Price parity clauses with webrooming and showrooming*

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Abstract

This paper studies the effects of price parity clauses (PPCs) on consumer surplus and platform profit by investigating the strategic interactions among horizontally differentiated multi-channel retailers selling through online platforms as well as in their direct channel. Consumers select their preferred product-channel combination and whether to engage in web/showrooming; platforms can decide about whether or not to impose PPCs. Contrary to expectations, PPCs do not uniformly elevate prices across channels; under certain conditions, platform prices can be lower with PPCs. We show that the direct sales channel constrains platform pricing strategies such that PPCs have ambiguous effects on consumers. From the social welfare perspective, imposing PPCs is desirable when sales channels are not very differentiated, offering similar pre-sale experiences. When investigating the equilibrium with platform competition, we find that both platforms adopt PPCs when channels are similar but one of the two can abandon PPCs when differentiation increase.

Keywords: *price parity clauses, vertical restraints, showrooming, webrooming, platform competition.*
JEL codes: *D43, L13, L42.*

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1 Introduction

In order to expand their sales, firms offer their products both online, possibly on multiple marketplaces, and directly in their physical points of sale, acting as multi-channel retailers. Consumers, therefore, find themselves in front of a multiplicity of places, physical and virtual, where to search for their favorite product and can switch swiftly from one channel to another. While this allows consumers to find the best deal, it may also result in free-riding behaviour: consumers can use presale services of brick and mortar shops before purchasing the product online; alternatively, consumers can search and compare products online before purchasing in brick and mortar shops (European Commission, 2017).

Empirical evidence reveals that in many cases the channel chosen to make the purchase differs from the one in which consumers have searched. For instance, the report prepared by Nielsen (2016) says that in 2015 about 20% of individuals in the US that made a purchase, searched for which product to buy by visiting retailers' physical stores but then finalized the transaction over an on-line marketplace. This practice is known as *showrooming*. A study conducted by Quint and Roger (2013) reports that 70% of mobile shoppers (consumers who use their mobile devices in store) have showroomed at least once in the past year.
At the same time, more and more frequently, things go the other way and consumers identify their favorite product on a virtual marketplace, prompted by the greater ease with which they can conduct search online, and then buy the product in the physical store or through sellers' websites, a practice known as *webrooming* (Flavián et al., 2016). According to Nielsen (2016), in 2015 80% of the consumers in the US used to search products online, and half of them then purchased the product in person in the physical store. As reported by the European Commission (2017), 72% of the manufacturers acknowledge the existence of free-riding by online sales on offline services. 62% acknowledge the existence of free-riding by offline retail on services (information) offered online. Approximately 40% of retailers also acknowledge the existence of free-riding behaviour both ways.

These forms of free-riding (i.e. webrooming and showrooming) are posing complex challenges for many platforms, which see some of their profits vanish due to consumers not paying fees on the service they used. In order to prevent such risk, platforms may impose the so-called price parity clauses (PPCs) according to which retailers, if they want to post their offers on a given marketplace, cannot charge lower prices on the other channels in which they operate for the same product/service. In this way, platforms aim at removing the incentives of free-riding driven by the price difference across sales channels (Gensler et al., 2017).
PPCs have long been the subject of heated debate. On the one hand, in fact, by preventing retailers from being able to freely choose the prices of their products on the various channels, PPCs represent a clear restriction to competition with likely negative effects on

consumer welfare (Baker and Scott-Morton, 2018). On the other hand, showrooming could severely reduce both platforms' profits and investments such that PPCs could be total-welfare-enhancing (Buccirossi, 2015). PPCs are labeled "wide" when sellers are forced by an intermediary not to offer better conditions for a given product in any other sales channel. In contrast PPCs are considered "narrow" when the constraint imposed by the intermediary applies to sellers' direct channel only. Both types of Price Parity Clauses have been imposed by several large platforms in the past such as Booking.com, Amazon and Apple, leading many competition authorities (mostly) in Europe to start investigations, especially in the online travel agencies (OTAs) sector.

Competition authorities and regulators have adopted different approaches to PPCs, depending on the jurisdiction. This jeopardized approach to PPCs in EU led the European Commission (EC) to develop two main documents in order to establish clear guidelines for ensuring a larger degree of homogeneity across member states. First, the EC established in 2022 the new Vertical Block Exemption Regulation (VBER) where the EC excludes wide PPCs from its safe harbour[1] and now imposes a case-by-case assessment under Article 101 TFEU[2] while narrow PPCs still benefit from the safe harbour of the VBER, under specific conditions.[3]

The other key document proposed by the EC in 2022 is the Digital Markets Act (DMA), which says that all types of PPCs should be considered unlawful when adopted by the so called *gatekeepers*.[4]

The DMA also addresses potential alternative strategies that platforms may use to discipline sellers. One of these practices is known as *dimming*, which consists in reducing the prominence on a given marketplace of the sellers that offer lower prices on other sales channels. Another example is a discriminatory fee that would be set higher for sellers offering better deals outside the platform.

Although the recent efforts exerted by the EC for reducing the regulatory fragmentation and legal uncertainty throughout the EU, PPCs remain a complex and heated argument. First, empirical evidence on the effect of a ban on PPCs in the OTAs sector have produced mixed evidence. On the one hand, Hunold et al. (2018) find that along with providing more

[1]The VBER sets a block exemption from the prohibition of Article 101.1 TFEU for vertical agreements. One of the necessary requirements is that neither the supplier, nor the buyer should surpass 30% of the relevant supply or purchase market. If these requirements are fulfilled, the vertical agreement is exempted from Article 101.1 TFEU.

[2]Article 5.1.d of the Regulation of the European Commission of 10 May 2022 on the application of Article 101.3 of the Treaty on the Functioning of the European Union to categories of vertical agreements and concerted practices (2022/720).

[3]Firstly, the exemption cannot be applied to companies whose market share is superior to 30% (Article 3.1). Secondly, the agreement will probably be excluded from the exemption if the digital platform using the clause is involved in a concentrated market and has a large share of users.

[4]Article 5.3 of the Digital Markets Act.

room availability and expanding the number of sales channels, the ban leads hotels to charge low price more frequently in Germany relative to countries without such a ban. On the other hand, other studies have shown that prices have not significantly decreased after the PPCs removal in the medium-run (Mantovani et al., 2021) and have also increased for cheaper hotels (Ennis et al., 2023).

Second, unlike the OTAs sector where showrooming may have a limited impact,[5] other sectors present a much higher rate of showrooming such that narrow PPCs are more likely to be considered lawful based on a much stronger efficiency justification (i.e. protecting profits and investments from consumer free-riding).[6] This is the case for product categories such as food, cosmetics, books, and apparel, where consumers' purchase decisions depend significantly on how well a product matches their idiosyncratic needs or preferences.[7] Such preferences are especially relevant in the context of horizontal differentiation (Zhong et al., 2022).[8]

Last, although the DMA has also addressed alternative tools that may act as substitute of PPCs, ' ' *there is still uncertainty as to whether a particular platform's design constitutes a non-compliance with the DMA such a regulatory intervention may negatively affect the overall quality of platforms' services (Peitz, 2022).*"

The aim of this paper is to shed light on the impact that PPCs may have on market outcomes in a context characterized by webrooming and showrooming.

Our results show that (i) PPCs always increase the price set in the direct channel compared to the unrestricted pricing (UP) case but the effect on the platform's price is ambiguous. In particular, there exist a combination of product differentiation parameters that ensures lower platform's prices under PPCs than under UP. (ii) Platforms benefit from adopting

[5]According to the investigation conducted by the Bundeskartellamt (i.e. the German authority) in 2020, only 1% of the customers who managed to find a new accommodation thanks to Booking.com eventually decided to visit the hotel's website to actually purchase the room there.

[6]For instance, BBC reports that at least 24% of customers showroomed during 2023 Christmas holidays (The peril of 'showrooming' - BBC News). Moreover, a 2012 Comscore study found 35% of U.S. consumers reported showrooming and of those, half were between 25 and 34 years old (The State of the U.S. Online Retail Economy in Q3 2012 - Comscore,... - Comscore, Inc.). Based on a 2013 survey polled 750 U.S. consumers, Accenture found that 73% of respondents reported having showroomed in the previous six months (Accenture Study Shows U.S. Consumers Want a Seamless Shopping Experience Across Store, Online and Mobile that Many Retailers are Struggling to Deliver). According to eMarketer, in 2014 72% of U.S. digital shoppers purchased a product after they examined it in a store, while 78% of shoppers examined the product online then bought it in a store (Flavián et al., 2020).

[7]According to the data journalist Felix Richter, the product categories most bought by showroomers are: electronics, apparel&clothing and books. These results have been produced by analysis conducted by ComScore, Deloitte, Retail Customer Experience, eMarketer and Progressive Grocer. Results have been posted on Statista in 2013: Chart: Showrooming in the Retail Environment — Statista .

[8]' ' *For instance, a consumer may choose a red dress over a green one in spite of the same quality level. Different from quality uncertainty, which can be resolved by applying past experiences or surveying the company's reputation, match uncertainty generally requires more time and effort to resolve because it is less correlated to others' tastes or choices."*

PPCs while the effect on consumers and total welfare is ambiguous and depends on the relative degree of product differentiation (characterized by transportation costs) between the platform and the direct channel. iii) When considering a platform duopoly, we observe a symmetric competitive equilibrium where both platforms impose PPCs but when product differentiation is much lower on platforms than on direct sales channels we may observe an asymmetric equilibrium where only one of the two platforms adopts PPCs.
The paper is organized as follows. Section 2, is devoted to review the related literature and how this paper contributes to it; Section 3 presents the basic model, while Sections 4 the outcomes obtained in the two regimes (unrestricted pricing and price parity) are compared. In Section 5, we investigate whether price parity arises as the result of platform competition. Section 6 concludes with some policy implications.

2 Related literature

This paper contributes to the streams of literature on showrooming and PPCs. Although the existing literature has addressed several questions regarding the effects of PPCs, rarely web/showrooming plays a crucial role.
Boik and Corts (2016) and Johnson (2017) assume consumers must use one of two differentiated platforms, and focus on how wide-PPCs result in each platform's demand becoming less responsive to its fees, resulting in higher equilibrium fees and prices. Carlton and Winter (2018) extend these works by allowing for a direct channel. They focus on the case with perfectly competitive firms that must list on the platform, applying their theory of a PPC to show the harm caused by the no-surcharge rule of credit card platforms. Edelman and Wright (2015), in a similar setting, show that when consumers can 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). Johansen and Vergé (2017) also allow for a direct channel, they focus on the effects of allowing firms to delist from platforms. Authors find that the 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, they find that price parity clauses are unlikely to cause any harm and may actually increase platforms' and suppliers' profits as well as consumer surplus.
Our model differs from these works in many aspects. A key difference in our analysis is precisely the showrooming behaviour (which is not investigated in the aforementioned works) which describes how consumers can exploit a combination of sales channels for purchasing a given product. This characterizes our results in terms of relative degree of product differentiation across channels, explaining how the platform and the direct channel exert competitive pressure on each other and why consumers could be better off in the presence of PPCs.

Also Wang and Wright (2020) focus on buyers' showrooming behavior and the effects of PPCs. In particular, they stress the difference between applying a wide-PPC and a narrow-PPC. Their findings support banning wide-PPCs, but whether narrow-PPCs should be banned as well depends on whether platforms would remain viable without them. The same authors extend this work to address the relationship between PPCs and platforms' investments (Wang and Wright, 2023), showing how wide (narrow) PPCs lead to higher (lower) than optimal level of investments.

First, we depart from Wang and Wright (2020) by modelling consumer preferences as horizontally differentiated with respect to three dimensions: i) channel selection, ii) product selection and iii) showrooming/webrooming. This not only extends the ability to switch channel to all customers (whereas in Wang and Wright (2020) it is assumed that only a fraction of consumers can showroom) but also allows customers to buy a product online after having tested it in the direct channel (whereas in Wang and Wright (2020) and in other works we only observe a switch from the platform to the direct channel). Then, from a results standpoint, we show that also narrow PPCs can increase both consumer and total welfare depending on the relative degree of product differentiation across channels. Although we investigate the ability of platforms to protect their profits from consumer free-riding, we do not directly address the topic of investments.

Finally, Mantovani et al. (2017) investigate the dynamics of hotel prices listed on Booking.com between 2014-2016, showing that prices decreased in 2015, the year in which the major antitrust decisions took place, whereas they bounced back in 2016. On top of this, they also provide both a comprehensive explanation of the previous evidence and a rationalisation based on a theoretical model of the OTAs sector. The present paper relates to their work as we employ and extend their theoretical model in order to account for both showrooming and webrooming. In line with their findings, we show that PPCs may reduce the price set by firms on the platform. However, while in Mantovani et al. (2017) this occurs via an additional benefit consumers receive by buying online, in our paper this is explained by the lower transportation cost incurred when visiting the platform compared to the direct channel. On top of this, we further depart from their paper by showing that consumer surplus can increase under PPCs and that we may not observe PPCs adoption by all platforms.

3 Baseline framework

We consider two firms indicated with $i \in \{1, 2\}$ selling a horizontally differentiated good both on a platform (P) and on a direct channel (D).[9] We also consider in our model the

[9]The direct channel can be considered as the whole disintermediated space where firms compete. This can be a search engine when firms have a website or a physical space when firms have a brick-and-mortar shop.

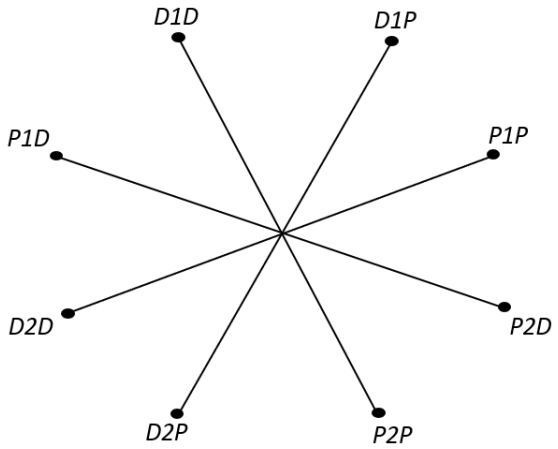

Figure 1: Spokes model with eight buying options

possibility for consumers to engage in both webrooming and showrooming such that they can visit a given channel first for collecting information on the product and then finalize the purchase for the same product (i.e. buying from the same firm) on a different channel. This allows consumer to select their preferred product-channel combination from a total of eight different options. Each of this is a triplet $\{c, i, s\}$, with $c, s \in \{P, D\}$, indicating the consumer selection of: the channel for having the pre-sale experience, the product to buy and whether to buy the product in a channel other than the one of the pre-sale experience (web/showrooming). These eight channel-firm-showrooming triplets are perceived by customers as horizontally differentiated. Following Mantovani et al. (2017), we adapt this framework over the "spokes" model of non-localised competition proposed by Chen and Riordan (2007). Thus, our market can be represented by a spatial structure with n = 8 spokes, where each purchasing option is represented by a point at the origin of a line of length 1/2. The other end of a line is called its terminal, and the terminals of all lines meet at a point called the centre.

There exists a unit mass of customers willing to buy at most a single unit of one of the two products. They are uniformly distributed over this spatial structure. Buying a product generates a gross utility $v_{c,h,s}$ which is symmetric across channel-firms-showrooming triplets, hence $v_{c,h,s} = v$. As common in the extant literature on spatial models, v is large enough for the market to be covered.

As indicated above, each spoke $k \in \{D1D; D2D; D1P; D2P; P1D; P2D; P1P; P2P\}$ represents a horizontally differentiated buying option. For instance, the spoke $D1D$ indicates the combination given by: going to the direct channel, selecting the product offered by Firm 1 and finalize the purchase in the direct channel (i.e. no showrooming), while the spoke $D1P$

indicates the combination given by: going to the direct channel, selecting the product offered by Firm 1 and switching to the platform to finalize the purchase in the direct channel (i.e. showrooming).

A customer located at $x_k = 0$ has a strong preference for buying option k, which exactly matches his preference. Instead, a customer located at $x_k = 1/2$, is indifferent across all options, as he has to cover the same distance to reach them. In order to capture differences in terms of customer experience across channels (e.g. ease of finding the product, information availability, ease of comparing the product with other items) we consider two different transportation costs, t_c with $c \in \{P, D\}$, that customers may incur depending on the channel that they visit before purchasing the item. In other words, transportation costs can be interpreted as the disutility of customers' pre-sale experience in a given channel. Hence, the net utility of the consumer located in x_k, buying product h through channel s after having visited channel c, is:

$$u_{x_k} = v - p_{h_s} - t_c x_k \quad c, s \in \{P, D\}, h \in \{1, 2\}. \tag{1}$$

Transportation costs incurred in the direct channel can be either lower, equal or larger than those incurred on the platform. This captures the fact that in certain sectors the direct channel can provide more information to the buyer, namely lower transportation costs (e.g. apparel and clothing sectors rely heavily on the touch and feel experience of clients), whereas other sectors make the direct channel experience harder compared to going on a dedicated platform (e.g. the accommodation sector has relatively high search cost in the direct channel while the time required to find the desired accommodation is much lower on OTAs where customers not only can quickly find hotels but they can also easily compare them for finding the option that suits them best). At the moment, the only restriction we are imposing is that t_P is not too small compared to t_D in order to ensure firms' full-participation (i.e. being active on every sales channel) absent PPCs, which is ultimately what we observe in most markets (Duch-Brown, 2017).

In line with Chen and Riordan (2007), we assume each customer compares the spoke on which he is located with one randomly drawn from the remaining seven spokes. All buying options compete with each other, i.e. competition is non-localised. Finally, selling products on each channel is assumed to be costless apart from the fees charged by the platform.

The timing of the game is the following:

1. the platform sets the per-transaction fee to firms, f;
2. firms simultaneously set prices;

3. consumers select their preferred buying option;

We are assuming perfect and complete information such that the solution concept is a subgame-perfect-Nash-equilibrium (SPNE).

3.1 Unrestricted pricing

First, we start considering the case where PPCs are not adopted by the platform such that the two firms are able to set different prices across sales channels.

3.1.1 Stage 2: firm competition

Firms maximize their profits by setting a price for each channel in which they operate. Each firm's demand is composed by two parts, one per channel:

$$\pi_h = p_{h_D} D_{h_D} + (p_{h_P} - f) D_{h_P} \quad h \in 1, 2. \tag{2}$$

The demand from a given sales channel is equal to the sum of the mass of consumers that buy the good in that channel without showrooming and the mass of consumers that first go in the other channel to collect information and then switch in order to finalize the purchase, formally:

$$D_{h_s} = d_{c,h,s} + d_{-c,h,s} \quad h \in 1, 2 \quad c, s \in P, D. \tag{3}$$

The element $d_{c,h,s}$ describes the demand of each buying option, namely of each spoke in the model. As in Chen and Riordan (2007), a given spoke's demand is defined as the average of $n-1$ demand functions, each of those determined as the result of Hotelling price competition between the given spoke and one of the other $n-1$. For instance, the demand for buying product 1 from channel D after visiting the platform P is defined as:

$$d_{P,1,D} = \frac{1}{7}(\tilde{x}_{P1D-P2D} + \tilde{x}_{P1D-P2P} + \tilde{x}_{P1D-D2D} + \tilde{x}_{P1D-D2P} + \tilde{x}_{P1D-P1P} + \tilde{x}_{P1D-D1D} + \tilde{x}_{P1D-D1P}), \tag{4}$$

where, for instance, $\tilde{x}_{P1D-P1P}$ captures the mass of consumers that prefers to webroom on the platform and then buy good 1 directly compared to finalized the purchase online, this is the result of the standard Hotelling competition in prices between these two buying options:

$$v - p_{1_D} - t_P x_{P1D} = v - p_{1_P} - t_P(1 - x_{P1D}); \tag{5}$$

consumers visit the platform in both cases (enjoying the same pre-sale experience) but pay different prices which, by solving for x_{P1D}, gives:

$$\tilde{x}_{P1D-P1P} = \frac{1}{2} + \frac{p_{1_P} - p_{1_D}}{2t_P}.$$

Repeating the above for all the competing alternatives to the buying option $P1D$, defines its demand:

$$d_{P,1,D} = \frac{1}{14}\left(3 + (p_{2_D} + p_{2_P} + p_{1_P} - 3p_{1_D})\left(\frac{1}{t_P} + \frac{2}{t_P + t_D}\right) + \frac{8t_D}{t_P + t_D}\right), \tag{6}$$

which is decreasing in the price of good 1 offered in the direct channel p_{1_D} and it is increasing in the prices set for the other product-channel combinations. The same logic applies to all the other buying options.

The two firms set prices simultaneously such that the competitive level is:

$$p_{h_D} = \frac{f}{4} + \alpha \tag{7}$$

$$p_{h_P} = \frac{3f}{4} + \alpha \tag{8}$$

where $h \in \{1, 2\}$ and $\alpha = \frac{7t_D t_P(t_D+t_P)}{t_D^2+6t_D t_P+t_P^2}$.
Firms set the same price as they are symmetric. The price set on the platform is higher than the one in the direct channel in order to cover the fee that firms have to pay to the platform on each unit of good sold. However, as a result of the non-localised competition, part of fee is passed on to consumers in the direct channel. Each firm's profit is then equal to:

$$\pi_{UP} = \frac{f(t_D^2 + 6t_D t_P + t_P^2)^2 + 392t_D^2 t_P^2(t_P + t_D)^2}{28t_P t_D(t_D + t_P)(t_D^2 + 6t_D t_P + t_P^2)}. \tag{9}$$

3.1.2 Stage 1: platform setting the per-transaction fee

The platform anticipates firms' strategies and sets the per transaction fee (the same for both firms) in order to maximize the following profit function:

$$\Pi_{UP} = f(d_{P,1,P} + d_{D,1,P} + d_{P,2,P} + d_{D,2,P}), \tag{10}$$

which, as for firms, it is composed by the demand of consumers using only the platform for their purchase and customers who engage in showrooming and buy through the platform after having visited firm's direct channel.
The fee that maximizes platform profit is

$$f^*_{UP} = \frac{(t_D t_P(29t_D + 27t_P))}{(3t_D^2 + 23t_D t_P + 4t_P^2)}, \tag{11}$$

which determines platform's equilibrium profit without PPCs

$$\Pi^*_{UP} = \frac{(t_D t_P (29t_D + 27t_P)^2)}{(28(t_D + t_P)(3t_D^2 + 23t_D t_P + 4t_P^2))}. \tag{12}$$

3.2 Price parity clause

We are now ready to analyze the model when platforms impose a PPC according to which firms cannot charge different prices on different channels. In line with the literature, the PPC softens inter-channel competition and makes the consumer decision about where to purchase product h to depend only on transportation costs. The timing of the game is unchanged.

3.2.1 Stage 2: firm competition with PPCs

Considering the example made in the previous section, the indifferent consumer between option $P1D$ and option $P1P$ when PPCs are imposed is determined by solving the following for x_{P1D}:

$$v - p_1 - t_P x_{P1D} = v - p_1 - t_P(1 - x_{P1D}), \tag{13}$$

meaning that consumers would pay the same price p_1 regardless of the channel in which they make their purchase.
By repeating this for all remaining six buying options, we obtain that total mass of consumer that want to purchase a good through the buying option $P1D$ is:

$$d_{P,1,D} = \frac{1}{14}\left(3 + (p_2 - p_1)\left(\frac{1}{t_P} + \frac{2}{t_P + t_D}\right) + \frac{8t_D}{t_P + t_D}\right), \tag{14}$$

which is decreasing in the price of good 1 (which is the same across channels) and increasing in the price of good 2.
Under PPCs, firms maximize the following profit function

$$\pi_h = p_h D_{h_D} + (p_h - f) D_{h_P} \quad h \in 1, 2. \tag{15}$$

Firm competition generates the following equilibrium price level

$$p_h = \frac{f}{2} + \alpha \quad h \in 1, 2 \tag{16}$$

and a profit of 2α.

3.2.2 Stage 1: platform setting the per-transaction fee with PPCs

By anticipating firm's pricing strategies, platform's objective function becomes:

$$\Pi_{PPC} = \frac{f}{14}\left(27 + \frac{2t_D}{(t_D + t_P)}\right). \tag{17}$$

Given that this profit function is increasing and linear in the fee f, the platform has the incentive to set a very high fee as long as full market coverage is ensured.
However, by raising the fee, firms find more and more profitable to deviate from full-participation to sell only on their direct channel. Hence, the platform's pricing strategy is constrained by firms possibility to delist from the online marketplace. This means that the platform will set the fee in order to allow firms to earn a profit which is equal to the one they would make by deviating to the direct channel:

$$\pi_{PPC} - \pi^{dev}_{PPC} = \frac{14t_D t_P(t_D + t_P)}{(t_D^2 + 6t_D t_P + t_P^2)} - \frac{(f(3t_D + t_P) + 22t_D^2 + 26t_D t_P)^2}{144t_D(t_D + t_P)(3t_D + t_P)} = 0. \tag{18}$$

Interestingly, firm's deviating profit (π^{dev}_{PPC}) not only increases with the fee but also with the difference between transportation costs $t_D - t_P$. In fact, when the pre-sale experience on the platform has a much lower costs than in the direct channel, firms' margins on intermediated sales are much lower than the one made by selling directly to clients. In order to keep firms operating on the platform, the more competition intensifies on the marketplace the more the platform has to lower its fee and profit to compensate companies for lost margins.
By solving this constrained optimization, the platform earns a full-participation (FP) equilibrium profit of:

$$\Pi^{FP}_{PPC} = \frac{6t_D^6 + 40t_D^5 - 252t_D^4 + 855t_D^3 - 1092t_D^2 + 1521t_D - 1170t_D^3 + 1404t_D^2 - 208t_P^6 + 162t_P^5}{7(t_D + t_P)(3t_D + t_P)^2(t_D^2 + 6t_D t_P + t_P^2)}. \tag{19}$$

However, when transportation costs on the platform are too small compared to the direct channel, preserving full-participation is too costly and the platform prefers to maintain a higher fee on a single firm, earning a partial-participation (PP) equilibrium profit of:

$$\Pi^{PP}_{PPC} = \frac{t_D(19t_D + 17t_P)^2}{48(t_D + t_P)(3t_D + t_P)}. \tag{20}$$

Under the above parameters' values, partial participation with PPCs arises in equilibrium as both firms are better off, because: i) the deviating firm does not have to pay the fee while ii) the firm selling on both channels enjoys a larger mass of consumers coming from the lesser competition on the platform.

4 Unrestricted pricing *vs* price parity clause

The main contributions of this paper are provided by comparing the equilibrium outcomes with and without PPCs.

4.1 Prices

First, we found that PPCs do not lead to higher prices in all sales channels. As predicted by the Economic literature, PPCs (especially in their "wide" form) are meant to restrict competition by limiting the ability of sellers to offer better prices than those set on the platform adopting this type of contract. This pushes the platform to raise its fee such that one would expect a general increase in prices across all sales channels. However, we show that there are transportation costs combinations such that a ban on PPCs would increase the price of the products sold on the platform.

Proposition 1. *PPCs always increase prices, on both the platform and the direct channel, but when both firms are active in both channels and t_P is small compared to t_D. In this case, the prices set on the platform are lower with PPCs than without.*

As shown in Figure 2, prices on the platform are higher than those in the direct channel absent PPCs. When parity is imposed on prices, firms' prices decrease in the transportation costs incurred on the platform as this increases competition. When prices under PPCs and full-participation are too low, firms find profitable to deviate from full-participation such that one of the firms sells only through the direct channel while the other is active on both. Under this partial-participation scenario, both firms increase again their price level due to a reduction in competition.[10] However, before deviating from full-participation, competition is fierce enough to drive PPCs prices below the equilibrium level of the prices on the platform without PPCs while still being above prices set in the direct channel.

[10] When deviating to partial-participation, firms propose less buying options to the same mass of consumers, thus increasing their market power at the margins.

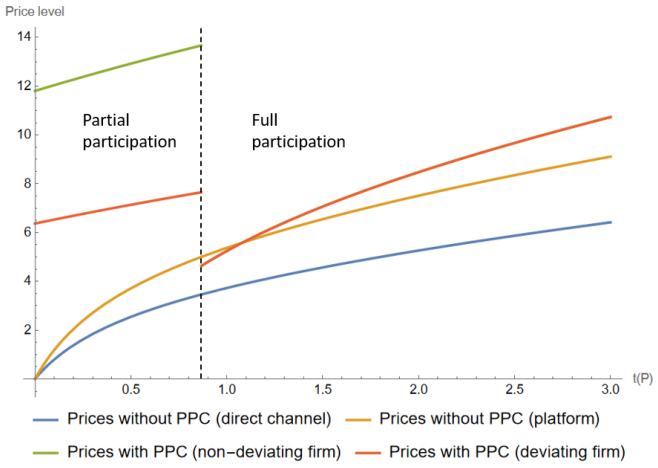

Figure 2: Equilibrium prices as a function of t_P (for $t_D = 2.8$)

4.2 Platform and firms' profits

Second, we found that the platform always find profitable to impose PPCs. Moreover, when full-participation is costly to support, the platform lets one of the firms deviate to the direct channel but keeps PPCs. In this way, the platform allows the non-deviating firm to increase its profit by enjoying prominence with respect to a larger portion of the market than its rival (now active only in the direct channel), this in turn enables the platform to maintain its fee at a sustained level rather than lowering it in order to have both firms on its marketplace. On the contrary, firms (overall) make higher profits with PPCs only in a partial-participation scenario (i.e. when t_P is very low compared to t_D). As explained before, partial participation allows both firms to raise their price due to softer competition. When partial participation is not optimal, firms would be better off by price-discriminating sales channels.[11]

Platform's optimal strategy is shown in Figure 3, where the larger area (in orange) captures the set of transportation costs combinations such that firms are active in all channels when PPCs are not adopted (and the market is fully covered), namely the parameter space that we are considering for this analysis; the smaller area (in blue) represents the set of combinations for which the platform finds optimal to adopt PPCs and preserving firm full-participation. The difference between the two areas indicates the combinations of transportation costs for which the platform finds most profitable to adopt PPCs but leaving one of the two firms to deviate from full-participation (partial-participation).

In other words, platforms benefit from PPCs adoption to the extent that they prefer not to serve all firms rather than allow them to price-discriminate sales-channels.

[11] See additional information in the Appendix A.

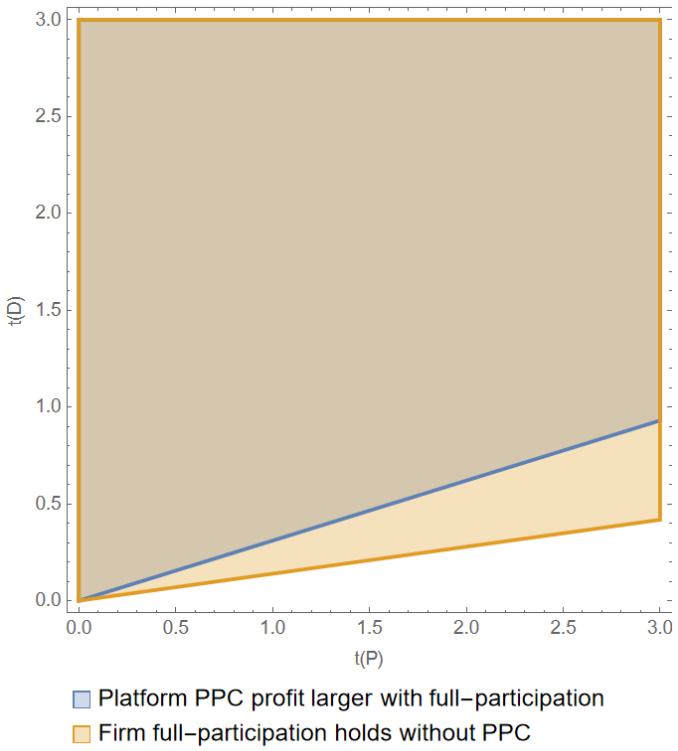

Figure 3: Equilibrium platform profits under PPC, with and without firm full-participation, as a function of transportation costs ($v = 15$)

Proposition 2. *The platform finds optimal to impose PPCs even if it has to sacrifice full-participation. Firms instead benefit from PPCs adoption only under partial-participation, namely when t_P is small compared to t_D.*

4.3 Consumer surplus and total welfare

Third, since the platform would always adopt PPCs if these were allowed, we have investigated what would be the effect of banning these contracts on social welfare.
We found that also consumers can benefit from PPCs (see Figure 4). This occurs for the same set of transportation costs combinations that allows prices set on the platform to be lower under PPCs (see Figure 2). This implies that also total welfare, defined as the "utilitarian" function given by the sum of all profits and surplus in the market, is higher with PPCs when the platform provides a similar pre-sale experience to the direct channel (i.e. when t_p is not too low compared to t_d) such that firms operate on sales-channels (full-participation).[12]

Proposition 3. *Under full-participation (i.e. when t_P is similar to t_D), total welfare is higher with PPCs. For a subset of this transportation costs combinations, also the consumer surplus can be higher under PPCs. In particular, this holds true when platform prices are lower with PPCs than without.*

[12]See Appendix B

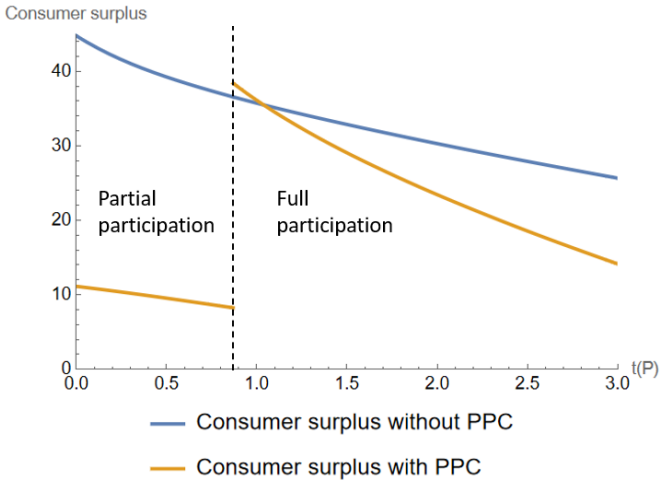

Figure 4: Consumer Surplus with and without PPC as a function of t_P (with $t_D = 2.8$ and $v = 15$)

These results suggest that when pre-sale experience return similar (dis)utilities to consumers across channels, adopting PPCs may be welfare enhancing and justified by efficiency reasons. Moreover, when firms are tempted to abandon the platform, prices on the platform can be lower with PPCs such that consumers are overall better off.
On the contrary, when the utility of the pre-sale customer experience differs substantially across channels, then imposing price parity is detrimental from a total welfare standpoint such that a ban on these contracts would be desirable.

5 Platform competition

Last, we have extended our baseline model presented above by including a second platform. In the same fashion of Mantovani et al. (2017), all three sales channels compete against each other. Given that now a customer that wants to finalise its purchase on a different channel (i.e. web/showrooming) has two options (instead of one), we extend the structure presented previously to a total of eighteen spokes. We assume platforms to be symmetric such that the disutility from the customer pre-sale experience is the same on both platforms (i.e. t_P). Most of the results obtained above are replicated even in this extension. We are now interested in investigating whether imposing PPCs can arise as the result of a competitive equilibrium. In order to do so, we add to the previous extensive form game an additional stage at the beginning where the two platforms simultaneously decide whether to adopt PPCs or not.

Proposition 4. *In equilibrium both platforms impose PPCs. However, when t_P is small compared to t_D, we have an asymmetric equilibrium in which only one of the two platforms*

imposes PPCs.

As shown in Figure 5, both platforms operating in an unrestricted pricing regime is never an equilibrium as it is always dominated by other scenarios.[13] Both platforms adopting PPC is instead an equilibrium as none of the platforms finds profitable to deviate by removing PPC. When the asymmetry in transportation costs gets larger, preserving full-participation is more expensive for platforms as a lower t_P makes more profitable for firms to deviate.[14] In response to this, one of the two platforms may decide to remove PPCs in order to avoid the full-participation constraint.[15]

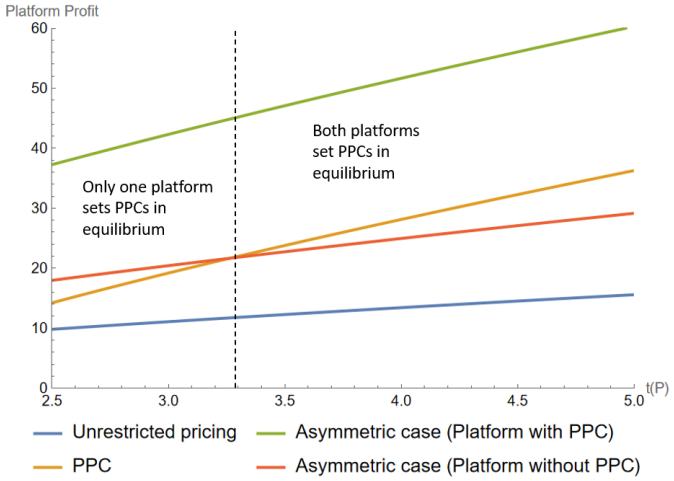

Figure 5: Platforms' profit with and without PPC as a function of t_P (with $t_D = 2.8$)

Removing PPCs from one of the platforms increases firms' profit as they are now able to set their price according to cost discrepancies across channels. This has a positive impact on both platforms: i) the platform that removes PPCs is not forced to lower the fee to attract firms and ii) the platform that preserves PPCs can set a higher fees since both firms make higher profits. Hence, also the case where only one of the two platforms impose PPCs can occur as the result of a competitive equilibrium.

[13]Please note that Figure 5 displays the x-axis from $t_P > 0$ as for lower values than that threshold firms deviate from full-participation also without PPCs, which is a case that is not covered by this work.

[14]When both platforms adopt PPCs, we refer to a "deviation" as a firm selling only on the direct channel. When only one platform is adopting PPCs, a "deviation" is defined as a firm selling through the direct channel and the platform who is not imposing PPC. The rationale for this is that when market conditions makes full-participation less profitable, firms abandon all platforms that impose PPCs. Platforms not imposing PPCs are not a concern for firms as they are free to adjust their price. Finally, we have replicated analysis considering also other types of deviations and all results are qualitatively unchanged.

[15]Formulas and codes can be made available upon request.

6 Conclusions

In conclusion, our study sheds light on the complex dynamics surrounding price parity clauses (PPCs) in the context of multi-channel retailing characterized by showrooming and webrooming behaviors. Our findings highlight several key insights regarding the equilibrium outcomes with and without PPCs.

Firstly, contrary to conventional economic expectations, PPCs do not universally lead to higher prices across all sales channels. While PPCs are typically designed to limit competition and increase prices, our analysis reveals that under certain conditions, prices on the platform can actually be lower with PPCs compared to unrestricted pricing. This counterintuitive result underscores the nuanced effects of PPCs, particularly in the presence of differentiated sales channels.

Furthermore, our analysis demonstrates that platforms consistently find it profitable to impose PPCs, even at the cost of not serving all firms. However, firms only benefit from PPCs in a partial-participation framework. On the contrary, consumers can be better off when firms offer their products in all channels but pre-sale experiences provide different (dis)utilities (i.e. the cost of visiting the platform is sufficiently low compared to the one for visiting the direct channel). Overall, PPCs are total-welfare-enhancing when firms are active in all channels while they are welfare-detrimental when some firms deviate from full participation and sell only through the direct channel.

Expanding our analysis to include platform competition, we find that in equilibrium, both platforms tend to impose PPCs. However, in cases where transportation cost differentials between channels are pronounced, an asymmetric equilibrium may emerge, with only one platform imposing PPCs. This asymmetry reflects strategic considerations by platforms in response to varying cost structures and competitive pressures.

Overall, our study contributes to a deeper understanding of the implications of PPCs on market outcomes and underscores the importance of considering contextual factors such as pricing strategies, channels' features and consumer behavior. Moving forward, policymakers and regulators should take into account the complex interplay between these factors when formulating regulatory frameworks in the rapidly evolving landscape of multi-channel retailing.

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Appendix

A Firm profit

A.1 Firm profit in the unrestricted pricing regime

Firm's profit without PPCs is equal to:

$$\pi_{UP} = \frac{t_D t_P (392(t_D + t_P)^2 + \beta)}{28(t_D + t_P)(t_D^2 + 6t_D t_P + t_P^2)}$$

Where β is defined as:

$$\beta = \frac{(29t_D + 27t_P)^2 (t_D^2 + 6t_D t_P + t_P^2)^2}{(3t_D^2 + 23t_D t_P + 4t_P^2)^2}$$

A.2 Firm profit with PPCs

Firm's profit with PPCs and full-participation is equal to:

$$\pi_{PPC} = \frac{14t_D t_P (392(t_D + t_P))}{(t_D^2 + 6t_D t_P + t_P^2)}$$

When one firm deviates from full participation, firms earn different profits depending of whether they have deviated (marked with "*dev*") or not (marked with "*stay*"):

$$\pi_{PPC}^{stay} = \frac{t_D (19t_D + 17t_P)^2}{144(t_P + t_D)(t_P + 3t_D)}$$

$$\pi_{PPC}^{dev} = \frac{t_D (41t_D + 17t_P)^2}{144(t_P + t_D)(t_P + 3t_D)}$$

The deviating firm earn higher profits than the one that keeps operating on both channels. However, when full-participation is no longer optimal, both deviating and non-deviating firms make higher profits than the full-participation case.

A.3 Firm profit comparison

Figure 6 shows that firms are better (worse) off with PPCs than without when in equilibrium there is partial (full) participation.

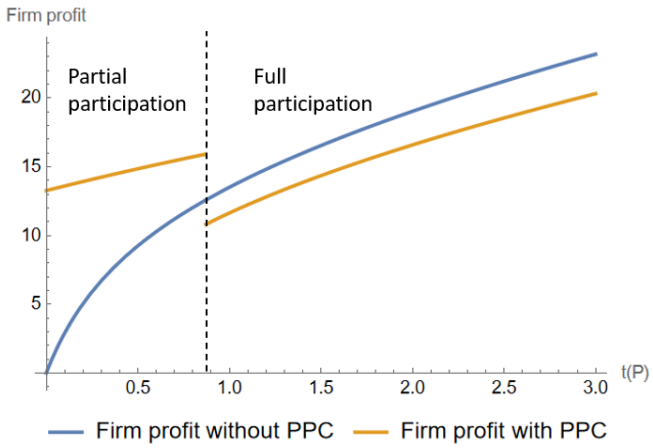

Figure 6: Firms' profit with and without PPC as a function of t_P (with $t_D = 2.8$)

B Welfare

B.1 Consumer surplus

Consumer surplus is defined as the willingness to pay net of prices and transportation costs (i.e. the disutility of the pre-sale experience). Given firm's incentive to deviate from full-participation when PPCs are adopted, equilibrium consumer surplus is described by the following function:[16]

$$CS = \begin{cases} CS^{FP}_{PPC} & \text{for } \pi^{dev}_{PPC} < \pi_{PPC} \\ CS^{PP}_{PPC} & \text{for } \pi^{dev}_{PPC} \geq \pi_{PPC} \end{cases}$$

In equilibrium, the platform finds optimal to adopt PPCs and a ban on these contracts would generally makes consumers better off. However, there exist a set of transportation costs that force both the platform and firms to lower prices such that consumer are better off under PPC than unrestricted pricing. This set of transportation costs is shown in blue in Figure 7.

[16]Formulas and codes can be made available upon request.

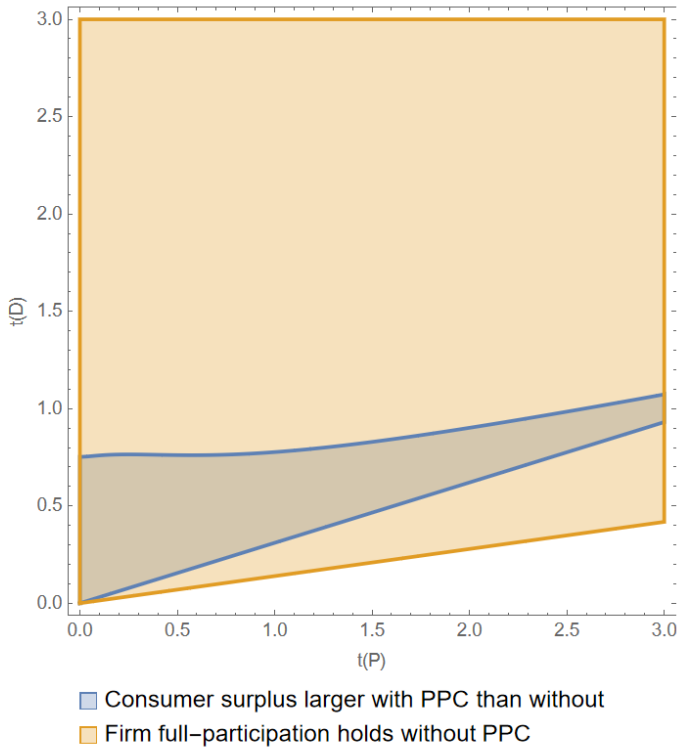

Figure 7: Consumer surplus with and without PPC as a function of t_P and t_D (with $v = 15$)

B.2 Total welfare

In this paper we employ an "utilitarian" welfare function which is defined as:

$$TW = \Pi + \sum_{h=1}^{2} \pi_h + CS$$

In equilibrium, total welfare is equal to:

$$TW = \begin{cases} \Pi_{PPC}^{FP} + 2\pi_{PPC} + CS_{PPC}^{FP} & \text{for } \pi_{PPC}^{dev} < \pi_{PPC} \\ \Pi_{PPC}^{PP} + \pi_{PPC}^{dev} + \pi_{PPC}^{stay} + CS_{PPC}^{PP} & \text{for } \pi_{PPC}^{dev} \geq \pi_{PPC} \end{cases}$$

As for the consumer surplus, a ban on PPCs can lead to lower total welfare when firms would operate in all sales channels (full-participation) despite the presence of PPCs, see Figure 8.[17]

[17]Formulas and codes can be made available upon request.

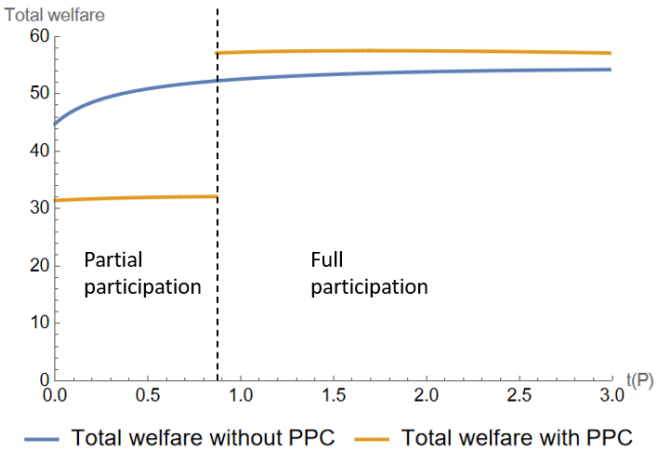

Figure 8: Total welfare with and without PPC as a function of t_P (with $v = 15$ and $t_D = 2.8$)