly consider their role in the agency business model. In their setting, equilibrium commissions are “cost based,” in the sense that the marginal commissions are always equal to the platforms’ marginal distribution cost, whether price parity clauses are used or

¹³The model also applies to consumers buying reading devices (Kindle or iPad) before the prices for the e-books are set.

not. Therefore, in a symmetric setting, price parity clauses have no impact on prices. However, their model does not necessarily fit well with some of the markets under investigation (notably the market for hotel booking platforms), where the commissions do not appear to be bilaterally efficient and may, therefore, generate double-marginalization effects.

The vertical relationships models mentioned above do not integrate all features of some online platforms. In particular, they do not account for consumer search or for services offered by platforms (on which suppliers could sometimes free ride). There is a second set of recent papers that try to account for these features but under some restrictive assumptions (on suppliers' differentiation or on vertical contracting). Wismer (2013) assumes that consumers first decide which product to buy, having observed prices on one platform only, and that they can then compare the price of that product on different platforms. Wang and Wright (2016) consider how price parity clauses may help to curb the risk of free-riding by platforms (through showrooming; i.e., using platforms to attract "searchers" and to sell the product at a lower price on their own website). They show that price parity may be useful for guaranteeing that platforms are viable. However, consumers do not necessarily benefit, as the platform can then charge higher commissions to suppliers. When competition between platforms is introduced, they show that wide price parity clauses always harm consumers, whereas narrow price parity clauses may benefit them. One important assumption in their model is that a supplier has to be active on the platform in order to generate any sales. Hence, delisting in this case is never a viable strategy. Moreover, because purchasing through the platforms is assumed to be superior to purchasing directly— for the consumer, all else being equal—all sales are made through the platforms in equilibrium whenever price parity clauses are used. It is worth noting that the latter does not fit very well with some of the motivating examples that we have in mind, such as, for example, the markets for payment systems and hotel bookings.¹⁴ In a related setting, Edelman and Wright (2015) show that when consumers can

¹⁴In each of these markets, the direct sales (i.e., cash payments and booking through hotels' websites) amount to a nonnegligible share of the total sales.

buy directly from the supplier or through one or more platforms, price parity clauses lead to higher prices and excessive investment by the platform (offering additional benefits to consumers to attract them away from the direct sales channel).

In this paper, we put the competition agencies' main theory of the harm caused by price parity clauses under new scrutiny. We present a standard vertical relationships model (i.e., we abstract from any efficiency argument, such as the protection of investment by platforms or the enabling of more efficient search) in which two differentiated platforms compete by offering (per-unit) commissions to multiple differentiated suppliers. We assume that the commissions are offered secretly and, therefore, that each supplier does not observe the commissions of its rivals. The suppliers in turn compete in prices on the downstream market, reaching consumers both indirectly through the (intermediation) platforms and directly through their own sales channel (e.g., a website).

We argue that the claim that price parity clauses necessarily cause an increase in platform commissions (as in Boik and Corts (2016) and Johnson (2014)) rests on the (implicit or explicit) assumptions that suppliers are not competing against each other and/or are not able to choose where to distribute their products. Instead, we find that when we allow each supplier to choose whether to list on both platforms or only on one, in addition to selling directly, whether price parity clauses lead to higher or lower commissions depends on the degree of competition between the suppliers. In particular, we find that price parity clauses may simultaneously lead to higher profits for platforms and suppliers, and increase consumer surplus.

Without the use of price parity clauses, a supplier is free to adjust the price in each sales channel to internalize fully the marginal cost of selling through that particular channel. Hence, given that the platforms' commission rates are higher than the supplier's cost of selling directly, the price is higher for intermediated sales than for direct sales. When the platforms impose price parity clauses, a supplier charges the same price in all channels, which, all else being equal, increases the supplier's average cost of distributing the product.

It therefore becomes more tempting for the supplier to deviate and to be active on only one of the platforms, which has the effect of reducing the supplier's average distribution costs, allowing the supplier to undercut its rivals. This strategy will become extremely profitable when suppliers are close substitutes, unless the platforms charge a very low commission. Hence, when the platforms use price parity clauses, the supplier's participation constraint on each platform binds, thus constraining the platforms' ability to raise prices.

We then compare the effects of wide and narrow price parity clauses. A narrow price parity clause implies that a supplier may set different prices on the two platforms. However, the supplier's price when selling directly has to be at least as high as the supplier's price on the "most expensive" platform. This means that in principle, the supplier may set a lower price on the platform that offers the lowest commission. This, in turn, may cause the platforms to compete and to reduce their commissions relative to the case with wide price parity. However, we find this not to be the case. Instead, we show that to induce a price reduction from the suppliers, a platform has to offer a commission rate that is drastically (not marginally) lower than its rival, which turns out to be unprofitable. Hence, as long as the commissions are not too different, the suppliers' prices will remain the same in all three channels. Thus, narrow price parity clauses play the same role as wide price parity clauses.

The rest of the paper is organized as follows. We present the model in Section 2, and we solve it for the case where suppliers can freely set prices in Section 3. In Section 4, we solve the model assuming that both platforms (exogenously) impose price parity clauses. We first consider wide price parity clauses before turning to the use of narrow price parity clauses. In Section 5, we endogenize the platforms' decisions to impose price parity and show that our results are unaffected. Finally, in Section 6, we summarize our results and suggest possible policy implications before discussing the robustness of our model.

2 Model

We consider a setting where $N \geq 2$ symmetrically differentiated suppliers compete for customers. Suppliers can reach final consumers by selling through two symmetrically differentiated platforms (intermediated sales), A and B , or through direct sales (e.g., on their own website), D . The platforms and the direct sales channels may be, for example, online booking sites, such as *Booking.com*, *Expedia* and hotels’ websites, or competing payment systems, such as *Visa*, *MasterCard* and cash payments; the suppliers may be hotels or brick-and-mortar retailers.

The suppliers’ production costs are assumed to be linear (i.e., we assume constant marginal costs), and we normalize the marginal production cost to zero. The marginal distribution costs are also normalized to zero for all distribution channels—i.e., we assume that selling directly is as efficient as selling through a platform. Therefore, some consumers may be attracted to the platforms simply because they offer a different “service” from the suppliers’ direct sales channels.¹⁵

Because of imperfect substitution between suppliers, as well as between sales channels, there exist up to $3N$ different products from the consumers’ point of view. Thus, demand for supplier j ’s product sold on platform i , where $i \in I \equiv \{A, B, D\}$ and $j \in J \equiv \{1, \dots, N\}$, depends on the vector of final prices $\mathbf{p} = (p_{ij})_{i \in I, j \in J}$. We assume that (inverse) demand functions are linear and that the (inverse) demand for supplier j on platform i is given by:

$$p_{ij}(\mathbf{q}) = 1 - q_{ij} - \alpha \sum_{k \neq j \in J} q_{ik} - \beta \sum_{h \neq i \in I} \left(q_{hj} + \alpha \sum_{k \neq j \in J} q_{hk} \right),$$

where $\alpha \in]0, 1[$ measures the degree of interbrand substitution (i.e., between suppliers) and $\beta \in]0, 1[$ measures the degree of intrabrand substitution (i.e., between platforms). Note that this demand specification implies that the platforms and the direct sales channel are symmetrically differentiated.

¹⁵We discuss in section 6 how the results are affected when the marginal cost of selling directly to consumers is strictly positive.

Given the set of products that are effectively available (i.e., for which $q_{ij} > 0$), we obtain the (direct) demand functions by inverting the system of equations for the indirect demand functions for these products. For instance, when all $3N$ “products” are available (i.e., all suppliers sell positive quantities through the three channels), the demand for supplier j ’s product on platform i is given by:¹⁶

$$q_{ij}(\mathbf{p}) = \frac{1 - \theta}{(1 - \theta\alpha)(1 + 2\beta)} \frac{(1 + \beta) \left(\frac{1 - \alpha}{1 - \theta} p_{ij} - \alpha \sum_{k \neq j \in J} p_{ik} \right) - \beta \sum_{h \neq i \in I} \left(\frac{1 - \alpha}{1 - \theta} p_{hj} - \alpha \sum_{k \neq j \in J} p_{hk} \right)}{\frac{1 - \alpha\theta}{1 - \theta} (1 - \alpha)(1 - \beta)(1 + 2\beta)},$$

where:

$$\theta \equiv \frac{(N - 1)\alpha}{1 + (N - 2)\alpha} \in]0, 1[\quad (1)$$

is the diversion ratio from one supplier to its rivals on a given platform; i.e., the share of the sales that are lost by supplier j on platform i , following an increase in the price p_{ij} , that are (collectively) captured by the other suppliers on that platform.¹⁷

Like Boik and Corts (2016), we assume that the contract signed between platform $i \in \{A, B\}$ and supplier $j \in J$ boils down to a constant per-unit commission w_{ij} paid by supplier j for each unit that it sells through platform i . In practice, platforms often impose revenue-sharing rules on suppliers, whereby the commission paid by supplier j to platform i is equal to a (constant) fraction of the revenues generated by the supplier through this platform. We could have focused on such revenue-sharing rules (as in Johnson (2014) or Foros *et*

¹⁶This demand specification is similar to that used in Ziss (1995). Although this demand function has some “unusual” features (for instance, $\frac{\partial q_{ij}}{\partial p_{hk}} < 0$ when $i \neq h$ and $j \neq k$), it keeps exposition simple and avoids the need to add restrictions on parameter values for α and β . Alternatively, we could simply extend the linear demand specification used by, among others, Rey and Vergé (2010) to $3N$ products, and we would obtain qualitatively similar results.

¹⁷Formally, this diversion ratio is $\frac{(N-1)\alpha(1-\theta)}{1-\alpha} = \frac{(N-1)\alpha}{1+(N-2)\alpha} = \theta$.

al. (2016), for instance), but the analysis quickly becomes intractable (even with our restriction to linear demands). Like revenue-sharing rules, linear commissions introduce vertical inefficiencies due to double marginalization, contrary to what would occur with more general nonlinear commissions (such as in Rey and Vergé (2016)). We believe that most of our qualitative results would apply to both types of commissions and, thus, prefer to focus on the simpler per-unit commission.¹⁸

Building on the earlier literature following Hart and Tirole (1990), we focus on secret contracting and assume that the commission offered by platform i to supplier j , as well as the supplier’s decision to accept that offer, is private information to the two parties. Modeling secret contracting in multilateral relationships is tricky, even in the absence of upstream competition.¹⁹ To keep the analysis as tractable as possible and to avoid some technicalities, we adopt the “contract equilibrium” approach developed by Crémer and Riordan (1987) and Horn and Wolinsky (1988), which has also been used in the context of downstream price competition by O’Brien and Shaffer (1992). The timing of the game is as follows.

1. Platforms $i \in \{A, B\}$ simultaneously offer individualized per-unit commissions to suppliers. Offers are secret, and listing decisions are not observed by the rival suppliers.
2. Suppliers simultaneously set retail prices on all platforms (including the direct sales channel) on which they are active.

We look for the “contract equilibria” of this two-stage game in which all suppliers are active on all channels, defined as follows. In the retail pricing stage, each supplier chooses its prices, assuming that its rivals set the equilibrium prices. In the contracting stage, platform i offers to supplier j the (acceptable) commission that maximizes its profit, given the other equilibrium commissions and resulting retail behavior.

¹⁸Note that the assumption of linear commissions is consistent with the main theory of harm put forward by antitrust authorities in several recent cases.

¹⁹See McAfee and Schwartz (1995) and Rey and Vergé (2004).

To state this formally, we use the following notations.

- $\mathbf{p}_j = (p_{ij})_{i \in I}$ denotes the vector of supplier j 's prices, and \mathbf{p}_{-j} denotes the vector of prices for all suppliers other than supplier j .
- When convenient, we express the vector of all retail prices as $\mathbf{p} = (\mathbf{p}_j, \mathbf{p}_{-j})$.
- We sometimes decompose the vector of supplier j 's prices as $\mathbf{p}_j = (p_{ij}, \mathbf{p}_{-i,j})$.
- We use $\mathbf{w}_j = (w_{ij}, w_{hj})_{i \neq h \in \{A,B\}}$ to denote the vector of commissions accepted by supplier j .

Definition 1 (*Contract equilibrium*)

A contract equilibrium (with unobservable offers and acceptance decisions) is a vector of commissions $\mathbf{w}^* = (w_{ij}^*)_{i \in \{A,B\}, j \in J}$, a vector of equilibrium retail prices $\mathbf{p}^* = (p_{ij}^*)_{i \in I, j \in J}$ and a vector of price responses $(\mathbf{p}_j^R(\mathbf{w}_j))_{j \in J}$, such that the following holds:

- In the second stage, for any vector of commissions \mathbf{w}_j that it has been offered, supplier j 's pricing strategy $\mathbf{p}_j^R(\mathbf{w}_j)$ is given by:

$$\mathbf{p}_j^R(\mathbf{w}_j) = \arg \max_{\mathbf{p}_j} \left[\sum_{i \in \{A,B\}} (p_{ij} - w_{ij}) q_{ij}(\mathbf{p}_j, \mathbf{p}_{-j}^*) + p_{Dj} q_{Dj}(\mathbf{p}_j, \mathbf{p}_{-j}^*) \right],$$

and the equilibrium prices and commissions satisfy $\mathbf{p}_j^* = \mathbf{p}_j^R(\mathbf{w}_j^*)$ for every $j \in J$.

- In the first stage, each commission w_{ij}^* offered by platform i to supplier j maximizes the platform's profit, taking as given the other equilibrium commissions faced by the supplier, the supplier's pricing $\mathbf{p}_j^R(\mathbf{w}_j)$ and the rival suppliers' equilibrium prices \mathbf{p}_{-j}^* . That is:

$$w_{ij}^* = \arg \max_{w_{ij}} \left[w_{ij} q_{ij}(\mathbf{p}_j^R(w_{ij}, w_{hj}^*), \mathbf{p}_{-j}^*) + \sum_{k \neq j \in J} w_{ik}^* q_{ik}(\mathbf{p}_j^R(w_{ij}, w_{hj}^*), \mathbf{p}_{-j}^*) \right].$$

In what follows, we restrict our attention to “symmetric” contract equilibria (i.e., $w_{ij}^* = w^*$ for every $i \in \{A, B\}$ and every $j \in J$) for which all suppliers are active on all three channels (i.e., they sell on both platforms as well as directly). In our linear demand setting, it is not difficult to prove that there is a unique contract equilibrium in which all suppliers are active and that this equilibrium is “symmetric”, but focusing directly on a symmetric equilibrium greatly simplifies the exposition.

3 Unrestricted pricing

We start by assuming that suppliers can freely set the prices in all three sales channels. Consider first the pricing decisions made by supplier j when it faces commissions \mathbf{w}_j . When setting its prices, supplier j anticipates that its rivals will set the equilibrium prices, \mathbf{p}_{-j}^* and, thus, it chooses the prices $\mathbf{p}_j^R(\mathbf{w}_j)$ given by:

$$\mathbf{p}_j^R(\mathbf{w}_j) = \arg \max_{\mathbf{p}_j} \left[\sum_{i \in \{A, B\}} (p_{ij} - w_{ij}) q_{ij}(\mathbf{p}_j, \mathbf{p}_{-j}^*) + p_{Dj} q_{Dj}(\mathbf{p}_j, \mathbf{p}_{-j}^*) \right].$$

Given that we focus on symmetric equilibria, retail prices will also be “symmetric”, in the sense that all suppliers set the same prices on a given platform; that is, $p_{ij}^* = p_i^*$. Moreover, we have $p_A^* = p_B^* \equiv p_P^*$. Using this symmetry, and the fact that $\alpha(N-1) = \frac{\theta(1-\alpha)}{1-\theta}$ (from (1)), the quantity $q_{ij}(\mathbf{p}_j, \mathbf{p}_{-j}^*)$ simplifies to (for any $i \in I$):

$$q_{ij}(\mathbf{p}_j, \mathbf{p}_{-j}^*) = \frac{(1-\beta)(1-\theta) - (1+\beta)(p_{ij} - \theta p_i^*) + \beta \sum_{h \neq i \in I} (p_{hj} - \theta p_h^*)}{(1-\alpha\theta)(1-\beta)(1+2\beta)}.$$

Solving for supplier j 's optimal pricing strategy yields:

$$p_{ij}^R(\mathbf{w}_j) = \frac{1-\theta + \theta p_P^* + w_{ij}}{2} \text{ for } i \in \{A, B\}, \text{ and } p_{Dj}^R(\mathbf{w}_j) = \frac{1-\theta + \theta p_D^*}{2}.$$

In any symmetric equilibrium, the equilibrium retail prices must satisfy

$p_P^* = p_{A_j}^R(w^*, w^*)$ and $p_D^* = p_{D_j}^R(w^*, w^*)$. Thus:

$$p_P^* = \frac{1 - \theta + w^*}{2 - \theta} \quad \text{and} \quad p_D^* = \frac{1 - \theta}{2 - \theta}.$$

In the first stage, the commission offered by platform i to supplier j maximizes the platform's profit, taking as given the other equilibrium commissions faced by all suppliers (w^*) and the supplier's pricing $\mathbf{p}_j^R(\mathbf{w}_j)$, as well as the rival suppliers' equilibrium prices \mathbf{p}_{-j}^* . Thus, the (symmetric) equilibrium commission w^* solves:

$$w^* = \arg \max_w \left[w q_{ij}(\mathbf{p}_j^R(w, w^*), \mathbf{p}_{-j}^*) + \sum_{k \neq j \in J} w^* q_{ik}(\mathbf{p}_j^R(w, w^*), \mathbf{p}_{-j}^*) \right]. \quad (2)$$

In principle, the platform needs to ensure that the supplier is willing to accept this commission and will effectively sell through the platform. However, given that the suppliers can freely set prices through all channels, a supplier will never drop a channel unless the commission set by that platform is excessive. However, it is never in the interest of a platform to set such an excessive rate, and it is easy to check that this is never the case in an equilibrium with unrestricted pricing.

Given that only the price p_{ij}^R depends on w_{ij} , the first-order condition of the maximization program given by (2) is written as:

$$w^* \frac{\partial p_{ij}^R}{\partial w_{ij}} \sum_{k \in J} \frac{\partial q_{ik}}{\partial p_{ij}} + q_{ij}(\mathbf{p}_j^*, \mathbf{p}_{-j}^*) = 0 \quad \iff \quad w^* = \frac{2(1 - \beta)}{2(2 + \beta) - \theta(1 + \beta)}.$$

Proposition 1 (*Unrestricted pricing equilibrium*)

When suppliers can freely set prices on all platforms, there exists a unique contract equilibrium for which all suppliers are active on all three channels. In this equilibrium, platforms charge the same commission w^ , such that:*

$$w^* = \frac{2(1 - \beta)}{2(2 + \beta) - \theta(1 + \beta)}.$$

The suppliers set prices $p_{ij}^* = p_P^*$ on the platforms A and B and prices $p_{Dj} = p_D^*$ when selling directly, where:

$$p_D^* = \frac{1 - \theta}{2 - \theta} \quad \text{and} \quad p_P^* = p_D^* + \frac{w^*}{2 - \theta}.$$

Unsurprisingly, the equilibrium commission decreases as the two platforms become closer substitutes (i.e., it is a decreasing function of β) and tends toward zero (and, thus, all prices become equal) as β tends toward one. The equilibrium commission increases as suppliers become closer substitutes or as the number of suppliers increases (i.e., w^* is an increasing function of θ and, therefore, an increasing function of α and N). When competition between suppliers is fierce (i.e., θ becomes closer to 1), price competition leads to low retail prices (i.e., close to the commission on the platforms and close to zero for the direct sales). Thus, the platforms can afford to charge higher commissions to compensate for the increase in intrabrand competition.

4 Price parity clauses

In this section, we assume that both platforms impose price parity clauses on their suppliers and consider these clauses as exogenously given. At this stage, we do not consider asymmetric situations in which only one of the two platforms requires price parity, but we allow the platforms to adopt price parity clauses endogenously in Section 5. Below, we analyze the effects of the two types of price parity clauses in turn.

- **Wide price parity:** under a wide price parity clause, platform i (with $i \in \{A, B\}$) does not allow a supplier to sell at a lower price anywhere else. Thus, it must be the case that for every $j \in J$, $p_{ij} \leq \min \{p_{hj}, p_{Dj}\}$. When both platforms impose wide price parity clauses, a supplier has to charge the same price on both platforms, and this common price has to be lower than the price charged for direct sales; i.e., $p_{Aj} = p_{Bj} \leq p_{Dj}$. Given that it is cheaper to sell directly (and that demand functions are symmetric), this last condition is always binding. Thus, under wide

price parity, a supplier sets a unique price p_j , which is then used on all channels (on which the supplier decides to be active).

- **Narrow price parity:** under a narrow price parity clause, platform i (with $i \in \{A, B\}$) allows the supplier to set its price freely on platform $h \neq i \in \{A, B\}$ and only requires that the price charged on its platform should not exceed the direct sales price; i.e., $p_{ij} \leq p_{Dj}$. When both platforms impose narrow price parity clauses, the supplier can freely choose the prices charged on both platforms but has to charge a price for direct sales that is higher than the price charged on the most expensive platform; i.e. $p_{Dj} \geq \max\{p_{Aj}, p_{Bj}\}$. Again, because it is cheaper to sell directly (and demand functions are symmetric), this last condition is binding; i.e., $p_{Dj} = \max\{p_{Aj}, p_{Bj}\}$.

4.1 Wide price parity clauses

We start by examining wide price parity clauses and focus on a (symmetric) contract equilibrium for which all suppliers are active in all three channels.

4.1.1 Deriving the equilibrium commission and retail price

In such an equilibrium, all suppliers charge the same price in all channels; i.e., $p_{ij} = p^W$ for every $i \in I$ and every $j \in J$. Given the equilibrium prices (p^W) set by its rival suppliers, when supplier j sets a common price p on all platforms, it sells a quantity $\hat{q}_j(p, p^W)$ in each channel, whereas each rival supplier sells a quantity $\hat{q}_{-j}(p, p^W)$ in each channel, where:

$$\hat{q}_j(p, p^W) = \frac{1 - \theta - p + \theta p^W}{(1 - \alpha\theta)(1 + 2\beta)} \quad \text{and} \quad \hat{q}_{-j}(p, p^W) = \frac{(1 - \theta)(1 - \alpha - p^W + \alpha p)}{(1 - \alpha\theta)(1 - \alpha)(1 + 2\beta)}.$$

Therefore, if it sells through all three channels, supplier j 's optimal price $p^R(\mathbf{w}_j)$ is equal to:

$$p^R(\mathbf{w}_j) = \arg \max_p 3 \left(p - \frac{w_{Aj} + w_{Bj}}{3} \right) \hat{q}_j(p, p^W) = \frac{1 - \theta + \theta p^W + \frac{w_{Aj} + w_{Bj}}{3}}{2}.$$

Given that each supplier sets the same price on all three channels and that these channels are symmetrically differentiated, everything occurs—on the suppliers’ side—as if there is only one channel and the supplier’s cost is the “average” commission (with the convention that the commission is equal to zero for direct sales); that is, supplier j faces an average marginal cost equal to $\frac{w_{A_j} + w_{B_j}}{3}$.

In addition, in any symmetric equilibrium, the retail price satisfies:

$$p^W = p^R(w^W, w^W) \quad \Longleftrightarrow \quad p^W = \frac{1 - \theta}{2 - \theta} + \frac{2w^W}{3(2 - \theta)}.$$

In the first stage, the commission offered by platform i to supplier j , w_{ij} , maximizes the platform’s profit π_i , taking as given the other equilibrium commissions faced by all suppliers (w^W) and supplier j ’s pricing strategy $p^R(w_{ij}, w^W)$, as well as the rival suppliers’ equilibrium prices p^W . Thus, the profit is:

$$\begin{aligned} \pi_i(w_{ij}, w^W) &= w_{ij} \hat{q}_j(p^R(w, w^W), p^W) + (N - 1)w^W \hat{q}_{-j}(p^W, p^R(w, w^W)) \\ &= w_{ij} \frac{6(1 - \theta) - (2 - \theta)w - (2 - 3\theta)w^W}{6(1 - \alpha\theta)(2 - \theta)(1 + 2\beta)} \\ &\quad + w^W \frac{\theta [6(1 - \alpha) + \alpha(2 - \theta)w + (4 - 2\alpha - \alpha\theta)w^W]}{6\alpha(1 - \alpha\theta)(2 - \theta)(1 + 2\beta)}. \end{aligned}$$

If one abstracts (for a moment) from suppliers’ incentives to accept an offer by a platform (and, thus, assumes that any offer will be accepted), the “unconstrained” commission will be given by:

$$\partial_{w_{ij}} \pi_i(w^W, w^W) = 0 \quad \Longleftrightarrow \quad w^W = \frac{6}{6 - \theta} > w^*.$$

Therefore, if the suppliers’ participation on both platforms is taken for granted, wide price parity clauses appear to allow platforms to increase their commissions substantially, in line with the results derived by Boik and Corts (2016) in the case of a monopolistic supplier and by Johnson (2015) in the case of

multiple platforms and multiple suppliers. It is also fully consistent with the theory of harm that has been developed by several competition authorities in recent cases.

However, one should carefully assess whether a supplier would have an incentive to delist from an excessively expensive platform, thereby reducing the incentives for a platform to increase its commission unilaterally above w^* . In our context, supplier j may have an incentive to reject platform i 's commission if it becomes sufficiently high—given that it has already accepted (or anticipates accepting) the rival platform's ($h \neq i$) commission and given that it anticipates that rival suppliers will list on both platforms. Formally, consider the case of supplier j having just received the offer w^W from platform i and anticipating that all other offers (identical to that one) will be accepted, and its rival then charging price p^W in all three channels. If it accepts the offer and sells on platform i (as well as through the other two channels), its profit is:

$$\pi_j(w^W, w^W) = 3 \left(p^W - \frac{2w^W}{3} \right) \hat{q}_j(p^W, p^W) = \frac{(1 - \theta)^2 (3 - 2w^W)^2}{3(1 - \alpha\theta)(2 - \theta)^2(1 + 2\beta)}.$$

Alternatively, supplier j could decide to reject platform i 's offer and sell only through the rival platform and the direct sales channel.²⁰ Assuming that deviations from the equilibrium are never observed by the rival suppliers (the rivals do not realize that supplier j does not sell through platform i), these rivals continue to set retail prices equal to p^W in all three channels.²¹ Therefore,

²⁰Given that we consider contract equilibria, it is assumed that supplier j takes its (acceptance) decision vis-à-vis the rival platform ($h \neq i$) as given. Thus, it is impossible for a supplier to consider delisting from both platforms simultaneously.

²¹If supplier j 's deviation from the equilibrium strategy (i.e., its decision to reject platform i 's offer) is observed by the rivals before suppliers set their prices, the rival suppliers will modify their retail prices, thus affecting supplier j 's incentives to deviate. Whether the decision is observable or not does not qualitatively affect our analysis. Therefore, we prefer to keep the presentation as simple as possible and to focus on the case where the deviations are not observed by rival suppliers.

supplier j 's maximal profit following this deviation is:

$$\tilde{\pi}_j(w^W) = \max_p \left[2 \left(p - \frac{w^W}{2} \right) \tilde{q}_j(p, p^W) \right],$$

where:

$$\tilde{q}_j(p, p^W) \equiv q_{ij}((p, p, \infty), \mathbf{p}^W) = \frac{6(1-\theta) - 3(2-\theta)p + 2\theta w^W}{3(1-\alpha\theta)(2-\theta)(1+\beta)}$$

is the quantity sold by supplier j on each channel through which it remains active (i.e., platform $h \neq i$ and direct sales) when it sets a price equal to p in these channels (and does not sell on platform i , which we denote by $p_{ij} = \infty$) and the rival suppliers all set prices equal to p^W on all three channels. Thus, the deviation profit is equal to:

$$\tilde{\pi}_j(w^W) = \frac{(12(1-\theta) - (6-7\theta)w^W)^2}{72(1-\alpha\theta)(2-\theta)^2(1+\beta)}.$$

Comparing the two profits when the commission is equal to $\frac{6}{6-\theta}$, we find that:

$$\begin{aligned} \pi_j\left(\frac{6}{6-\theta}, \frac{6}{6-\theta}\right) &> \tilde{\pi}_j\left(\frac{6}{6-\theta}\right) \\ \Leftrightarrow \frac{(3-2\theta)^2}{2(1-\alpha\theta)(6-\theta)^2(1+\beta)} &> \frac{3(1-\theta)^2}{(1-\alpha\theta)(6-\theta)^2(1+2\beta)} \\ \Leftrightarrow \frac{(3-2\theta)^2}{6(1-\theta)^2} &> \frac{1+\beta}{1+2\beta}. \end{aligned}$$

The left-hand term of the last inequality is minimized for $\theta = 0$ and, thus, it is larger than $\frac{3}{2}$ for any θ , whereas the right-hand term of the same inequality is lower than one for any β . This implies that at the unconstrained commission level, a supplier would always want to deviate and stop selling on one of the platforms. Therefore, if there exists an equilibrium for which all suppliers sell on both platforms (as well as directly), the “true” equilibrium commission

must be such that the supplier's participation constraint is binding; that is, w^W is given by:

$$\begin{aligned}\pi_j(w^W, w^W) &= \tilde{\pi}_j(w^W) \\ \Leftrightarrow \frac{(1-\theta)^2(3-2w^W)^2}{3(1-\alpha\theta)(2-\theta)^2(1+2\beta)} &= \frac{(12(1-\theta) - (6-7\theta)w^W)^2}{72(1-\alpha\theta)(2-\theta)^2(1+\beta)} \\ \Leftrightarrow \frac{4(1-\theta)(3-2w^W)}{12(1-\theta) - (6-7\theta)w^W} &= \sqrt{\frac{2(1+2\beta)}{3(1+\beta)}}\end{aligned}$$

Proposition 2 (*Wide price parity clauses*)

Given that both platforms use wide price parity clauses, there exists a unique contract equilibrium for which all suppliers are active on all three channels. In this equilibrium, platforms charge the same commission w^W , with:

$$w^W = \frac{12(1-\theta)(1-\sigma(\beta))}{2(1-\theta)(4-3\sigma(\beta)) + \theta\sigma(\beta)}, \quad \text{where } \sigma(\beta) = \sqrt{\frac{2(1+2\beta)}{3(1+\beta)}} \in \left[\sqrt{\frac{2}{3}}, 1 \right],$$

and the suppliers set the same price p^W on both platforms and when selling directly:

$$p^W = \frac{1-\theta}{2-\theta} + \frac{2w^W}{3(2-\theta)}.$$

When wide price parity clauses are introduced, the supplier's participation constraint is always binding in equilibrium and, thus, this constraint determines the equilibrium commission level. The intuition for this result is relatively simple. Consider a supplier's incentives to accept an offer in a candidate equilibrium where all the rival suppliers list on both platforms. If it accepts the offer, the supplier has to charge the same price in all three sales channels and, thus, because of the symmetry assumption on demand, it makes one-third of its sales through each channel. If both platforms offer the same commission, w , everything happens as if the supplier's perceived marginal cost (for any unit sold) were equal to two-thirds of the symmetric commission (i.e., $\frac{2w}{3}$).

If it rejects one platform's offer, the supplier now makes all of its sales

through the remaining two channels. Given that it is still constrained by the price parity clause, it sets a retail price that is a best reply to the price charged by the rival suppliers (unchanged) and its perceived marginal cost, which is now half of the commission on average (i.e., $\frac{w}{2}$). Rejecting one platform's offer has three effects on a supplier's sales and profit.

- (i) Keeping retail prices constant, leaving one platform reduces the average cost per unit sold from $\frac{2w}{3}$ to $\frac{w}{2}$. The higher the commission charged by the platforms, the larger is this effect.
- (ii) Keeping retail prices constant, leaving one platform reduces total sales by one-third.
- (iii) However, this last effect is compensated for by the price effect. When it leaves platform i , supplier j adjusts the price that it charges on platform $h \neq i$ and for direct sales. Because its perceived average marginal cost is reduced, it reduces its retail price and, thus, increases its market share on the two channels (platform h and direct sales) on which it remains active. This last effect is larger when the commissions are high and/or when suppliers are close substitutes.

When competition between suppliers is fierce (i.e., θ is close to one because α is close to one and/or N is large), it is straightforward to see that the positive effects outweigh the negative effect. By leaving platform i , a supplier loses one-third of its initial sales, but those sales generated an extremely limited margin. On the other hand, the supplier can now profitably undercut its rivals in the other two distribution channels (platform h and direct sales) and substantially increase its sales on those channels. Moreover, these sales now generate a higher profit, especially if the commissions are high. As a consequence, a platform has a strong incentive to leave one platform unless the commissions are sufficiently low (close to zero as θ tends to one).

The result is very intuitive when interbrand competition is fierce (i.e., θ is close to one), but it also applies when there is no substitution between the suppliers ($\theta = 0$). Competition with rival suppliers in this case is no longer

a constraint. However, it is still the case that the supplier has the choice between listing on both platforms and listing on only one. If it is active in all three channels, it sets its monopoly price when facing an average marginal cost equal to $\frac{2w}{3}$. The alternative is to sell to only two-thirds of the market but facing now an average marginal cost of $\frac{w}{2}$. If w is too high, the positive effect of leaving the platform on its average margin dominates. Therefore, the commission cannot increase too much and, in particular, cannot be set at its “unconstrained” level $\left(\frac{6}{6-\theta}\right)$.

As a consequence of the above discussion, the equilibrium commission decreases as the suppliers become closer substitutes, and it tends to zero as θ tends to one. Because the effect of leaving one platform is smaller when platforms are close substitutes (the sales lost by one supplier on that platform will be recaptured by that supplier on the rival platforms where it sells the same good at a cheaper price), it is also the case that the equilibrium commission decreases as platforms become closer substitutes and tends to zero as β tends to one. Figure 1 presents the different commission levels as functions of the diversion ratio to other suppliers (i.e., θ) for different values of the degree of substitution between platforms (i.e., β).

Our results show that the generalized adoption of wide price parity clauses by platforms does not necessarily imply higher commissions for suppliers but that, on the contrary, price parity clauses may imply very low commissions in order to ensure that suppliers continue to list on both platforms. Once we account for the suppliers’ participation constraints, it is no longer obvious that commissions are higher under price parity. In our setting, the result depends crucially on the possibility of selling directly to consumers. An important element of our analysis is that when it drops one platform, a supplier reduces its average marginal cost. In the absence of direct sales, the average commission would be unchanged, at least when commissions are symmetric. Moreover, because we focus on unilateral deviations (i.e., a platform can only modify one commission at a time and, more importantly, a supplier can only choose to leave one platform at a time), platform i has no incentives to offer a very low commission to supplier j to induce that supplier to drop the rival platforms:

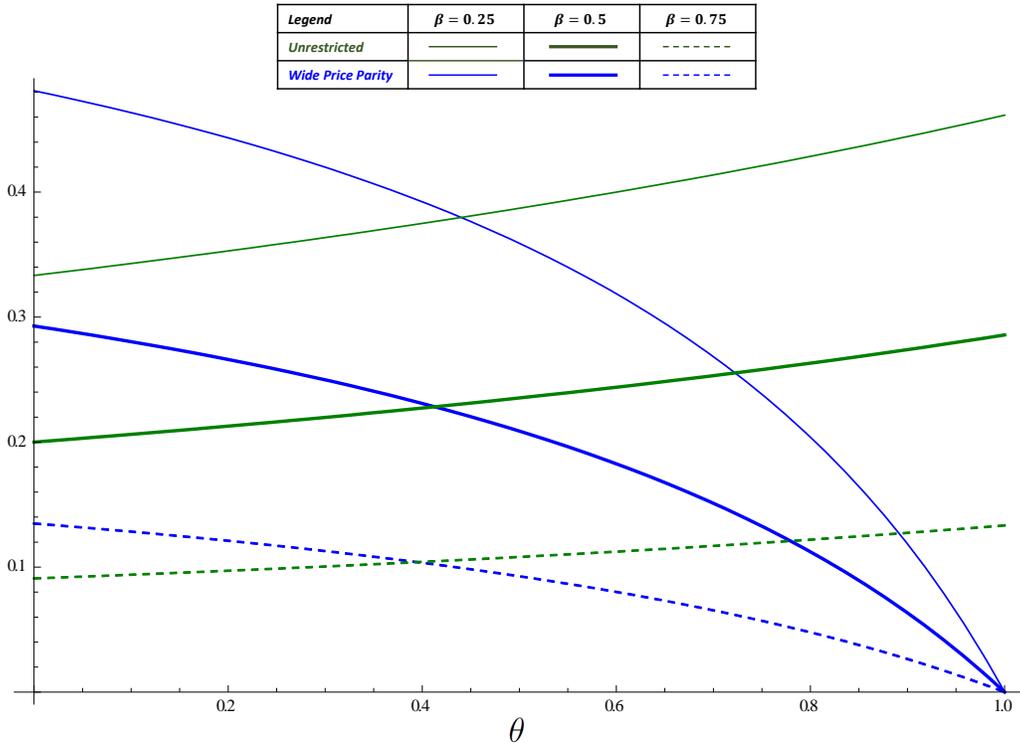


Figure 1: Equilibrium commissions in the unrestricted regime and under wide price parity.

by the “definition” of a contract equilibrium, when negotiating with platform i , supplier j takes as given the fact that it will sell on the rival platform and only considers whether or not to list on platform i . Therefore, our contract equilibrium concept, while ensuring the existence of an equilibrium, does not allow for any possible deviation by a supplier; thus, the contract equilibrium makes it even more difficult for the participation constraint to be binding—thus biasing the analysis against our result—especially in the absence of any possibility of selling directly.²²

Although our result does not depend on the number of suppliers but only

²²For instance, if it is profitable for the supplier to drop one platform and to reduce its marginal cost from $\frac{2w}{3}$ to $\frac{w}{2}$, it may be even more attractive to drop both platforms and to sell directly only (thereby reducing the marginal cost to zero).

on the parameter θ —i.e., the diversion ratio from one supplier to the others on a given platform—the number of platforms or the relative size of the platforms matters. For instance, when the number of platforms is M , leaving one platform reduces the average marginal cost for the supplier from $\frac{Mw}{M+1}$ to $\frac{(M-1)w}{M}$. However, although the incentives to leave one platform are lower for any given value of θ , it remains the case that the participation constraint will be binding for high values of the commission, at least when interbrand competition is fierce (i.e., θ is close to one). Similarly, if the relative size of the direct sales channel is small (relative to the size of a platform), incentives to drop a platform will be lower as the weight of the direct sales channel in the computation of the average marginal cost is now relatively limited.

4.1.2 Effects of the wide price parity clauses

We now evaluate the impact of price parity clauses on prices (commissions as well as retail prices), suppliers' and platforms' profits, and consumer surplus.

Effect on commissions

So far, the analysis has illustrated that the effect of the platforms' price parity clauses is not as straightforward as the prevailing theories of harm suggest. As we have seen, price parity clauses may lead to lower commissions in equilibrium. Indeed, when prices are fully flexible (no price parity clauses), the equilibrium commission is always strictly positive (unless platforms are perfectly substitutable; i.e., $\beta = 1$) and increases with interbrand competition (i.e., w^* is an increasing function of θ). With wide price parity clauses, the equilibrium commission w^W decreases with interbrand competition and tends to zero as θ tends to one. One can easily check that $w^* < w^W$ in the absence of interbrand competition (i.e., when $\theta = 0$). Therefore, for any degree of substitution between platforms (β), there exists a threshold $\theta_w(\beta) \in]0, 1[$ such that the equilibrium commission increases when wide price parity clauses are introduced (i.e., $w^W > w^*$) if and only if $\theta < \theta_w(\beta)$.

Effect on final prices and consumer surplus

Now, we consider the effect of price parity clauses on prices paid by consumers.

In the absence of such clauses, the suppliers' prices on the platforms and for direct sales are:

$$p_P^* = \frac{1 - \theta}{2 - \theta} + \frac{w^*}{2 - \theta} \quad \text{and} \quad p_D^* = \frac{1 - \theta}{2 - \theta}.$$

Given that prices are higher on the platforms than for direct sales, more than one-third of the sales occur directly and, thus, the average price is strictly lower than $\bar{p}(w^*)$, where:

$$\bar{p}(w) = \frac{1 - \theta}{2 - \theta} + \frac{2w}{3(2 - \theta)}.$$

When wide price parity clauses are introduced, the symmetric price charged on the two platforms as well as on the direct sales channel is $p^W = \bar{p}(w^W)$. Therefore, introducing price parity clauses has two effects.

- (i) Keeping the commission unchanged, introducing a price parity clause increases the average price paid by consumers as it divert sales from the cheapest channel (direct sales) to the more expensive platforms.
- (ii) Introducing a price parity clause affects the equilibrium commission, which in turns affects the final prices paid by consumers.

When $\theta \leq \theta_w(\beta)$, consumers are harmed by both effects. However, when $\theta > \theta_w(\beta)$, consumers benefit from lower commissions, and this positive effect dominates when interbrand competition is fierce: indeed, as θ moves toward one, the commission under price parity tends toward zero and, thus, the price paid by consumers tends toward p_D^* . This implies that there exists a threshold $\theta_p(\beta)$, with $\theta_w(\beta) < \theta_p(\beta) < 1$, such that the average price paid by consumers is higher under price parity if and only if $\theta \leq \theta_p(\beta)$.

Our linear demand specification results from a standard quasi-linear/quadratic utility model with a representative consumer. Given the symmetry in this utility function with imperfectly substitutable products, consumer surplus is greater when the market shares are similar on the three “platforms.” In the unrestricted pricing regime, suppliers generate more sales through the direct

sales than they achieve on each platform, whereas sales are equally divided among the three channels under price parity. Therefore, consumer surplus may increase when price parity clauses are introduced, even if the average price paid by consumers increases. A comparison of consumer surplus in both cases shows that there exists a threshold $\theta_{CS}(\beta)$, with $\theta_w(\beta) < \theta_{CS}(\beta) < \theta_p(\beta)$, such that consumer surplus decreases when wide parity clauses are introduced if and only if $\theta < \theta_{CS}(\beta)$.

Effect on platforms' profits

When the introduction of wide price parity clauses leads to higher equilibrium commissions, platforms always benefit from such clauses because their per-unit margin increases as well as their market share. Because the average price paid increases if the commission increases, there is also a negative demand effect (consumers being price sensitive), but this effect tends to be relatively small and is always dominated by the margin and market share effects in our linear demand setting.

Moreover, the fact that the equilibrium commission decreases when wide price parity clauses are introduced does not necessarily imply that the platforms do not benefit from such clauses. Indeed, platforms may be willing to accept lower commissions in return for higher market shares, at least if the commissions do not decrease too much. Obviously, when interbrand competition becomes very fierce (i.e., θ is close to one), the equilibrium commissions and, therefore, the platforms' profits tend toward zero, in which case the platforms cannot benefit from such clauses. A profit comparison shows that a threshold $\theta_P(\beta)$ exists, with $\theta_{CS}(\beta) < \theta_P(\beta) < 1$ such that platforms benefit from wide parity clauses if and only if $\theta < \theta_P(\beta)$.

Effect on suppliers' profits

Finally, consider the effect of price parity clauses on suppliers' profits. If these clauses lead to higher commissions, suppliers are necessarily harmed: they face higher costs for each sale made through a platform and, moreover, because of price parity, the share of sales made through the platforms increases. In addition, because the average price paid by consumers also increases, total

sales decrease. Thus, all effects are negative for the suppliers' profits. However, when suppliers are very close substitutes, introducing price parity clauses leads to a substantial drop in commission rates, as they now tend toward zero as θ tends toward one, whereas they were at their highest levels in the absence of price parity. Although more sales now take place on the platforms, the cost of selling on these platforms is substantially lower and, thus, suppliers' profits increase. Profit comparisons show that suppliers benefit from price parity clauses when interbrand competition is fierce. Moreover, in our linear demand setting, the threshold $\theta_S(\beta)$ above which suppliers benefit from the introduction of price parity clauses corresponds to the threshold above which consumers benefit; that is, $\theta_S(\beta) = \theta_{CS}(\beta)$. Thus, the interests of consumers and suppliers are perfectly aligned.

These thresholds are illustrated in Figure 2 and lead to the following corollary.

Corollary 1 *There exist thresholds $\theta_S(\beta)$ and $\theta_P(\beta)$, with $0 < \theta_S(\beta) < \theta_P(\beta) < 1$, such that platforms, suppliers and consumers all benefit from the introduction of wide price parity clauses whenever $\theta \in [\theta_S(\beta), \theta_P(\beta)]$.*

This result suggests that competition authorities should be careful when assessing the effects of price parity clauses in intermediation markets where suppliers can also sell directly to consumers. The theories of harm that have been developed by some agencies in recent cases (hotel online booking platforms, online marketplaces, insurance, etc.) may be accurate when interbrand competition is limited, but our analysis suggests that they fail to apply whenever interbrand competition is fierce enough. This result is consistent with the idea held by some economists and practitioners that vertical restraints are less likely to be harmful for consumers when interbrand competition is fierce, even when these restraints soften or even eliminate intrabrand competition.

In our setting, it is interesting to note that the degree of substitutability between platforms (i.e., β) plays a limited role. Although the commissions and prices depend on this parameter, the different thresholds that we have

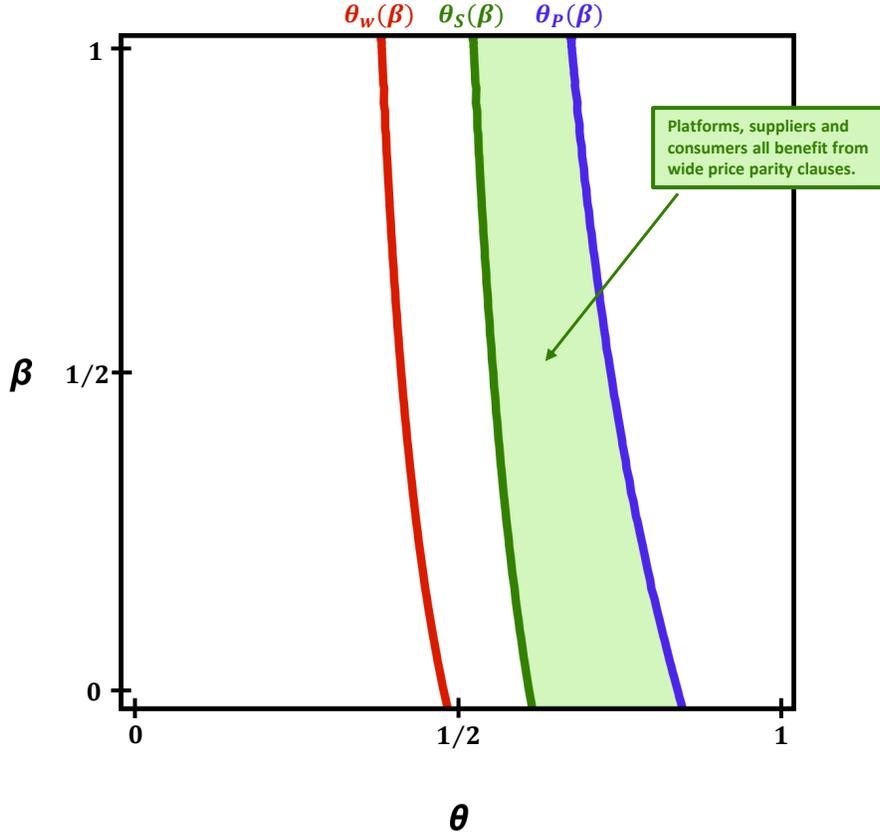


Figure 2: Effects of wide price parity clauses on equilibrium commissions and profits.

identified do not vary much with β . This suggests that more of the focus in competition cases should be on interbrand rather than intrabrand competition.

4.2 Narrow price parity clauses

We now consider narrow price parity clauses, under which a platform does not constrain the suppliers' pricing decisions on the platforms but simply requires that the price charged by a supplier on its platform should not exceed that charged (by the same supplier) for direct sales. Thus, under a narrow price parity clause, platform $i \in \{A, B\}$ simply requires that any supplier $j \in J$ should set prices satisfying $p_{ij} \leq p_{Dj}$.

As in the previous section, we assume that—for exogenous reasons—both

platforms impose narrow price parity clauses. This implies that supplier j 's direct price has to be set equal to or above the highest price charged on the two platforms; that is, $p_{Dj} \geq \max\{p_{Aj}, p_{Bj}\}$. Recall that as a result of the symmetry assumption for demand, and because it is cheaper to sell directly, this condition is always binding; i.e., $p_{Dj} = \max\{p_{Aj}, p_{Bj}\}$.

Again, we focus on a ‘‘symmetric’’ contract equilibrium, in which all suppliers are active in all three channels. Hence, equilibrium commissions are all identical, as are the retail prices; that is, $w_{ij} = w^N$ and $p_{Dj} = p_{ij} = p^N$ for any $i \in I$ and $j \in J$, and price parity constraints are both binding for each supplier as long as $w^N > 0$.

Suppose that supplier i has been offered a commission w_{ij} by platform $i \in \{A, B\}$, whereas it has received the (equilibrium) offer w^N from platform $h \neq i$. When setting its prices, supplier j anticipates that its rivals have received and accepted the equilibrium commissions equal to w^N and charge equilibrium prices equal to p^N . Given the narrow price parity constraints, supplier j has two alternative pricing strategies:

1. set a lower price on platform i than on platform h , implying that: $p_{ij} = p - d$ and $p_{hj} = p_{Dj} = p$; or
2. set a higher price on platform i than on platform h , implying that: $p_{ij} = p_{Dj} = p$ and $p_{hj} = p - d$,

where $d > 0$. Intuitively, charging a lower price on platform i than on platform h should be attractive whenever $w_{ij} < w^N$, so suppose that this is the case. Then, supplier j chooses its base price p and the level of the discount $d > 0$ offered on platform i so as to maximize its profit $\pi_j(p, d)$ where:

$$\begin{aligned} \pi_j(p, d) = & (p - d - w_{ij}) q_{ij}((p - d, p, p), \mathbf{p}_{-j}^N) + (p - w^N) q_{hj}((p - d, p, p), \mathbf{p}_{-j}^N) \\ & + p q_{Dj}((p - d, p, p), \mathbf{p}_{-j}^N) \end{aligned}$$

with

$$q_{ij}((p - d, p, p), \mathbf{p}_{-j}^N) = \frac{(1 - \beta)(1 - \theta - p + \theta p^N) + (1 + \beta)d}{(1 - \alpha\theta)(1 - \beta)(1 + 2\beta)}$$

and

$$q_{hj}((p-d, p, p), \mathbf{p}_{-j}^N) = q_{Dj}((p-d, p, p), \mathbf{p}_{-j}^N) = \frac{(1-\beta)(1-\theta-p+\theta p^N) - \beta d}{(1-\alpha\theta)(1-\beta)(1+2\beta)}.$$

Maximizing the profit function with respect to p , taking the discount d as given, yields:

$$p^R(d) = \frac{1-\theta+\theta p^N + \frac{w_{ij}+w^N}{3}}{2} + \frac{d}{3}.$$

When we substitute $p^R(d)$ into the profit function and take the derivative with respect to d , we obtain:

$$\frac{d\pi_j(p^R(d), d)}{dd} = \frac{w^N - 2w_{ij} - 4d}{3(1-\alpha\theta)(1-\beta)}.$$

This derivative is negative for any discount level whenever $2w_{ij} > w^N$; hence, the supplier j optimally undercuts on platform i (i.e., chooses $d > 0$) if and only if the commission w_{ij} offered by this platform is substantially lower than (less than half) the commission w^N set by the rival platform h . If the difference is not large enough, supplier j continues to set the same prices in all channels ($d = 0$).

A similar reasoning can be used to show that the supplier is not willing to offer a discount on platform h either, unless the commission becomes very high on platform i ; i.e., unless $w_{ij} > 2w^N$. Therefore, supplier j 's pricing strategy is identical under narrow and wide price parity clauses, as long as $w_{ij} \in \left[\frac{w^N}{2}, 2w^N\right]$. Thus, any contract equilibrium with narrow price parity has to be identical to the equilibrium with wide price parity: platforms' profit functions are identical for narrow and wide price parity for "small" deviations on the commission—and large deviations are not attractive (as either margins or sales are drastically reduced), which ultimately secures the existence of an equilibrium with narrow price parity.

Proposition 3 (*Narrow price parity clauses*)

When both platforms impose narrow price parity clauses, the unique contract

equilibrium, for which all suppliers are active in all three channels, is identical to the unique contract equilibrium when both platforms use a wide price parity clause; i.e., $w^N = w^W$ and $p^N = p^W$.

Proposition 3 suggests that whenever price parity clauses are harmful for consumers (i.e., there is insufficient interbrand competition), price parity clauses should be banned altogether. Allowing narrow price parity on the basis that it would still allow platforms to compete is not a good solution.

It is interesting to compare our Proposition 3 with Wang and Wright’s (2016) result. Unlike us, they find that narrow price parity clauses allow competition between platforms; hence, consumers may benefit from such clauses (but not from wide price parity). The main reason for this important difference between the two models is that in equilibrium, suppliers do not sell directly in their model because consumers prefer to use the platforms rather than buying from the suppliers directly. Because there are no direct sales, each supplier sees its (equilibrium) marginal cost as w^W (using our notations), and a small reduction in platform i ’s commission, to $w^W - \varepsilon$, will cause the supplier to see its marginal cost drop to $w^W - \varepsilon$ on that platform—whereas its marginal cost is still w^W for any additional sales made on the rival platform h . In turn, this will induce the supplier to drop its price on platform i , relative to its price on platform h . Therefore, it becomes profitable for the platforms to reduce their commissions relative to the equilibrium commission level under wide price parity, in order to steal market shares from each other (which is not possible under wide price parity). It seems natural to expect that the supplier will offer a discount on the cheaper platform in our model when narrow price parity is used. However, as shown above, this is not the case unless the platform offering the low commission is substantially cheaper than the other. The intuition behind this result is relatively simple. Suppose again that platform i offers a lower commission, $w^W - \varepsilon$. Because of the narrow price parity clause imposed by platform h , the supplier has to set the same price in the direct sales channel and on platform h . Moreover, because 50% of the sales that are not made through platform i are then made directly (unlike in Wang and Wright’s (2016) model), the supplier sees the direct sales channel and

platform h as a single platform, on which its marginal cost is $\frac{w^W}{2}$. Therefore, when considering how to adjust its prices in the face of the new commission from platform i , the supplier faces a trade-off between driving sales toward platform i , on which its marginal cost is $w^W - \varepsilon$, and driving them toward its direct sales channel and platform h , where its (average) marginal cost is $\frac{w^W}{2}$. It follows that the supplier should not be tempted to offer a discount on platform i , unless $w^W - \varepsilon < \frac{w^W}{2}$. As it cannot impose a surcharge either, because of the narrow price parity clause imposed by platform i , it sets the same price in all three channels (as long as ε is sufficiently small). Hence, wide and narrow price parity clauses yield the same outcome in our model.

From the discussion above, it is clear that the question about what happens to direct sales is important for our conclusion about narrow price parity. If we recall some of the antitrust investigations discussed in the introduction, it seems to be the case in several markets (the markets for hotel bookings and payments systems in particular) that a nonnegligible share of the overall sales are made directly—even if price parity clauses are put in place by the platforms in order to limit the amount of direct sales. Our results suggest that one should be careful and not jump to the conclusion that a move from wide to narrow price parity will stimulate the competition between the platforms in these markets.

5 Endogenous adoption of price parity

So far, we have assumed that either no platform or both platforms adopt price parity simultaneously, for exogenous reasons. We now endogenize the decision to impose price parity clauses, adding an initial stage (prior to contracting) where each platform is allowed to make the decision unilaterally of whether or not to impose price parity on its suppliers. The platform can decide either to let the suppliers be free to set prices as they wish (unrestricted pricing) or to impose price parity clauses on all of them (price parity). The key assumption here is that each platform makes a single decision (unrestricted pricing or price parity) that applies to all suppliers. Moreover, in this section, we focus on wide

price parity only.

If both platforms opt for unrestricted pricing at this stage, the game proceeds exactly as in Section 3. If both platforms decide to impose price parity clauses, the game proceeds as in Section 4. Thus, we are left with one asymmetric scenario to consider, where one platform (say platform i) imposes a price parity clause, whereas the second platform (platform h) opts for unrestricted pricing.

5.1 Only one platform imposes price parity

When only platform i imposes price parity, final prices have to satisfy $p_{ij} \leq \min\{p_{hj}, p_{Dj}\}$ for any $j \in J$. Given that it is cheaper to sell directly, this condition is rewritten as: $p_{Dj} = p_{ij} \leq p_{hj}$.

Suppliers' equilibrium pricing strategies

Let \hat{p}^W and \hat{p}^U , with $\hat{p}^W \leq \hat{p}^U$, denote the equilibrium prices on platform i (and, therefore, the prices for direct sales as well) and on platform h respectively; that is, in equilibrium, supplier j sets prices $p_{ij} = p_{Dj} = \hat{p}^W$ and $p_{hj} = \hat{p}^U$. For supplier j , we use $\hat{\mathbf{p}}_j = (\hat{p}^W, \hat{p}^U, \hat{p}^W)$ to denote the vector of its equilibrium final prices. When all other suppliers set the equilibrium prices, demands for supplier j on platform i and in the direct sales channels are:

$$\begin{aligned} q_{ij}((p_{ij}, p_{hj}, p_{ij}), \hat{\mathbf{p}}_{-j}) &= q_{Dj}((p_{ij}, p_{hj}, p_{ij}), \hat{\mathbf{p}}_{-j}) \\ &= \frac{(1 - \theta)(1 - \beta) - (p_{ij} - \theta\hat{p}^W) + \beta(p_{hj} - \theta\hat{p}^U)}{(1 - \alpha\theta)(1 - \beta)(1 + 2\beta)}, \end{aligned}$$

whereas the demand for supplier j on platform h is:

$$q_{hj}((p_{ij}, p_{hj}, p_{ij}), \hat{\mathbf{p}}_{-j}) = \frac{(1 - \theta)(1 - \beta) - (1 + \beta)(p_{hj} - \theta\hat{p}^U) + 2\beta(p_{ij} - \theta\hat{p}^W)}{(1 - \alpha\theta)(1 - \beta)(1 + 2\beta)}.$$

Then, supplier j maximizes its profit, taking as given the commissions it faces, w_{ij} and w_{hj} , its rivals' equilibrium prices, $\hat{\mathbf{p}}_{-j}$, and the constraint to charge a lower price on platform i (and for direct sales) than on platform h .

Therefore, supplier j chooses prices $\hat{p}_{ij}^R(\mathbf{w}_j)$ and $\hat{p}_{hj}^R(\mathbf{w}_j)$ that are solutions of:

$$\begin{aligned} (\hat{p}_{ij}^R(\mathbf{w}_j), \hat{p}_{hj}^R(\mathbf{w}_j)) = & \arg \max_{p_{ij} \leq p_{hj}} \left[2 \left(p_{ij} - \frac{w_{ij}}{2} \right) q_{ij}((p_{ij}, p_{hj}, p_{ij}), \hat{\mathbf{p}}_{-j}) \right. \\ & \left. + (p_{hj} - w_{hj}) q_{hj}((p_{ij}, p_{hj}, p_{ij}), \hat{\mathbf{p}}_{-j}) \right]. \end{aligned}$$

Abstracting from the constraint ($p_{ij} \leq p_{hj}$) and solving for supplier j 's optimal pricing strategy yields:

$$\hat{p}_{ij}^R(\mathbf{w}_j) = \frac{1 - \theta + \theta \hat{p}^W + \frac{w_{ij}}{2}}{2} \quad \text{and} \quad \hat{p}_{hj}^R(\mathbf{w}_j) = \frac{1 - \theta + \theta \hat{p}^U + w_{hj}}{2}.$$

Given that equilibrium prices must satisfy $\hat{p}^W \leq \hat{p}^U$, it appears that the constraint does not bind, unless platform i charges a much higher commission than platform h —and, in our linear demand setting, it is relatively easy to check that the latter is never optimal in equilibrium.

The equilibrium prices must satisfy $\hat{p}^W = \hat{p}_{ij}^R(\hat{w}^W, \hat{w}^U)$ and $\hat{p}^U = \hat{p}_{hj}^R(\hat{w}^W, \hat{w}^U)$, where \hat{w}^W and \hat{w}^U are the equilibrium commissions charged by platform i (imposing a wide price parity clause) and h (allowing unrestricted pricing), respectively. Thus, these prices are equal to:

$$\hat{p}^W = \frac{1 - \theta}{2 - \theta} + \frac{\hat{w}^W}{2(2 - \theta)} \quad \text{and} \quad \hat{p}^U = \frac{1 - \theta}{2 - \theta} + \frac{\hat{w}^U}{2 - \theta}.$$

Notice that the condition $\hat{p}^W \leq \hat{p}^U$ is satisfied as long as $\hat{w}^W \leq 2\hat{w}^U$; that is, whenever the commission charged by the platform imposing price parity is lower than twice the commission charged by the other platform.

When substituting into its profit function, we derive supplier j 's equilibrium profit when it chooses to be active on both platforms:

$$\begin{aligned} \pi_j(\hat{w}^W, \hat{w}^U) = & \frac{(1 - \theta)^2 (2 - \hat{w}^W) (2 - 2\beta - \hat{w}^W + 2\beta\hat{w}^U)}{2(1 - \beta)(1 + 2\beta)(1 - \alpha\theta)(2 - \theta)^2} \\ & + \frac{(1 - \theta)^2 (1 - \hat{w}^U) (1 - \beta - (1 + \beta)\hat{w}^U + \beta\hat{w}^W)}{(1 - \beta)(1 + 2\beta)(1 - \alpha\theta)(2 - \theta)^2}. \end{aligned}$$

Delisting from platform i

Rather than being active through all channels, supplier j could decide to delist from one platform. First, suppose that supplier j decides not to list on the platform imposing price parity. In this case, supplier j only sells through platform h , for a price p_{hj} , and directly, for a price p_{Dj} . Because platform h does not impose price parity, supplier j 's pricing strategy is now unrestricted. Moreover, given that the (out-of-equilibrium) decision to delist is not observed by the rival suppliers, supplier j continues to anticipate that the rivals will set prices \hat{p}^W on platform i and for direct sales and \hat{p}^U on platform h . Therefore, supplier j 's optimal prices following its deviation are :

$$(\tilde{p}_{hj}, \tilde{p}_{Dj}) = \arg \max_{(p_{hj}, p_{Dj})} \left[(p_{hj} - \hat{w}^U) q_{hj} ((\infty, p_{hj}, p_{Dj}), \hat{\mathbf{P}}_{-j}) + p_{Dj} q_{Dj} ((\infty, p_{hj}, p_{Dj}), \hat{\mathbf{P}}_{-j}) \right].$$

Solving for the optimal prices yields:

$$\tilde{p}_{hj} = \frac{1 - \theta}{2 - \theta} + \frac{\hat{w}^U}{2 - \theta} \quad \text{and} \quad \tilde{p}_{Dj} = \frac{1 - \theta}{2 - \theta} + \frac{\theta \hat{w}^W}{4(2 - \theta)}.$$

When substituting these prices into supplier j 's profit function, we obtain the deviation profit $\tilde{\pi}_j(\hat{w}^W, \hat{w}^U)$ for supplier j when it decides to delist from platform i :

$$\begin{aligned} \tilde{\pi}_j(\hat{w}^W, \hat{w}^U) = & \frac{(1 - \theta)(1 - \hat{w}^U)(4(1 - \theta)(1 - \beta - \hat{w}^U) - \beta\theta\hat{w}^W)}{4(1 - \alpha\theta)(2 - \theta)^2(1 - \beta^2)} \\ & + \frac{(4(1 - \theta) + \theta\hat{w}^W)(4(1 - \theta)(1 - \beta + \beta\hat{w}^U) + \theta\hat{w}^W)}{16(1 - \alpha\theta)(2 - \theta)^2(1 - \beta^2)}. \end{aligned}$$

At the first stage, platform i proposes to supplier j the commission w_{ij} that maximizes its profit $\pi_i((w_{ij}, \hat{\mathbf{w}}^W), \hat{\mathbf{w}}^U)$, taking as given the equilibrium commissions faced by all suppliers, \hat{w}^W on platform i and \hat{w}^U on platform j , as well as the suppliers' pricing decisions, accounting for supplier j 's participation

constraint. Platform i 's profit is written as:

$$\begin{aligned} \pi_i((w_{ij}, \hat{\mathbf{w}}^W), \hat{\mathbf{w}}^U) &= w_{ij}q_{ij}((\hat{p}_{ij}^R(\hat{\mathbf{w}}_{-j}), \hat{p}_{hj}^R(\hat{\mathbf{w}}_{-j}), \hat{p}_{ij}^R(\hat{\mathbf{w}}_{-j})), \hat{\mathbf{p}}_{-j}) \\ &\quad + (N-1)\hat{w}^W q_{ik}((\hat{p}_{ij}^R(\hat{\mathbf{w}}_{-j}), \hat{p}_{hj}^R(\hat{\mathbf{w}}_{-j}), \hat{p}_{ij}^R(\hat{\mathbf{w}}_{-j})), \hat{\mathbf{p}}_{-j}). \end{aligned}$$

If we abstract from the supplier's participation and simply maximize platform i 's profit with respect to w_{ij} , we obtain:

$$\frac{\partial \pi_i}{\partial w_{ij}}((\hat{w}^W, \hat{\mathbf{w}}^W), \hat{\mathbf{w}}^U) = 0 \quad \Longleftrightarrow \quad \hat{w}^W = 4 \frac{1 - \beta + \beta \hat{w}^U}{4 - \theta}.$$

However, as in the case when both platforms adopt price parity, the supplier's participation constraint would then be violated. Indeed, we find that:

$$\begin{aligned} \tilde{\pi}_j\left(4 \frac{1 - \beta + \beta \hat{w}^U}{4 - \theta}, \hat{w}^U\right) &\equiv \pi_j\left(4 \frac{1 - \beta + \beta \hat{w}^U}{4 - \theta}, \hat{w}^U\right) \\ &\quad + \underbrace{\frac{(2 - \theta^2 + 2\beta(3 - 2\theta))(1 - \beta + \beta \hat{w}^U)^2}{(4 - \theta)^2 (1 - \alpha\theta)(1 + 2\beta)(1 - \beta^2)}}_{>0}. \end{aligned}$$

Therefore, the suppliers' participation constraints are binding in equilibrium and implicitly determine the commission charged by platform i (\hat{w}^W) as a function of the commission charged by platform h through the condition:

$$\pi_j(\hat{w}^W, \hat{w}^U) = \tilde{\pi}_j(\hat{w}^W, \hat{w}^U). \quad (3)$$

Delisting from platform h

A third option for the supplier is to refuse to sell on platform h and to sell only on platform i as well as directly. However, unless the commission charged by platform h is excessively high and would generate zero sales²³, supplier j always prefers to sell on platform h as well, because the price that it charges

²³Formally, in our linear demand setting, this would happen for commission levels such that the demand for supplier j on platform h would become negative.

on that platform is unconstrained.²⁴

This implies that platform h offers to supplier j the commission w_{hj} that maximizes its profit $\pi_h((w_{hj}, \hat{\mathbf{w}}^U), \hat{\mathbf{w}}^W)$, taking as given the equilibrium commissions faced by all suppliers, \hat{w}^W on platform i and \hat{w}^U on platform h , as well as the suppliers' pricing strategies. Thus, the equilibrium commission \hat{w}^U set by platform h is given by:

$$\hat{w}^U = \arg \max_{w_{hj}} \pi_h((w_{hj}, \hat{\mathbf{w}}^U), \hat{\mathbf{w}}^W) \iff \frac{\partial \pi_h}{\partial w_{hj}}((\hat{w}^U, \hat{\mathbf{w}}^U), \hat{\mathbf{w}}^W) = 0, \quad (4)$$

where:

$$\begin{aligned} \pi_h((w_{hj}, \hat{\mathbf{w}}^U), \hat{\mathbf{w}}^W) &= w_{hj} q_{hj}((\hat{p}_{ij}^R(\hat{\mathbf{w}}_{-j}), \hat{p}_{hj}^R(\hat{\mathbf{w}}_{-j}), \hat{p}_{ij}^R(\hat{\mathbf{w}}_{-j})), \hat{\mathbf{p}}_{-j}) \\ &\quad + (N-1) \hat{w}^U q_{hk}((\hat{p}_{ij}^R(\hat{\mathbf{w}}_{-j}), \hat{p}_{hj}^R(\hat{\mathbf{w}}_{-j}), \hat{p}_{ij}^R(\hat{\mathbf{w}}_{-j})), \hat{\mathbf{p}}_{-j}). \end{aligned}$$

Equilibrium with asymmetric adoption

Then, solving the system formed by equations (3) and (4) yields the equilibrium commissions \hat{w}^W and \hat{w}^U . In our linear demand setting, this system has a unique solution that satisfies $\hat{w}^W < 2\hat{w}^U$. This ensures that $\hat{p}^W < \hat{p}^U$ and, therefore, suppliers are always willing to set higher prices on the platform that does not constrain their pricing strategy (here, platform h). In addition, we can check that the commission is higher for the platform that imposes price parity if and only if suppliers are sufficiently differentiated; that is, there exists a unique threshold $\tilde{\theta}(\beta) \in]0, 1[$ such that $\hat{w}^W > \hat{w}^U \Leftrightarrow \theta < \tilde{\theta}(\beta)$.

Then, the final prices, \hat{p}^W on platform i and for direct sales, and \hat{p}^U on platform h , are given by:

$$\hat{p}^W = \frac{1-\theta}{2-\theta} + \frac{\hat{w}^W}{2(2-\theta)} < \hat{p}^U = \frac{1-\theta}{2-\theta} + \frac{\hat{w}^U}{2-\theta},$$

and from there, one can compute the platforms' equilibrium profits, Π^{WU} for the platform imposing price parity, and Π^{UU} for the platform adopting

²⁴This applies as long as commissions induce final prices satisfying $p^W < p^U$, which always occurs in equilibrium.

unrestricted pricing.

At this stage, it is interesting to notice that suppliers are more tempted to deviate and list only on platform h than when both platforms adopt price parity, all else being equal. The reason is rather straightforward. Unlike the situation with generalized price parity clauses, with partial adoption, a supplier becomes unrestricted in its pricing decisions if it decides to drop the platform that requires price parity. This makes this deviation more attractive and implies that the platform that adopts price parity has to lower its commission even more than when both adopt price parity (for a given level of commission set by the rival platform). For this reason, it may become unattractive for the platforms to adopt price parity unless the rival adopts price parity as well.

5.2 Equilibrium adoption strategies

Based on the analysis carried out in sections 3, 4.1 and 5.1, we can compute the platforms' equilibrium profits in each situation and characterize the equilibria of this adoption game. In this section, we present only a quick summary of the analysis. We use the following notations.

- In the symmetric situation where both platforms choose to let suppliers freely set their prices (i.e., adopt unrestricted pricing), each platform achieves a profit equal to Π^{UU} .
- In the symmetric situation where both platforms impose (wide) price parity clauses to suppliers, each platform achieves a profit equal to Π^{WW} .
- In the asymmetric situation where platform i imposes price parity, whereas platform h adopts unrestricted pricing, platform i 's and h 's profits are equal to Π^{WU} and Π^{UW} , respectively.

Recall from Corollary 1 that the platforms jointly prefer price parity over unrestricted pricing whenever $\theta < \theta_P(\beta)$; i.e., as long as suppliers are sufficiently differentiated. Comparing the different profits, we can then show

that there exist two thresholds $\underline{\theta}(\beta)$ and $\bar{\theta}(\beta)$ that are such that $0 < \underline{\theta}(\beta) < \theta_P(\beta) < \bar{\theta}(\beta) < 1$, and such that:

$$\Pi^{WW} \geq \Pi^{UW} \Leftrightarrow \theta \leq \bar{\theta}(\beta) \quad \text{and} \quad \Pi^{UU} \geq \Pi^{WU} \Leftrightarrow \theta \geq \underline{\theta}(\beta).$$

Thus, the adoption game has a unique (pure strategy) equilibrium whenever $\theta \notin [\underline{\theta}(\beta), \bar{\theta}(\beta)]$. When $\theta < \underline{\theta}(\beta)$ —i.e., when suppliers are sufficiently differentiated—both platforms adopt price parity clauses in equilibrium, whereas when suppliers are close substitutes—i.e., $\theta > \bar{\theta}(\beta)$ —both adopt unrestricted pricing.

For intermediate values of θ , the two symmetric equilibria involving either price parity or unrestricted pricing coexist. However, we know from the previous analysis that platforms prefer to use price parity clauses (unrestricted pricing) when θ is lower (higher) than $\theta_P(\beta)$. Therefore, if we restrict our attention to Pareto-undominated (from the platforms' point of view) equilibria, the adoption game has a unique Nash equilibrium.

These results are summarized in the following Proposition and illustrated by Figure 3.²⁵

Proposition 4 (*Equilibrium adoption of price parity*)

The adoption game has only symmetric pure strategy equilibria. There exist two thresholds, $\underline{\theta}(\beta)$ and $\bar{\theta}(\beta)$, with $0 < \underline{\theta}(\beta) < \theta_P(\beta) < \bar{\theta}(\beta) < 1$, such that there exists an equilibrium for which both platforms adopt:

- *price parity clauses whenever $\theta \leq \bar{\theta}(\beta)$; or*
- *unrestricted pricing whenever $\theta \geq \underline{\theta}(\beta)$.*

However, there always exists a unique Pareto-undominated (from the platforms' point of view) equilibrium. This equilibrium involves price parity if and only if $\theta < \theta_P(\beta)$.

²⁵Rigorously, when $\theta = \theta_P(\beta)$, there are two Pareto-undominated equilibria, but generically, the game has a unique Pareto-undominated equilibrium.

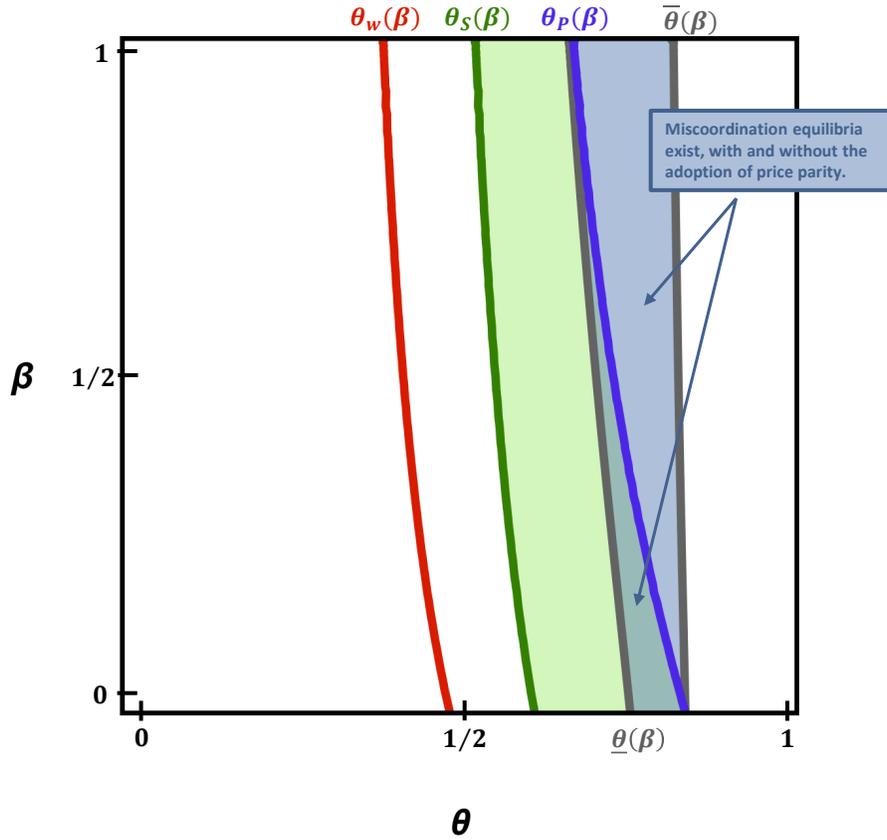


Figure 3: Pareto-dominated equilibria (from the platforms' perspective) exist both with and without price parity.

This analysis shows that if we restrict our attention to Pareto-undominated equilibria, platforms adopt price parity clauses whenever it is (collectively) profitable for them to do so. Thus, the results from section 4 fully apply: there exist a range of values of the parameters for which price parity clauses are adopted by platforms to the benefit of suppliers and consumers.

6 Discussion and concluding remarks

The prevailing theory of harm suggests that platforms may impose price parity clauses in order to eliminate intrabrand competition and to increase their

commissions, to the detriment of both their suppliers and consumers. Our analysis shows instead that one should be more careful when evaluating the welfare effects of price parity clauses. Even in the absence of any obvious efficiency arguments (e.g., reduction of consumers' search costs, or promotion of services and investments), we find that the adoption of price parity may sometimes benefit everyone—the platforms, the suppliers and the consumers.

An important insight from our analysis is that the extent of harm from price parity depends critically on the degree of competition between the suppliers and on their ability to sell directly. In particular, when the suppliers compete fiercely, we find that price parity clauses are unlikely to cause any harm and may actually increase platforms' and suppliers' profits as well as consumer surplus. The reason is that the suppliers' participation constraints then become very restrictive under price parity, which prevents the platforms from increasing their commissions too much or even forces them to reduce their commissions. This suggests that when assessing the effects of price parity, the competition agencies should pay more attention to interbrand competition than so far has been the case; for example in some of the recent investigations in Europe.

Moreover, our analysis suggests that replacing wide price parity clauses (when they reduce consumer surplus) with narrow price parity clauses—a remedy that has been proposed, for instance, by *Booking.com* and accepted by the French, Italian and Swedish competition authorities in recent investigations of the hotel online booking market—may not always be appropriate because, in our setting, narrow and wide price parity clauses are equivalent in terms of their outcomes.

Whether price parity clauses imposed by intermediation platforms are pro- or anticompetitive is ultimately an empirical question, and empirical evaluations of these practices will soon be possible.

Our model rests on a number of assumptions. Most are not important for our qualitative results, but some are essential. The first important assumption is the restriction of simple linear commissions when platforms contract with their suppliers. As already mentioned, our results would not be robust to

the use of nonlinear commissions. Rey and Vergé (2016) consider a similar setting but without direct sales (their focus is on interlocking relationships and resale price maintenance) and show that if platforms and suppliers negotiate over two-part commissions (a fixed component and a per-unit commission), price parity clauses have no impact on final prices. Our model is undoubtedly more restrictive. However, we believe that linear commissions are more in line with the motivating examples (e.g., hotel booking platforms). Perhaps more importantly, assuming linear commissions seems to be consistent with the prevailing theory of harm put forward by the antitrust authorities and other commentators.

Because we have assumed that there are only two competing platforms, our model applies primarily to markets that are characterized by a relatively “tight” oligopoly on the platform side. Although increasing the number of platforms should not qualitatively affect our results, it may change the threshold values that we have identified. This would depend on how we choose to model an increase in the number of platforms. Because the suppliers in our model also sell directly, this extension is not straightforward. For example, one question would be what happens to the share of direct sales as we increase the number of platforms. We could assume that the share of direct sales remains constant. Alternatively, we could assume that the share of direct sales shrinks as the number of platforms increases, all else being equal. The final result would crucially depend on this choice. Thus, before drawing any conclusions on the effects of price parity in a specific case, one should utilize the assumption that is consistent with the facts of the case.

We have assumed that the degree of substitution is the same between the two platforms and between each platform and each suppliers’ direct sales. This assumption is made for tractability. However, assuming different degrees of substitution should not qualitatively affect any of our results—as long as the difference in substitution is not too large.²⁶

²⁶We have checked that this assumption does not affect the result that narrow and wide price parity have the same outcome in our model. We find that as long as the difference in substitution is not too high, a pure strategy equilibrium exists at each pricing stage—and, given that such a pure strategy equilibrium exists, narrow and wide price parity always give

In our model, the suppliers do not observe their rivals' listing decisions before they set their prices at the final stage. The alternative assumption would make the model less tractable. As long as the equilibrium entails that all suppliers are active in all channels, observable listing decisions should not affect the outcome with unrestricted pricing. However, the assumption does affect the outcome when the platforms use price parity clauses—because, in this case, the suppliers' listing decisions become relevant for the platforms' choice of commissions (the suppliers' participation constraints are then binding). It is worth noting, however, that observable listing decisions will actually strengthen the main mechanism through which the platforms' commission levels are curbed when they use price parity clauses. The intuition is that when supplier j decides to deviate and list only on platform B , say, its rivals will gain additional market power on platform A , which will mean that they optimally increase their prices in all channels, all else being equal. The fact that the rivals set higher prices after the deviation makes the deviation more attractive for supplier j , compared with the situation where listing decisions are not observed. This means that when using price parity clauses, the platforms will have to charge even lower commissions when the suppliers' listing decisions are observed, compared with when they are not observed.

Finally, we have assumed that the cost of selling directly is the same as the distribution cost for platforms (we normalize that distribution cost to zero). Now, suppose that it is slightly more costly to sell directly and that this cost is $c > 0$. As long as the cost is not too large and the platforms are sufficiently differentiated (β is small enough), it is still the case that—in the absence of price parity—final prices are higher on platforms than for direct sales. Thus, we expect that our results would not be qualitatively affected. When platforms are close substitutes, (β tends toward one), it may be the case that the equilibrium commission is lower than the cost of selling directly ($w^*(c) < c$). In this case, price parity clauses only matter across platforms because the suppliers continue to be able to charge higher prices in their own direct sales channel. Thus, narrow price parity clauses are useless (they do

the same outcome.

not bind), and wide price parity clauses always lead to higher commissions and higher (average) prices and, thus, harm consumers and suppliers.

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