



HAL
open science

A Buyer Power Theory of Exclusive Dealing and Exclusionary Bundling

Claire Chambolle, Hugo Molina

► **To cite this version:**

Claire Chambolle, Hugo Molina. A Buyer Power Theory of Exclusive Dealing and Exclusionary Bundling. 2021. hal-03231803v2

HAL Id: hal-03231803

<https://hal.inrae.fr/hal-03231803v2>

Preprint submitted on 17 Nov 2021 (v2), last revised 28 Jul 2023 (v3)

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

A Buyer Power Theory of Exclusive Dealing and Exclusionary Bundling*

Claire Chambolle[†]

Hugo Molina[‡]

November 17, 2021

Abstract

We develop a unified theory of exclusive dealing and exclusionary bundling. In a framework with two competing manufacturers which supply their product(s) through a monopolist retailer, we show that buyer power restores the profitability of such practices involving inefficient exclusion. The mechanism underlying this exclusion is that the compensation required by the retailer to renounce selling the rival product erodes with its buyer power. Among others, we further show that our theory holds when the buyer power differs across manufacturers or when the retailer can strategically narrow (or expand) its product assortment.

Keywords: Vertical relations, Buyer power, Exclusive dealing, Exclusionary Bundling, Nash-in-Nash bargaining with Threat of Replacement.

JEL classification: C78, L13, L42.

*We would like to thank John Asker and two anonymous referees for their remarks and suggestions. We are also grateful to Marie-Laure Allain, Rémi Avignon, Özlem Bedre-Defolie, Clémence Christin, Alexandre de Cornière, Alon Eizenberg, Matthias Hunold, Robin S. Lee, Laurent Linnemer, Guy Meunier, Juan-Pablo Montero, João Montez, Robert Porter, Patrick Rey, Howard Smith, Thibaud Vergé, Christian Wey and Yaron Yehezkel for helpful discussions as well as conference and seminar participants at CREST, TSE, INRAE, CRESE (Heraklion, 2018, 2021), and EARIE (Barcelona, 2019) for their valuable comments. We gratefully acknowledge support from the French Agence Nationale de la Recherche (ANR) and the Deutsche Forschungsgemeinschaft (DFG) for the cooperation project “Competition and Bargaining in Vertical Chains”. Hugo Molina also thanks the IO research group at KU Leuven for financial support. The authors declare that they have no relevant or material financial interests that relate to the research described in this article. This article supersedes a previous version circulated under the title “Buyer Power, Upstream Bundling, and Foreclosure”. All remaining errors are ours.

[†]Université Paris-Saclay, INRAE, UR ALISS, 94205, Ivry-sur-Seine, France; CREST, Institut Polytechnique de Paris; claire.chambolle@inrae.fr; <http://chambolle.io>

[‡]Université Paris-Saclay, INRAE, UR ALISS, 94205, Ivry-sur-Seine, France; hugo.molina@inrae.fr; <https://sites.google.com/site/hugomolinaresearch/>

1 Introduction

Vertical restrictions imposed by a manufacturer on a retailer's purchases have been the subject of a long-standing debate in the antitrust literature.¹ Prominent examples include exclusive dealing contracts by which a manufacturer prohibits its retailer to buy and distribute products of rival manufacturers.² Bundling or full-line forcing practices, whereby a manufacturer sells its products in a package, are also observed in many industries.³ While these restrictions may enable a manufacturer to foreclose its rivals, the core of the debate is whether such a foreclosure is anticompetitive or not.⁴ Starting in the 1950s, the Chicago School argued that inefficient exclusion is unlikely to arise because a retailer cannot accept a bundling or an exclusive dealing restriction without asking for a compensation that makes these practices unprofitable for the manufacturer.⁵ Our article offers a new perspective on this debate in showing that the retailer need not require to be (fully) compensated when it has buyer power. As a result, buyer power enables inefficient vertical restrictions such as exclusive dealing or exclusionary bundling to arise.

To formalize our argument, we develop a framework of vertical relations with two manufacturers and a monopolist retailer. One manufacturer offers a leading product while its rival offers a less efficient secondary product. Products are either imperfect substitutes or independent, implying that efficiency requires the sale of the two products. We consider the following sequence of play. First, each manufacturer chooses

¹See, e.g., [Rey and Vergé \(2008\)](#) for a survey.

²See, for instance, *Masterfoods Ltd v HB Ice Cream* (European Court of Justice, 2003); *United States vs Dentsply* case (2005); *The Coca-Cola Company* (2005) – Case COMP/A.39.116/B2; *Google Search – AdSense* (2019) – Case AT.40411; *FTC v Qualcomm Inc* (2019) – Case No 17-cv-00220-LHK.

³See, for instance, *The Coca-Cola Company* (2005) – Case COMP/A.39.116/B2; *Cablevision v. Viacom* (2013) – Case No. 13 Civ. 1278; *Google Android* (2018) – Case AT.40099. The use of full-line forcing practices has also been documented in other sectors such as the U.S. video rental industry ([Ho, Ho and Mortimer, 2012a,b](#)).

⁴While a manufacturer inherently excludes its rivals through exclusive dealing, the foreclosure effect of bundling practices is more likely when retailers have a limited stocking capacity. As pointed out by the European Commission (EC) in the *Coca-Cola Company* (TCCC) case (2005): “making the supply of the strongest TCCC brands conditional upon the purchase of less-selling Carbonated Soft Drinks (CSDs) and non-CSDs [...] has the effect of making sales space in outlets harder to obtain for rival suppliers [...]” See http://ec.europa.eu/competition/elojade/isef/case_details.cfm?proc_code=1_39116

⁵See, e.g., [Posner \(1976\)](#) and [Bork \(1978\)](#).

whether or not to impose an exclusive dealing restriction on the retailer. The retailer then selects its product assortment which comprises only one of the two products under exclusive dealing or both products otherwise. Finally, the retailer and the manufacturer(s) of the selected product(s) negotiate over efficient contracts according to the bargaining protocol of [Ho and Lee \(2019\)](#), referred to as “Nash-in-Nash with Threat of Replacement” (NNTR) bargaining solution. This bargaining protocol has the appealing property that when one manufacturer is excluded from the retailer’s assortment, its product may still be used by the retailer as a threat of replacement during the course of the negotiation with the other manufacturer.

We show that the retailer’s ability to play off manufacturers against each other and obtain a compensation for renouncing to the rival product under exclusive dealing erodes with its buyer power. Indeed, absent buyer power, the retailer is fully compensated for not selling the rival product implying that the standard Chicago School argument applies, that is, exclusive dealing is not profitable. In contrast, when its buyer power increases, the retailer obtains a larger amount of surplus from its negotiation for the exclusive product which alters the credibility to threaten to replace it with the rival product. As a result, the compensation required by the retailer to renounce selling the rival product decreases in its buyer power and, when it is sufficiently high, the manufacturer of the exclusive product need not pay the retailer any compensation. We thus show that buyer power may restore the profitability of exclusive dealing for the leading product manufacturer to the detriment of the retailer and the industry profit. Hence, what makes the retailer stronger in its negotiations with manufacturers makes it weaker vis-à-vis exclusive dealing practices.

Our exclusionary mechanism readily extends to upstream bundling practices. To formalize this, we adapt our previous framework by allowing the leading product manufacturer to also offer a secondary product which is, however, less efficient than that of its rival. Due to a limited stocking capacity, we consider that the retailer cannot sell more than two products. In the first stage of the game, the leading product manufacturer now decides whether to bundle its products or not. The subsequent stages are as before. We show that buyer power restores the profitability of bundling practices lead-

ing to an inefficient exclusion of the rival manufacturer. This provides a new rationale for the so-called “leverage theory” according to which a multi-product manufacturer has the incentive to leverage its monopoly power in one market to foreclose a more efficient rival in a competitive market through bundling practices. We show that the mechanism through which this leverage occurs may hold even if the rival sells the leading product or when the multi-product manufacturer offers a bundle of complementary products (instead of imperfect substitutes or independent products).

We then analyze the profitability of these inefficient vertical restrictions when the buyer power differs across manufacturers. We highlight that our exclusionary mechanism depends only on the presence of buyer power vis-à-vis the manufacturer which imposes the restriction. We also study the retailer’s incentive to narrow or expand its product assortment. While such a strategy does not affect the profitability of exclusive dealing, we find that the retailer may choose to expand its product assortment and distribute all available products to offset the harmful effect of bundling. Despite inefficient exclusion, we also show that the retailer may find profitable to keep a narrow product assortment and distribute only the bundle of products for a rent-extraction motive.

To further motivate our results, we finally introduce the “Nash-in-Nash with Prior Competition for Slots” (NNPCS) model in which the retailer auctions off a limited number of slots and receives upfront payments before negotiating wholesale contracts with manufacturers according to the “Nash-in-Nash” solution ([Horn and Wolinsky, 1988](#)). We highlight that the surplus division in the NNPCS model coincides with the NNTR solution and that the scope of our buyer power theory extends to markets where upfront payments are prevalent.

Our article contributes to a large literature on exclusive dealing and exclusionary bundling. In response to the Chicago School critique, one strand of this literature has put forward the prominent role of scale economies in the profitability of such practices. This is the case in the two seminal contributions of [Aghion and Bolton \(1987\)](#) and [Rasmusen, Ramseyer and Wiley \(1991\)](#) which have formally demonstrated the (inefficient) entry deterrence effect of exclusive dealing.⁶ Similarly, since [Whinston’s \(1990\)](#)

⁶The main difference between these two articles is that, in contrast to [Rasmusen, Ramseyer and Wiley \(1991\)](#), contracts in [Aghion and Bolton \(1987\)](#) are not designed to deter entry *per se* but to

pioneering work, a large number of articles have relied on scale economies to provide support for the leverage hypothesis.⁷ Another body of the literature has highlighted that the profitability of exclusive dealing and exclusionary bundling crucially depends on the presence of imperfect rent extraction due to contracting externalities. For instance, linear contracts (Mathewson and Winter, 1987), moral hazard (Bernheim and Whinston, 1998), or adverse selection (Calzolari and Denicolò, 2013, 2015) create price distortions that may restore the profitability of exclusive dealing.⁸ In the same vein, a number of “leverage theories” of bundling have been based on the presence of linear contracts or moral hazard (e.g., de Cornière and Taylor, 2021).⁹ Our theory abstracts from scale economies and contracting externalities. Instead, we rely on the presence of buyer power which, under exclusive dealing or bundling practices, alters the retailer’s ability to exploit the competition between manufacturers and receive a compensation for relinquishing to buy the rival product. Our article thus provides a new theory of competitive harm in vertical markets.¹⁰

Finally, we also contribute to a growing literature that analyzes the formation of buyer-seller networks in vertically related markets. A strand of research points out that strategic restrictions of a distribution network may work out as a bargaining leverage

extract rent from the entrant through breakup fees. Among others, this “rent-extraction” theory has been extended to investment choice and contractual renegotiation (Spier and Whinston, 1995), sequential bargaining (Marx and Shaffer, 2010a), elastic demand and nonlinear pricing (Choné and Linnemer, 2015), and nonpivotal buyers (Bedre-Defolie and Biglaiser, 2017). Similarly, the “naked-exclusion” theory of Rasmusen, Ramseyer and Wiley (1991), subsequently refined by Segal and Whinston (2000), has been extended in several directions including secret contracts (Miklós-Thal and Shaffer, 2016) and vertical relations with downstream competition (Fumagalli and Motta, 2006; Simpson and Wickelgren, 2007; Wright, 2009).

⁷For instance, when scale economies stem from fixed costs of entry, bundling has been shown to serve as an entry-deterrent strategy in an oligopolistic market (Whinston, 1990; Peitz, 2008) or in multiple markets (Carlton and Waldman, 2002; Nalebuff, 2004). Similar findings have been found with scale economies in R&D activities (Choi, 1996, 2004).

⁸Calzolari, Denicolò and Zanchettin (2020) emphasize that “the source of price distortions is not important: the theory applies whenever marginal prices exceed marginal costs, and for whatever reason.”

⁹As pointed out in Fumagalli, Motta and Calcagno (2018), imperfect rent extraction arising from regulated pricing, demand uncertainty (Greenlee, Reitman and Sibley, 2008), or future quality upgrades (Carlton and Waldman, 2012) may also restore the profitability of bundling. Similarly, non-negative price constraints which, for instance, prevent consumers’ moral hazard also create room for imperfect rent extraction and restore the profitability of bundling in two-sided markets (Choi and Jeon, 2021).

¹⁰It is worth noting that, to our knowledge, we provide one of the few “leverage theory” of bundling in vertical relations. Other theories in this strand find that the profitability of bundling relies on the presence of contracting externalities (de Cornière and Taylor, 2021) or on retail competition and shopping costs (Ide and Montero, 2019).

within a vertical channel (Inderst and Shaffer, 2007; Montez, 2007; Marx and Shaffer, 2010b). More recently, Ho and Lee (2019) have developed the NNTR bargaining solution to analyze the strategic decision of an insurer to adjust its hospital network.¹¹ We show that the NNPCS model developed in our article offers a microfoundation for the NNTR bargaining solution.

The remainder of our article is organized as follows. Section 2 introduces the main assumptions of our model. Section 3 highlights that the profitability of exclusive dealing stems from the presence of buyer power. Section 4 extends the analysis to bundling practices and offers a new “leverage theory” in vertical markets. We analyze in Section 5 the welfare implications of exclusive dealing and bundling practices. Section 6 discusses key assumptions and presents various extensions of our model. We highlight in Section 7 that the logic of our argument holds under the NNPCS model which provides a noncooperative microfoundation for the NNTR bargaining solution. Section 8 concludes.

2 The model

We consider a vertical market with two manufacturers at the upstream level, denoted by U_i with $i = 1, 2$, and a monopolist retailer at the downstream level, denoted by D . Three differentiated products, indexed by $X \in \{H, M, L\}$, may be offered on the market. U_1 produces H and L and U_2 produces M .

Industry profits. The primitive profit functions representing the industry profit (i.e., the profit of a fully integrated firm) generated by each product assortment are denoted as follows: Π^X when only product X is offered on the market, Π^{XY} when products X and Y are both offered on the market, and Π^{HML} when the three products are offered on the market. We make the following assumptions:

¹¹The use of strategic network size restrictions is also analyzed in Liebman (2018) and Ghili (Forthcoming) under alternative frameworks. As in Ho and Lee (2019), the gain in bargaining leverage of a downstream firm stems from its ability to play upstream firms off against each other by exercising threats of replacement during negotiations.

Assumption A1 *Among the assortments of one product, H generates a higher industry profit than M which generates a higher industry profit than L:*

$$\Pi^H > \Pi^M > \Pi^L > 0.$$

The assortment HML generates the highest industry profit. Among the assortments of two products, HM generates a higher industry profit than HL which generates a higher industry profit than ML:

$$\Pi^{HML} > \Pi^{HM} > \Pi^{HL} > \Pi^{ML} > 0.$$

The fact that a product generates a higher industry profit than another may be due to a lower cost, a higher quality or preferred variety, or a combination of both.

Assumption A2 *Products are either independent or imperfect substitutes:*

$$\Pi^X + \Pi^Y \geq \Pi^{XY} > \Pi^X \text{ with } Y \neq X.$$

Note that we also consider complementarity among products in Section 4.

Timing and information. We assume that firms interact according to the following sequence of play:

- Stage 1: Each manufacturer decides whether or not to impose an exclusive dealing/bundling requirement to D . Then, D publicly announces its product assortment.
- Stage 2: Given D 's product assortment decision, trade takes place. Terms of trade are determined through bilateral negotiations and take the form of two-part tariffs. If D purchases from both manufacturers, negotiations take place simultaneously and secretly.
- Stage 3: D sets its price(s) and sells to consumers.

We now discuss each stage of the game in detail including the network formation protocol and the bargaining solution.

Product assortment decision. Our first stage builds on the vertical restraints literature as well as on the literature on endogenous buyer-seller network in which the network formation takes place prior to contract negotiations (we refer to Section 6.1 for a discussion). Given each manufacturer’s selling policy, we consider that the announced product assortment commits D to engage in negotiations with manufacturer(s) of the corresponding product(s). To ease exposition, we assume that only manufacturers are able to constrain D ’s product assortment through an exclusive dealing/bundling requirement. We relax this assumption in Section 6.3 where we consider that D is also able to adjust the size of its product assortment.

Bargaining solution. We use the “Nash-in-Nash with Threat of Replacement” (NNTR) bargaining solution developed by [Ho and Lee \(2019\)](#) to determine the terms of trade in stage 2. We denote by $\alpha \in [0, 1]$ the bargaining weight of D in each bilateral negotiation and use the terms “bargaining weight” and “buyer power” interchangeably as α captures one source of the retailer’s bargaining power.¹²

The NNTR bargaining solution has attractive properties compared to the more commonly used “Nash-in-Nash” bargaining solution ([Horn and Wolinsky, 1988](#)) when some firms are excluded from negotiations. A typical representation of the “Nash-in-Nash” bargaining is that each upstream and downstream firm behave independently across bargains by sending separate delegated agents to negotiate each tariff according to the Nash bargaining solution ([Nash, 1950](#)), each pair of agents anticipating that the other pairs reach an agreement (see, e.g., [Rey and Vergé, 2020](#)).¹³ In our framework, this

¹²For the sake of exposition, we consider that D ’s bargaining weight vis-à-vis U_1 and U_2 is similar. We relax this assumption in Section 6.2.

¹³Firms’ independent behavior across negotiations implies that each delegated agent participates in only one bilateral negotiation, cannot communicate with its counterparts (even those coming from the same firm), and never revises its beliefs about the tariffs negotiated elsewhere. In our framework, however, a pair that succeeds in its bargaining when an exclusive dealing/bundling requirement is imposed would infer that the other pair cannot reach an agreement. The independent behavior assumption required by the “Nash-in-Nash” solution is thus difficult to apply when, among multiple bilateral negotiations, only one can come to an agreement.

bargaining model thus predicts that the manufacturer excluded from the market due to an exclusive dealing/bundling requirement has no role to play on the bargaining outcome. Instead, the NNTR bargaining solution extends the “Nash-in-Nash” by allowing the downstream firm to threaten to replace each of its upstream trading partners with an excluded alternative one during negotiations. In each bilateral negotiation, the downstream firm thus has an outside option defined as the surplus obtained from replacing its current upstream trading partner with another (excluded) one at its reservation price (that is, the price that makes this excluded upstream firm indifferent between replacing or not the downstream firm’s current trading partner).¹⁴ Building on [Manea \(2018\)](#), [Ho and Lee \(2019\)](#) have shown that the NNTR solution replicates the Markov perfect equilibrium of a noncooperative bargaining game in which the downstream firm can go “back and forth” between upstream firms during negotiations. To further motivate the use of this solution concept, we provide in Section 7 a novel microfoundation for the NNTR solution in which D plays U_1 and U_2 off against each other by auctioning a limited number of slots.¹⁵

Bilateral efficiency. The common agency literature has shown that competing manufacturers can use the common agent D as a coordination device to replicate a collusive outcome and maximize the industry profit regardless of the distribution of bargaining power in the vertical chain (e.g., [Bernheim and Whinston, 1985](#); [O’Brien and Shaffer, 2005](#)).¹⁶ As a result, bilateral efficiency (i.e., cost-based wholesale contracts) prevails whatever manufacturers’ selling strategies. This implies that, in stage 3, D always chooses prices that maximize the integrated industry profit. Based on this result, we consider throughout our article that stages 2 and 3 are gathered in a unique stage where each pair $D - U_i$ bargains over a fixed fee F_i to share the integrated industry profit.

¹⁴As discussed in [Ho and Lee \(2019\)](#), the NNTR solution directly relates to the literature on bargaining with outside options (e.g., [Shaked and Sutton, 1984](#); [Binmore, 1985](#); [Binmore, Shaked and Sutton, 1989](#)).

¹⁵It is worth noting that the NNTR solution also coincides with a number of other noncooperative bargaining models when the buyer faces multiple sellers but can reach an agreement with only one of them, a situation analog to exclusive dealing or bundling in our framework (see, e.g., [Osborne and Rubinstein, 1990](#); [Bolton and Whinston, 1993](#); [Manea, 2018](#); [Thomas, 2018](#)).

¹⁶Note that this efficiency result would also hold under public contracts.

3 Exclusive Dealing

In this section, we consider a framework in which U_1 only offers product H (the case where U_1 also offers product L is considered in Section 4 devoted to the bundling analysis). In what follows, we solve the subgames absent and with an exclusive dealing requirement and then analyze the optimal selling strategy for manufacturers.

3.1 Absent exclusive dealing requirement

Consider first that manufacturers do not impose any exclusive dealing requirement to D . In this case, D engages in bilateral negotiations with U_1 for H and U_2 for M . As D deals with both manufacturers, it cannot threaten any of its trading partner of replacement. The NNTR solution is here equivalent to the “Nash-in-Nash” solution, implying that the division of surplus in each bilateral negotiation is determined according to the (asymmetric) Nash bargaining solution given that the other pair of firms comes to an agreement. Formally, the fixed fee negotiated between D and U_1 for H is derived from the following maximization problem:

$$\max_{F_1^{HM}} (\Pi^{HM} - F_1^{HM} - F_2^{HM} - (\Pi^M - F_2^{HM}))^\alpha (F_1^{HM})^{1-\alpha} \quad (1)$$

where $\Pi^{HM} - F_1^{HM} - F_2^{HM} - (\Pi^M - F_2^{HM})$ and F_1^{HM} are the gains from trade of D and U_1 respectively. These gains correspond to the difference between the profits obtained by D and U_1 if an agreement is reached (i.e., $\Pi^{HM} - F_1^{HM} - F_2^{HM}$ and F_1^{HM} respectively) and their status quo payoff if the negotiation never comes to an agreement (i.e., $\Pi^M - F_2^{HM}$ and 0 respectively). Similarly, the fixed fee negotiated between D and U_2 for product M is derived from the following maximization problem:

$$\max_{F_2^{HM}} (\Pi^{HM} - F_1^{HM} - F_2^{HM} - (\Pi^H - F_1^{HM}))^\alpha (F_2^{HM})^{1-\alpha} \quad (2)$$

From (1) and (2), we obtain that U_1 's fixed fee is $F_1^{HM} = (1 - \alpha)(\Pi^{HM} - \Pi^M)$ and U_2 's fixed fee is $F_2^{HM} = (1 - \alpha)(\Pi^{HM} - \Pi^H)$. As a result, the equilibrium profit of D , U_1 , and

U_2 are respectively given by:

$$\pi_D^{HM} = \Pi^{HM} - F_1^{HM} - F_2^{HM}; \quad \pi_1^{HM} = F_1^{HM}; \quad \pi_2^{HM} = F_2^{HM}. \quad (3)$$

The industry profit sharing in (3) shows that each manufacturer obtains a share $1 - \alpha$ of its marginal contribution to the industry profit.

3.2 Exclusive dealing requirement

Consider now that either U_1 or U_2 imposes an exclusive dealing requirement to D . In this case, D engages in a bilateral negotiation either with U_1 for H or with U_2 for M . As previously described, the NNTR solution allows D to threaten to replace the product of its current trading partner with that of its (excluded) rival when bargaining. Following [Ho and Lee \(2019\)](#), we apply the NNTR solution only to stable buyer-seller networks which requires that each product in D 's assortment generates greater bilateral surplus than any product used as a replacement threat (taking as given all other agreements). Otherwise, the selected product assortment would not be stable in the sense that D would wish to terminate a relationship with one of its current trading partner and replace its product with another one which generates a greater surplus when playing them off against each other.¹⁷ Under Assumption A1, we have that H is the unique product assortment which satisfies this stability condition. As a result, there is no equilibrium in which U_2 imposes an exclusive dealing requirement to D . Moreover, D always engages in a bilateral negotiation with U_1 for H when the latter imposes an exclusivity requirement. Following the NNTR solution, the fixed fee resulting from this negotiation is determined as follows:

$$\max_{F_1^H} (\Pi^H - F_1^H)^\alpha (F_1^H)^{1-\alpha} \quad \text{such that} \quad \Pi^H - F_1^H \geq \Pi^M - f_2 \quad (4)$$

¹⁷More precisely, [Ho and Lee's \(2019\)](#) Proposition 2 states that a network is stable if two main conditions are satisfied. First, as for the "Nash-in-Nash" solution, every firm involved in a bilateral negotiation must have positive gains from trade. Second, due to the downstream firm's ability to exercise threats of replacement, each of its upstream trading partners must generate a higher surplus than any alternative upstream firm used as a replacement threat.

where the gains from trade of D and U_1 are $\Pi^H - F_1^H$ and F_1^H respectively. In this case, both D and U_1 have a status quo payoff of 0 because there are not involved in any other bilateral negotiation. The constraint $\Pi^H - F_1^H \geq \Pi^M - f_2$, however, reflects that D 's gains from trade must at least be equal to what it would obtain by replacing H with M at U_2 's reservation tariff. This tariff, denoted by f_2 , is equal to the surplus U_2 would be willing to accept to deal with D taking as given its other agreements (if any). As U_2 has no alternative downstream partner to deal with, it is willing to accept any nonnegative payment to replace H , implying that $f_2 = 0$. From (4), we obtain that U_1 's fixed fee equals $F_1^H = \min\{(1 - \alpha)\Pi^H, \Pi^H - \Pi^M\}$. Hence, the equilibrium profit of D , U_1 , and U_2 are respectively given by:

$$\pi_D^H = \max\{\alpha\Pi^H, \Pi^M\}; \quad \pi_1^H = \min\{(1 - \alpha)\Pi^H, \Pi^H - \Pi^M\}; \quad \pi_2^H = 0. \quad (5)$$

The industry profit sharing in (5) can be described as follows. When $\alpha > \alpha_c \equiv \frac{\Pi^M}{\Pi^H}$, D gets a large fraction of the industry profit from its negotiation with U_1 and its option to replace H with M cannot be a credible threat, which implies that the surplus division yields the same outcome as the standard (asymmetric) Nash bargaining solution. In contrast, when $\alpha_c > \alpha$, the option of replacing H with M becomes a credible threat and U_1 's fixed fee is capped. In particular, this threat ensures that D obtains a profit at least equal to Π^M (i.e., the profit it would obtain from replacing H with M at U_2 's reservation tariff). Hence, the NNTR solution allows the excluded manufacturer U_2 to affect the surplus division in the vertical chain following the logic of the “outside option principle” in bargaining theory (e.g., [Binmore, Shaked and Sutton, 1989](#)).¹⁸

3.3 Buyer power and the profitability of exclusive dealing

We now analyze the profitability of exclusive dealing. As U_2 has no incentive to impose an exclusive dealing requirement to D , we simply compare U_1 's profit in (3) and (5) and obtain the following proposition:

¹⁸According to this principle, a bargainer's outside option is irrelevant to the bargaining outcome unless it provides a higher payoff than what the bargainer can get from his negotiation.

Proposition 1 *Exclusive dealing arises in equilibrium when the buyer power of the retailer vis-à-vis manufacturers is high: $\alpha > \alpha_{ED} \equiv \frac{\Pi^{HM} - \Pi^H}{\Pi^{HM} - \Pi^M}$. Exclusive dealing harms the rival manufacturer, the retailer, and the industry profit.*

Proof. See Appendix A. While the harm for the rival manufacturer and the industry profit is straightforward, we show in Appendix B that exclusive dealing also harms the retailer. ■

Several comments are in order. First, Proposition 1 extends the Chicago School argument to the case where the retailer has some bargaining power vis-à-vis manufacturers. The insight is as follows. On the one hand, under exclusive dealing and when $\alpha_C > \alpha$, we have seen that D 's option to deal with U_2 is a credible threat and induces U_1 to leave a surplus of Π^M to D , which is tantamount to paying D a compensation for not dealing with U_2 . On the other hand, absent exclusive dealing, (3) shows that U_1 's profit is $(1 - \alpha)(\Pi^{HM} - \Pi^M)$. Focusing on the polar case $\alpha = 0$, the Chicago School argument correctly asserts that exclusive dealing is never profitable because the compensation U_1 has to pay reduces its profit to $\Pi^H - \Pi^M$ which is lower than what it can get absent exclusive dealing (that is, $\Pi^{HM} - \Pi^M$). Proposition 1 thus generalizes this argument by showing that it holds whenever the buyer power of the retailer is limited ($\alpha_{ED} > \alpha \geq 0$).

When $\alpha > \alpha_{ED}$, Proposition 1 highlights that the Chicago School argument ceases to operate and that exclusive dealing which leads to an inefficient exclusion becomes profitable. The logic underlying this result is that the compensation $C = \max\{\Pi^M - \alpha\Pi^H, 0\}$ paid by U_1 for exclusivity is decreasing in α .¹⁹ Indeed, as D gets a larger share of the surplus generated by its exclusive deal with U_1 (that is, Π^H), its ability to credibly threaten U_1 of replacement with U_2 and receive a compensation erodes. As a result, when $\alpha > \alpha_{ED}$, the compensation paid by U_1 is low enough to make exclusive dealing a profitable strategy. The profitability of exclusive dealing is even more striking when $\alpha > \alpha_C$ as D is unable to require any compensation from U_1 . In this case, U_1 's profit un-

¹⁹We define the compensation that the retailer receives from U_1 under exclusive dealing as the extra amount of surplus D obtains, in addition to what it can get from U_1 ($\alpha\Pi^H$), when the option of dealing with U_2 is a credible threat to exercise.

der exclusive dealing becomes $(1 - \alpha)\Pi^H$ which, by Assumption A2, is (weakly) larger than what it can get absent exclusive dealing, that is $(1 - \alpha)(\Pi^{HM} - \Pi^M)$. Proposition 1 thus shows that the presence of a powerful retailer which is able to negotiate trading terms with manufacturers facilitates the emergence of anticompetitive exclusive dealing. It is worth noting that the use of the NNTR solution allows us to preserve the main essence of the Chicago School argument: the retailer may exploit the presence of a rival manufacturer to receive a compensation for accepting an exclusive deal. The central result of Proposition 1 is thus to reconsider the Chicago School argument as a special case of a more general bargaining game in which the retailer's compensation decreases in its buyer power.²⁰

As shown in Proposition 1, the condition under which exclusive dealing is profitable depends on the substitution among products. The following corollary summarizes this insight:

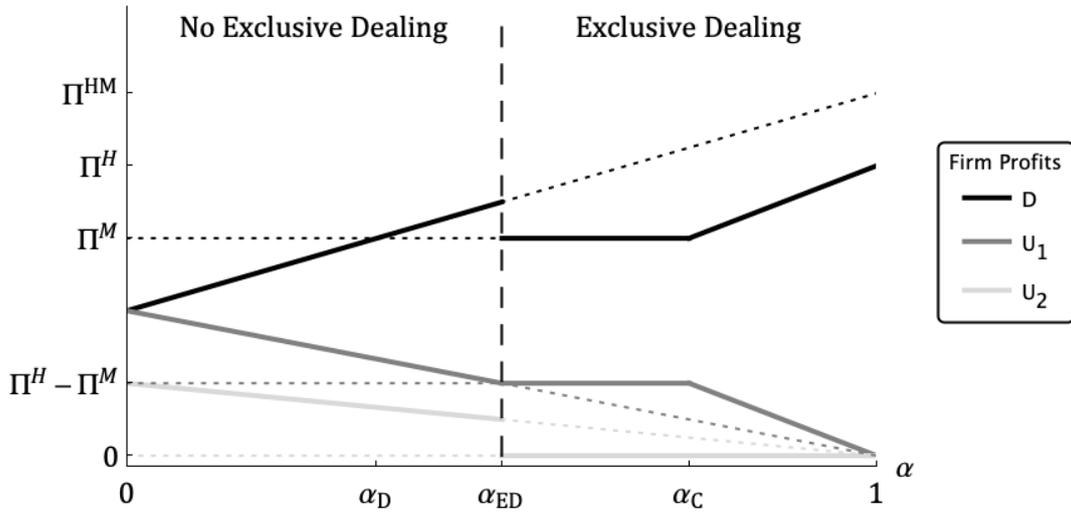
Corollary 1 *More substitution among products favor the emergence of exclusive dealing.*

From Assumptions A1 and A2 as well as Proposition 1, we have $\Pi^H + \Pi^M \geq \Pi^{HM} > \Pi^H$ and $\alpha_{ED} = \frac{\Pi^{HM} - \Pi^H}{\Pi^{HM} - \Pi^M}$. In the polar case where products are independent, Π^{HM} tends to $\Pi^H + \Pi^M$ and α_{ED} tends to α_C . Hence, any positive compensation required by D for not dealing with U_2 makes the use of exclusive dealing unprofitable ($\alpha_C > \alpha$). When this compensation boils down to 0 ($\alpha > \alpha_C$), U_1 is indifferent between imposing or not an exclusive dealing requirement as it gets $(1 - \alpha)\Pi^H$ in any case. Consider now that the degree of substitution between products increases such that Π^{HM} gets closer to Π^H (keeping Π^H and Π^M unchanged). On the one hand, U_1 's profit absent exclusive dealing decreases as it has a smaller marginal contribution to the industry profit. On the other hand, U_1 's profit under exclusive dealing is unchanged. As a result, exclusive dealing becomes more likely when the substitution among products increases (α_{ED} decreases).²¹ In that case, however, exclusion is less damaging for the industry profit.

²⁰Considering instead the “Nash-in-Nash” solution, it is straightforward to see that exclusive dealing is profitable whenever $1 > \alpha \geq 0$. However, by ruling out the possibility for the retailer to use an excluded manufacturer as a bargaining leverage and receive a compensation for accepting an exclusive deal, the “Nash-in-Nash” solution does not allow to preserve the logic of the Chicago School argument even when $\alpha = 0$.

²¹In the polar case where products are perfect substitutes, however, D gets the entire industry profit regardless of U_1 's selling strategy.

Figure 1: Exclusive dealing in the presence of buyer power



Notes: This figure is drawn under the following numerical values: $\Pi^H = 4$, $\Pi^M = 3$, $\Pi^{HM} = 5$. The x-axis represents D 's bargaining weight $\alpha \in [0, 1]$. The y-axis corresponds to values for profits obtained by each manufacturer and D . The dotted lines represent the counterfactual profits of firms (i.e., firms' profits under exclusive dealing when $\alpha_{ED} > \alpha$ and firms' profits absent exclusive dealing when $\alpha > \alpha_{ED}$).

Illustrative example. We consider a simple example to illustrate the insights drawn from Proposition 1. We set $\Pi^H = 4$, $\Pi^M = 3$, $\Pi^{HM} = 5$, implying that $\alpha_{ED} = \frac{1}{2}$.²² Figure 1 depicts how the profit of each firm is affected by D 's bargaining weight α .

Consider first the case in which $\alpha_{ED} > \alpha$. Following Proposition 1, the Chicago School argument applies and exclusive dealing is not profitable. Solid lines in Figure 1 represent the equilibrium profit of firms and dotted lines are what they would obtain under exclusive dealing. As previously described, the surplus division coincides with the ‘‘Nash-in-Nash’’ solution, which implies that the profit of D is strictly increasing in α (black line) while the profit of both U_1 (grey line) and U_2 (light grey line) are strictly decreasing in α . Consider now that $\alpha > \alpha_{ED}$. In this case, Proposition 1 highlights that exclusive dealing arises and U_2 is excluded from the market. Again, solid lines in Figure 1 represent the equilibrium profit of firms and dotted lines are what they would obtain absent exclusive dealing. The emergence of exclusive dealing generates a discontinuity in D 's profit: the gap between the solid and the dotted black line illustrates

²²In Appendix G, we show that this illustrative example can be derived from a quasi-linear quadratic utility model (Shubik and Levitan, 1980) with an appropriate choice of parameter values.

D 's losses from exclusive dealing. In contrast, the gap between the solid and the dotted grey line illustrates the profitability of exclusive dealing for U_1 . When $\alpha_c > \alpha > \alpha_{ED}$, D 's threat to replace H with M is credible and induces U_1 to provide (at least) a profit of Π^M to D (i.e., the constraint in (4) is binding meaning that absent such a threat D would have obtained a lower profit). As a result, the profits of D (black line) and U_1 (grey line) remain constant with respect to α . The kink arising in the profits of D and U_1 when $\alpha = \alpha_c$ depicts the situation in which D 's option to deal with U_2 is no longer a credible threat to exercise. Hence, when $\alpha > \alpha_c$, the surplus division yields the same outcome as the (asymmetric) Nash bargaining solution, implying that D 's (resp., U_1 's) profit is increasing (resp., decreasing) in α .

4 Upstream bundling

Consider now that U_1 offers both H and L whereas U_2 still offers M . Among the three available products, we assume that D can purchase and distribute at most two of them. This modeling assumption aims at capturing the limited stocking capacity of retailers which is a pre-requisite for the exclusionary concerns of bundling practices in vertical markets. In what follows, we solve the subgames in which U_1 chooses a component and a bundling selling strategy and then analyze the profitability of bundling.

4.1 Component strategy

Consider first that U_1 chooses a component selling strategy by offering H and L separately. In this case, D may either select the assortment HM , HL , or ML due to its limited stocking capacity. As described in Section 3, however, the presence of a third available product may be used by D to exercise threats of replacement and gain bargaining leverage with respect to its current upstream trading partner(s). This requires that each product in D 's assortment generates greater bilateral surplus than any product used as a replacement threat, taking as given all other agreements (see Proposition 2 of [Ho and Lee, 2019](#)). Under Assumption A1, it is easy to see that HM is the unique product assortment which satisfies this stability condition. Hence, D always engages in

bilateral negotiations with U_1 for H and U_2 for M when a component strategy is chosen by U_1 . The NNTR solution thus determines the fixed fee negotiated between D and U_2 for M as follows:

$$\begin{aligned} & \max_{\tilde{F}_2^{HM}} \left(\Pi^{HM} - \tilde{F}_1^{HM} - \tilde{F}_2^{HM} - (\Pi^H - \tilde{F}_1^{HM}) \right)^\alpha (\tilde{F}_2^{HM})^{(1-\alpha)} \\ & \text{such that } \Pi^{HM} - \tilde{F}_1^{HM} - \tilde{F}_2^{HM} \geq \Pi^{HL} - \tilde{f}_1 \end{aligned} \quad (6)$$

where $\Pi^{HM} - \tilde{F}_1^{HM} - \tilde{F}_2^{HM} - (\Pi^H - \tilde{F}_1^{HM})$ and \tilde{F}_2^{HM} correspond to the gains from trade of D and U_2 respectively. The constraint $\Pi^{HM} - \tilde{F}_1^{HM} - \tilde{F}_2^{HM} \geq \Pi^{HL} - \tilde{f}_1$ reflects that D 's profit must at least be equal to what it would obtain by replacing M with L at U_1 's reservation tariff (holding fixed the outcome determined in the other negotiation). This tariff, denoted by \tilde{f}_1 , is equal to the surplus U_1 would be willing to accept to replace U_2 and deal with D for L . Given that U_1 already receives a surplus of \tilde{F}_1^{HM} from its negotiation with D for H , we have $\tilde{f}_1 = \tilde{F}_1^{HM}$.

When bargaining with U_1 for H , we consider that D 's option to replace H with L cannot be exercised as both H and L are owned by U_1 .²³ Taking as given the bargaining outcome between D and U_2 for M , the fixed fee negotiated between D and U_1 for H is thus derived as follows:

$$\max_{\tilde{F}_1^{HM}} \left(\Pi^{HM} - \tilde{F}_1^{HM} - \tilde{F}_2^{HM} - (\Pi^M - \tilde{F}_2^{HM}) \right)^\alpha (\tilde{F}_1^{HM})^{(1-\alpha)} \quad (7)$$

where $\Pi^{HM} - \tilde{F}_1^{HM} - \tilde{F}_2^{HM} - (\Pi^M - \tilde{F}_2^{HM})$ and \tilde{F}_1^{HM} are the gains from trade of D and U_1 respectively. Solving (6) and (7), we obtain that $\tilde{F}_1^{HM} = (1 - \alpha)(\Pi^{HM} - \Pi^M)$ and $\tilde{F}_2^{HM} = \min\{(1 - \alpha)(\Pi^{HM} - \Pi^H), \Pi^{HM} - \Pi^{HL}\}$. Hence, the equilibrium profits of D , U_1 , and U_2 are respectively given by:

$$\tilde{\pi}_D^{HM} = \Pi^{HM} - \tilde{F}_1^{HM} - \tilde{F}_2^{HM}; \quad \tilde{\pi}_1^{HM} = \tilde{F}_1^{HM}; \quad \tilde{\pi}_2^{HM} = \tilde{F}_2^{HM}. \quad (8)$$

²³While it is intuitive that a downstream firm cannot play off an upstream trading partner against itself (i.e., threatening to replace one of its products with another), we motivate this modeling assumption by relying on the fact that it emerges as the equilibrium outcome of the NNPCS model developed in Section 7 (see [Chambolle and Molina, 2020](#) for a comprehensive analysis) as well as the bargaining model considered in [Beckert, Smith and Takahashi \(2021\)](#). It is worth noting that [Ho and Lee \(2019\)](#) focus on hospital-insurer bargaining over reimbursement rates and do not consider the case of multi-product upstream firms.

4.2 Bundling strategy

Consider now that U_1 chooses a bundling strategy by offering H and L only in a package. In this case, D may either engage in a bilateral negotiation with U_1 for HL or U_2 for M . The analysis is thus equivalent to the exclusive dealing case in Section 3.2, replacing product H by the bundle of products HL . The NNTR solution determines U_1 's fixed fee for the bundle HL as follows:

$$\max_{\tilde{F}_1^{HL}} (\Pi^{HL} - \tilde{F}_1^{HL})^\alpha (\tilde{F}_1^{HL})^{(1-\alpha)} \quad \text{such that} \quad \Pi^{HL} - \tilde{F}_1^{HL} \geq \Pi^M - \tilde{f}_2 \quad (9)$$

where the gains from trade of D and U_1 are $\Pi^{HL} - \tilde{F}_1^{HL}$ and \tilde{F}_1^{HL} respectively. The constraint $\Pi^{HL} - \tilde{F}_1^{HL} \geq \Pi^M - \tilde{f}_2$ reflects that D 's gains from trade must at least be equal to what it would get by replacing HL with M at U_2 's reservation tariff \tilde{f}_2 . Having no alternative downstream partner to deal with, U_2 is willing to accept any non negative payment to distribute M , implying that $\tilde{f}_2 = 0$. From (9), we obtain that U_1 's fixed fee for HL equals $\tilde{F}_1^{HL} = \min\{(1 - \alpha)\Pi^{HL}, \Pi^{HL} - \Pi^M\}$. Hence, the equilibrium profit of D , U_1 , and U_2 are respectively given by:

$$\tilde{\pi}_D^{HL} = \max\{\alpha\Pi^{HL}, \Pi^M\}; \quad \tilde{\pi}_1^{HL} = \min\{(1 - \alpha)\Pi^{HL}, \Pi^{HL} - \Pi^M\}; \quad \tilde{\pi}_2^{HL} = 0. \quad (10)$$

When $\alpha > \tilde{\alpha}_C \equiv \frac{\Pi^M}{\Pi^{HL}}$, D obtains a large fraction of the industry profit from its negotiation with U_1 , making D 's threat to replace the bundle of products HL with M not credible. In contrast, when $\tilde{\alpha}_C > \alpha$, D 's threat of replacement becomes credible and ensures that its profit is at least equal to Π^M .

4.3 Buyer power and the profitability of bundling

Comparing U_1 's profit in (8) and (10), we obtain the following proposition:

Proposition 2 *Bundling arises in equilibrium when the buyer power of the retailer vis-à-vis manufacturers is high: $\alpha > \alpha_B \equiv \frac{\Pi^{HM} - \Pi^{HL}}{\Pi^{HM} - \Pi^M}$. Bundling harms the rival manufacturer, the retailer, and the industry profit.*

Proof. See Appendix A. While the harm for the rival manufacturer and the industry profit is straightforward, we show in Appendix B that bundling also harms the retailer.

■

In the same vein as for the exclusive dealing restrictions, the Chicago School critique to the “leverage theory” of bundling states that a multi-product manufacturer cannot find profitable to bundle its products for exclusionary motives because it would have to pay the retailer a prohibitive compensation for giving up the opportunity to sell the rival product whenever this is efficient for the industry. Initially framed in the polar case $\alpha = 0$, Proposition 2 extends the Chicago School argument to situations in which the retailer has some bargaining power vis-à-vis manufacturers. The insight is similar to that described in Proposition 1.

When $\alpha > \alpha_B$, however, Proposition 2 highlights that a bundling strategy leading to an inefficient exclusion becomes profitable, which breaks down the logic of the Chicago School argument. Again, the reason is similar to that described in Proposition 1. The amount of compensation received by D depends on its credibility to threaten U_1 's bundle of replacement with U_2 's product. Such a credibility, however, weakens as D gets stronger in its bargaining with U_1 (the compensation paid by U_1 is decreasing in α). When $\alpha > \alpha_B$, the compensation paid by U_1 is low enough to make bundling a profitable strategy. This result is even more straightforward when $\alpha > \tilde{\alpha}_C$ as U_1 has no compensation to pay for ensuring that D does not deal with U_2 . In this case, U_1 's profit under bundling equals $(1 - \alpha)\Pi^{HL}$ which, by Assumption A2, is greater than what it gets under a component selling strategy, that is $(1 - \alpha)(\Pi^{HM} - \Pi^M)$. Proposition 2 thus restores the “leverage theory” of bundling by highlighting that the presence of a powerful retailer which is able to negotiate trading terms with manufacturers facilitates the emergence of anticompetitive bundling. Overall, a nice feature of our model is that the buyer power parameter allows us to go from the Chicago School argument to the “leverage theory” of bundling.

Although Propositions 1 and 2 are very close in spirit, there are some results which are specific to the bundling analysis. In particular, the following corollary characterizes two other conditions for the profitability of bundling:

Corollary 2 *Bundling is more likely to arise in equilibrium when:*

- (i) *products M and L are closer substitutes,*
- (ii) *product H is a must-stock item.*

First, when M and L become closer substitutes, Π^{HL} increases toward Π^{HM} which decreases α_B and implies that a bundling strategy is more likely to arise in equilibrium.²⁴ In that case, however, bundling is less damaging for the industry profit. Second, when H is a must-stock item, it generates most of the industry profit implying that Π^H tends to Π^{HL} or Π^{HM} which decreases α_B and facilitates the emergence of a bundling strategy. However, the following remark shows that the presence of a must-stock item is not a necessary condition for the profitability of bundling:

Remark 1 *Proposition 2 holds when $\Pi^{HL} > \Pi^M > \Pi^H$.*

Proof. See Appendix C. ■

For the sake of exposition and motivated by the case law in Section 1, we have considered that $\Pi^H > \Pi^M$ (Assumption A1). However, when $\Pi^M > \Pi^H$, Proposition 2 still holds as long as $\Pi^{HL} > \Pi^M$ (i.e., the bundle of products generates a higher industry profit than the rival's product). In that case, bundling excludes the product generating the highest surplus which is even more detrimental for the industry profit.

Proposition 2 states that anticompetitive upstream bundling may arise under the case of independent or imperfect substitutes products (Assumption A2). The following remark shows that our result carries over to the case of complementary products extensively analyzed in the bundling literature ([Whinston, 2001](#)):

Remark 2 *Proposition 2 still holds when M and L are complements to H and the complementarity between M and H is limited: $\Pi^{HX} > \Pi^H + \Pi^X$ with $X \in \{M, L\}$ and $\Pi^{HL} + \Pi^M \geq \Pi^{HM}$.*

²⁴Note that the convergence between M and L can result from a reduction in their quality gap or their cost differential.

Proof. See Appendix D. ■

This result highlights that our buyer power argument provides a new rationale to the “leverage theory” of bundling whether products are substitutes, independent, or complements. To apply the NNTR solution, however, we must restrict the degree of complementarity between H and M .²⁵ Indeed, the complementarity makes the marginal contribution of every product to the industry profit greater when other agreements have been formed, which implies that the sum of tariffs determined by the NNTR solution and paid by D may be greater than the value of the industry profit. In particular, if $\Pi^{HL} + \Pi^M \geq \Pi^{HM}$ does not hold, we show in Appendix D that D rejects one of its agreements at the NNTR tariffs.²⁶

Illustrative example with independent products. We consider a simple example to illustrate the insights drawn from Proposition 2. In particular, we focus on the case of independent products in which only Assumption A1 matters as it implies that Assumption A2 holds. We set $\Pi^H = 4$, $\Pi^M = 3$, $\Pi^L = 1$, implying that $\alpha_B = \frac{1}{2}$ and $\tilde{\alpha}_C = \frac{3}{5}$.²⁷ Figure 2 depicts how firms’ profits are affected by D ’s bargaining weight α .²⁸

Consider first the case in which $\alpha_B > \alpha$. Following Proposition 2, the Chicago School critique applies and bundling is not profitable. Solid lines in Figure 2 represent the equilibrium profit of firms and dotted lines are what they would obtain under bundling. Consider now that $\alpha > \alpha_B$. In this case, Proposition 2 highlights that bundling arises and U_2 is excluded from the market. Solid lines in Figure 2 represent the equilibrium profit of firms and dotted lines are what they would obtain under a component selling strategy. The gap between the solid and the dotted grey line thus illustrates the profitability of U_1 ’s bundling strategy. Note that, when $\tilde{\alpha}_C > \alpha > \alpha_B$, D

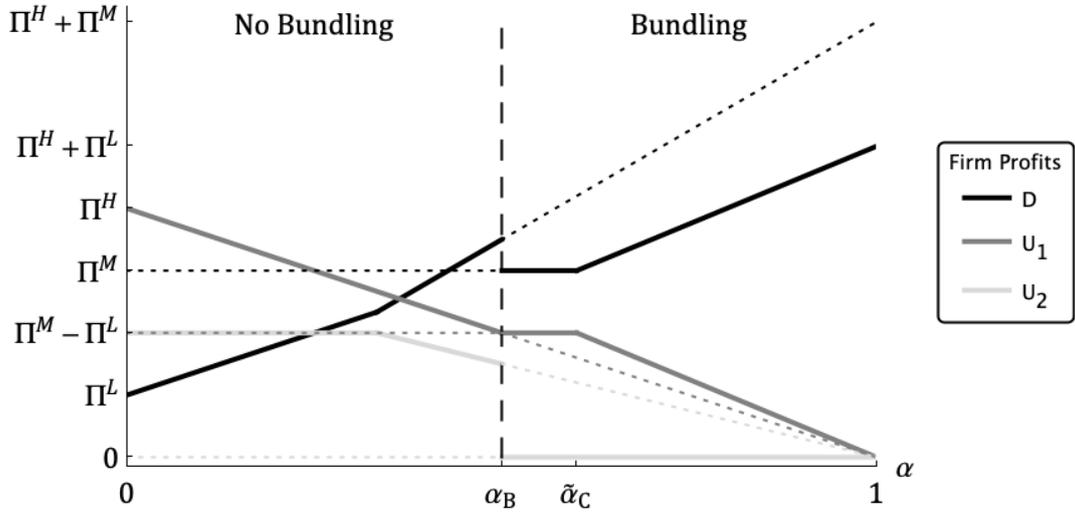
²⁵More precisely, the condition $\Pi^{HL} + \Pi^M \geq \Pi^{HM}$ ensures that $\tilde{\pi}_D^{HM} = \Pi^{HM} - \tilde{F}_1^{HM} - \tilde{F}_2^{HM} > 0$. This is similar in spirit to the feasibility assumption in Collard-Wexler, Gowrisankaran and Lee (2019) which is used to guarantee the existence of a “Nash-in-Nash” equilibrium.

²⁶It is worth noting that this condition rules out cases where products are perfect complements or where H is essential for all uses of M as in Section 3 of Whinston (1990).

²⁷Again, Appendix G shows that this illustrative example can be derived from a quasi-linear quadratic utility model (Shubik and Levitan, 1980) with an appropriate choice of parameter values.

²⁸Note that the market outcome when $\alpha = 0$ directly relates to the textbook examples of the Chicago School critique to the “leverage theory” of bundling as developed in Choi (2006) and Fumagalli, Motta and Calcagno (2018).

Figure 2: Bundling in the presence of buyer power



Notes: This figure is drawn under the following numerical values: $\Pi^H = 4$, $\Pi^M = 3$, $\Pi^L = 1$. The x-axis represents D 's bargaining weight $\alpha \in [0, 1]$. The y-axis corresponds to values for profits obtained by each manufacturer and D . The dotted lines represent the counterfactual profits of firms (i.e., firms' profits under bundling when $\alpha_B > \alpha$ and firms' profits absent bundling when $\alpha > \alpha_B$).

credibly threatens U_1 's bundle of replacement with U_2 's product. This induces U_1 to concede a surplus equal to Π^M and implies that D 's profit (black line) and U_1 's profit (grey line) remain constant with respect to α . When $\alpha > \tilde{\alpha}_C$, however, D 's threat of replacement is no longer credibly exercised.

5 Welfare implications

To discuss the welfare implications of exclusive dealing and bundling, we denote by CS^X the consumer surplus when the product assortment X is offered on the market and assume that:

Assumption A3 $CS^{HML} > CS^{HM} > CS^H > CS^M > CS^L$.

Assumption A3 is satisfied when preferences exhibit a taste for variety. Among others, this arises under most linear demand systems for differentiated products (see [Choné and Linnemer, 2020](#), for a comprehensive overview). We thus obtain the following corollary:

Corollary 3 *Under Assumption A3, exclusive dealing and bundling harm consumers surplus and total welfare.*

This result offers a new perspective on the commonly held view that vertical restrictions imposed by a dominant manufacturer are more likely to raise anticompetitive concerns absent powerful retailers. Instead, our theory suggests that the presence of buyer power makes the emergence of vertical restrictions more likely to the detriment of both consumers and welfare. This is in stark contrast with the EU guidelines on vertical restraints according to which: “Buying power is relevant, as important buyers will not easily be forced to accept tying without obtaining at least part of the possible efficiencies. Tying not based on efficiency is therefore mainly a risk where buyers do not have significant buying power.”²⁹ Moreover, as highlighted in Remark 1, bundling can also arise when $\Pi^{HL} > \Pi^M > \Pi^H$. In this case, we may have $CS^M > CS^H$ which exacerbates the harmful effect of bundling practices on welfare as the product generating both the highest industry profit and consumer surplus is excluded from the market.

Despite the presence of buyer power, it is worth noting that our theory does not challenge the fact that a manufacturer must hold a dominant position to impose an exclusive dealing or a bundling requirement. Indeed, a key condition for the profitability of these vertical restrictions in our theory is that U_1 owns a “must-have” product or product portfolio: exclusive dealing (resp. bundling) cannot be profitable if H (resp. HL) generates less profit than M . Instead, we stress that buyer power is unlikely to help preventing the use of such anticompetitive practices.

6 Discussion

We discuss now the timing and commitment assumptions required in our buyer power theory and relate them to previous work in the literature (Section 6.1). We also extend our theory to the cases where D has a different bargaining weight vis-à-vis U_1 and U_2 (Section 6.2) and where D is able to strategically choose the number of products to distribute (Section 6.3).

²⁹See paragraph 221 of the EU guidelines on vertical restraints: <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52010SC0411&from=EN>.

6.1 Timing and commitment

Timing. In our model, we assume that manufacturers can impose a vertical restraint prior to contract negotiations. While this aims at capturing the long-term nature of exclusive dealing and bundling contracts which may typically cover several years, we rely on two distinct literature to further motivate this timing assumption. First, we build on a recent stream of articles that develop game theoretical frameworks in which a model of network formation is followed by a surplus sharing rule conditional upon the realized network (see, e.g., [Liebman, 2018](#); [Nocke and Rey, 2018](#); [Ho and Lee, 2019](#); [Rey and Vergé, 2020](#)). As in our framework where the vertical restraint affects the product assortment that D can select (network formation), the timing considered in these articles involves a commitment to a buyer-seller network before bargaining take place. Second, the assumption that manufacturers choose their contractual form (e.g., exclusive dealing or territories, resale price maintenance) in an initial stage is customary in the vertical restraints literature (see, e.g., [Rey and Tirole, 1986](#); [Mathewson and Winter, 1987](#); [Rey and Stiglitz, 1995](#); [Martimort and Piccolo, 2010](#); [Calzolari, Denicolò and Zanchettin, 2020](#)). This also entails a certain degree of commitment that we discuss below.³⁰

Commitment. Our timing assumption involves two types of commitment. First, we assume that U_1 is able to commit to exclusive dealing or bundling, implying that it engages not to offer H to D if the latter were to deal with U_2 for M . We motivate this commitment assumption on the ground that U_1 may build a reputation for enforcing a particular selling policy.³¹ It is worth noting, however, that this requires a lower level of

³⁰An alternative approach to our sequential structure is that manufacturers offer a menu of contracts (e.g., a two-part tariff with and without exclusivity) from which D can choose. In addition to frequently create a multiplicity of Nash equilibria (see, e.g., [Bernheim and Whinston, 1998](#); [Calzolari, Denicolò and Zanchettin, 2020](#)), incorporating a menu of contracts in a bargaining game is beyond the scope of this article.

³¹In practice, this “all-or-nothing” deal is often used by manufacturers which own “must-have” products. A prominent example can be found in *United States vs Dentsply* (2005) in which the artificial teeth manufacturer Dentsply (75–80 per cent of market shares) imposed an “all-or-nothing” deal stating that: “In order to effectively promote Dentsply/York products, dealers that are recognized as authorized distributors may not add further tooth lines to their product offering.” (<https://www.justice.gov/atr/case-document/us-v-dentsply-brief-united-states-redacted>). See also *The Coca-Cola Company* (2005) in which the European Commission gathered evidence that: “TCCC and its bottlers

commitment than [Whinston \(1990\)](#) in which bundling is profitable only to the extent that entry is deterred (see also [Choi and Stefanadis, 2001](#); [Carlton and Waldman, 2002](#), among others).³² Instead, along the lines of [Peitz \(2008\)](#), our Proposition 2 highlights that bundling is an optimal selling strategy in the presence of an actual (rather than a potential) rival.³³

Second, we also assume that D is able to commit to a particular product assortment. As no agreement is formed in stage 1, it is noteworthy that this assumption is weaker than that in the “rent-extraction” theory ([Aghion and Bolton, 1987](#)) and the “naked-exclusion” theory ([Rasmusen, Ramseyer and Wiley, 1991](#); [Segal and Whinston, 2000](#)).³⁴ Once an exclusive dealing or bundling contract is signed with U_1 in stage 2, however, we rule out any Pareto-improving renegotiation leading D to also deal with U_2 while leaving the same profit to U_1 (thereby eliminating the inefficiency of U_1 ’s vertical restraint).³⁵ The presence of prohibitive transaction costs (e.g., renegotiation efforts, delaying production, breach penalties) helps sustain this commitment. Moreover, as previously stated, U_1 is much likely to engage in costly judicial disputes to sustain its reputation in the enforcement of such selling policies.

6.2 Manufacturer-specific bargaining weights

So far, we have assumed that D has the same bargaining weight vis-à-vis each manufacturer. In what follows, we show that relaxing this assumption does not affect our results.

Let us denote by α_i the bargaining weight of D vis-à-vis U_i with $i = 1, 2$. Rewrit-

refused to supply a customer with only one of their brands unless the customer was willing to carry other CSDs or non-CSD NABs of TCCC or its bottlers.” (Case COMP/A.39.116/B2).

³²More precisely, the fact that bundling is a suboptimal selling strategy absent entry implies that these alternative “leverage theories” only apply to technical bundling.

³³As a consequence, our commitment assumption is also weaker than that in [Aghion and Bolton \(1987\)](#) and the ensuing literature which require the incumbent to commit on both the contractual form and the terms of trade with the retailer before the entrant shows up.

³⁴As pointed out in [Ide, Montero and Figueroa \(2016\)](#), these theories rely on the assumption that the retailer contractually commits to exclusivity with the incumbent before the entrant shows up. In contrast, while bargaining with U_1 , we consider that the retailer remains free to leave the negotiation table and deal with U_2 without having to pay any penalty for contractual breach.

³⁵A similar commitment assumption is found in the “rent-extraction” literature (e.g., [Aghion and Bolton, 1987](#); [Marx and Shaffer, 1999](#)). We refer to [Spier and Whinston \(1995\)](#) for an extensive discussion on the role of contract renegotiation.

ing (1) and (4) accordingly, U_1 's profit equals $(1 - \alpha_1)(\Pi^{HM} - \Pi^M)$ absent exclusive dealing and $\min\{(1 - \alpha_1)\Pi^H, \Pi^H - \Pi^M\}$ under exclusive dealing. Thus, we find that exclusive dealing is profitable for U_1 whenever $\alpha_1 > \alpha_{ED}$. Similarly, rewriting (7) and (9), U_1 's profit equals $(1 - \alpha_1)(\Pi^{HM} - \Pi^M)$ under the component strategy and $\min\{(1 - \alpha_1)\Pi^{HL}, \Pi^{HL} - \Pi^M\}$ under bundling. As a result, we find that bundling is profitable for U_1 whenever $\alpha_1 > \alpha_B$.

Interestingly, these profitability conditions for U_1 's vertical restrictions do not depend on D 's bargaining weight vis-à-vis U_2 . Indeed, α_2 only increases D 's losses caused by U_1 's restrictions.³⁶ This result has two implications: U_1 does not find less profitable to exclude M from the market even if it is sold at cost by a competitive fringe or if U_2 is vertically integrated with D (i.e., $\alpha_2 = 1$); conversely, the use of vertical restrictions are not more profitable for U_1 when U_2 is powerful (i.e., $\alpha_2 = 0$).

6.3 Endogenous product assortment size

According to [Ho and Lee \(2019\)](#), a downstream firm may have an incentive to strategically narrow its product assortment to strengthen its bargaining leverage with respect to upstream firms (see also [Inderst and Shaffer, 2007](#); [Marx and Shaffer, 2010b](#), among others). Moreover, one may also consider that the downstream firm can widen its product assortment to prevent any harmful effect of bundling practices. We explore both strategies by allowing D to choose the number of products to distribute.

Exclusive dealing. Consider first the framework of exclusive dealing as developed in Section 2 and solved in Section 3. In stage 1, we now allow D to select either HM or H when manufacturers do not impose any exclusive dealing requirement.³⁷ If D selects the assortment HM , the equilibrium outcome is given by (3). Instead, if D selects the assortment H , it gets the same profit as under exclusive dealing which is given by (5). Comparing D 's profit in (3) and (5) we obtain that, absent exclusive dealing, D chooses

³⁶More specifically, D 's losses from U_1 's exclusive dealing or bundling are increasing in α_2 at a rate $\Pi^{HM} - \Pi^H$ (i.e., the marginal contribution of U_2 's product to the industry profit).

³⁷Considering that D can also select M is irrelevant as it is not a stable product assortment under Assumption A1.

to narrow its product assortment to H when $\alpha_D \equiv \frac{\Pi^{HM} - \Pi^H}{2\Pi^{HM} - \Pi^H - \Pi^M} > \alpha$ (see Figure 1 for an illustrative example). As $\alpha_{ED} > \alpha_D$, D 's strategy to narrow its product assortment has no effect on U_1 's incentive to impose an exclusive dealing, which implies that Proposition 1 still holds. However, this highlights a close relationship between D 's product assortment size and its bargaining power in negotiations with manufacturers. When D is strong in its bargaining (α is high), its threats of replacement are not credible to exercise. The sharing of profit is thus determined by the “Nash-in-Nash” solution in which the surplus captured by each manufacturer is proportional to its marginal contribution to the industry profit. Hence, by expanding its product assortment to HM , D not only increases the industry profit to be divided but also decreases the marginal contribution of each manufacturer. This strategy strengthens D 's bargaining position which extracts a larger share of a larger pie. In contrast, when D is weak in its bargaining (α is low), it has an incentive to narrow its product assortment to intensify upstream competition by playing manufacturers off against each other. Although such a strategy shrinks the industry profit to H , it ensures a profit of Π^M to D even when α tends to 0.

Bundling. A similar reasoning applies to the case of upstream bundling. While D may have an incentive to narrow its assortment to a single product when α is low, this strategy is unlikely to affect U_1 's incentive to bundle its products which only arises when α is high. Instead, one may consider that D has an incentive to expand its product assortment to annihilate any harmful effect of bundling. To explore such a strategy, we consider the framework of upstream bundling and modify stage 1 in Section 2 as follows. When U_1 chooses a bundling strategy, D is now able to select either HML or HL ; otherwise, D can select either HML or HM .³⁸ In what follows, we sketch the solution of this game and refer to Appendix E for a formal analysis.

First, regardless of U_1 's selling strategy, if D selects HML the surplus division in the vertical chain is determined by the “Nash-in-Nash” solution. The equilibrium fixed fees are thus given by $\tilde{F}_1^{HML} = (1 - \alpha)(\Pi^{HML} - \Pi^M)$ and $\tilde{F}_2^{HML} = (1 - \alpha)(\Pi^{HML} - \Pi^{HL})$ and D 's profit equals $\tilde{\pi}_D^{HML} = \Pi^{HML} - \tilde{F}_1^{HML} - \tilde{F}_2^{HML}$. Alternatively, if D selects HL (resp.,

³⁸Again, considering any other assortment of two products is irrelevant as none of them is stable under Assumption A1.

HM) when U_1 chooses a bundling (resp., component) strategy, the equilibrium outcome is given by (10) (resp., (8)). Comparing $\tilde{\pi}_D^{HML}$ and $\tilde{\pi}_D^{HL}$ we obtain that, if U_1 has opted for a bundling strategy, D chooses to expand its product assortment to HML when $\alpha > \min\{\tilde{\alpha}_C, \tilde{\alpha}_D\}$ where $\tilde{\alpha}_D \equiv \frac{\Pi^{HML} - \Pi^{HL}}{2\Pi^{HML} - \Pi^{HL} - \Pi^M}$. This strategy offsets the harmful effect of bundling to the benefit of D and the industry profit. In contrast, when $\min\{\tilde{\alpha}_C, \tilde{\alpha}_D\} > \alpha$ and despite the bundling restriction, narrowing the product assortment to HL remains an appealing rent-extraction mechanism for D through the use of threats of replacement. Similarly, comparing $\tilde{\pi}_D^{HML}$ and $\tilde{\pi}_D^{HM}$ we obtain that, if U_1 opts for a component strategy, D chooses to expand its product assortment to HML when $\alpha > \min\{\frac{\Pi^{HL} - \Pi^H}{\Pi^{HM} - \Pi^H}, \tilde{\alpha}'_D\}$ where $\tilde{\alpha}'_D \equiv \frac{\Pi^{HML} - \Pi^{HM}}{2\Pi^{HML} - \Pi^{HL} - \Pi^{HM}}$.

To analyze the profitability of bundling, we compare U_1 's profit under both selling strategies and obtain that bundling arises in equilibrium when $\min\{\frac{\Pi^{HL} - \Pi^H}{\Pi^{HM} - \Pi^H}, \tilde{\alpha}'_D\} > \alpha > \alpha_B$. While the condition from Proposition 2 still holds (that is, $\alpha > \alpha_B$), this result shows that the profitability of bundling practices is less likely when D is able to expand its product assortment. In the following illustrations, we show that this strategy does not always neutralize U_1 's bundling practices (see Appendix E for a general condition). Consider two simple examples with independent products. In the example already analyzed in Section 4, we have $\Pi^H = 4$, $\Pi^M = 3$, and $\Pi^L = 1$, implying that $\min\{\frac{\Pi^{HL} - \Pi^H}{\Pi^{HM} - \Pi^H}, \tilde{\alpha}'_D\} = \frac{1}{4}$ and $\alpha_B = \frac{1}{2}$. Thus, in this case, the expansion of D 's product assortment prevents the emergence of bundling practices. Considering instead that $\Pi^M = \frac{3}{2}$, we have $\min\{\frac{\Pi^{HL} - \Pi^H}{\Pi^{HM} - \Pi^H}, \tilde{\alpha}'_D\} = \frac{2}{5}$ and $\alpha_B = \frac{1}{8}$, implying that bundling arises in equilibrium when $\frac{2}{5} > \alpha > \frac{1}{8}$. Moreover, we have that bundling excludes U_2 from the market when $\frac{3}{13} > \alpha > \frac{1}{8}$.³⁹

Summary. A consequence of the above analysis is that exclusive dealing is more likely to raise anticompetitive concerns than bundling practices as D is never able to counteract the harmful effect of such a vertical restraint. For instance, whenever U_1 finds profitable to impose an exclusive dealing requirement to D for distributing only H and

³⁹As previously mentioned, allowing D to narrow its product assortment to a single product when U_1 opts for a component strategy is unlikely to affect the profitability of bundling practices. Indeed, if U_1 opts for a component strategy, it can be shown that D selects H instead of HML or HM only when $\frac{1}{8} > \alpha$.

L , M is always excluded from the market. If instead U_1 sells H and L as a bundle, we have shown that D may (if doable) find profitable to expand its stocking capacity and distribute the assortment HML .

7 Alternative microfoundation for NNTR

Throughout this article, we rely on the NNTR bargaining solution to reconsider the Chicago School critique of exclusive dealing and the leverage doctrine in a bargaining context. To motivate this surplus division rule, [Ho and Lee \(2019\)](#) have offered a noncooperative foundation for the NNTR solution which hinges on two key elements. First, the downstream firm can commit to engage in negotiations with a particular network of upstream firms. Second, each delegated agent sent by the downstream firm to negotiate on its behalf is able to go “back and forth” between upstream firms inside and outside its network (thereby playing them off against one another during negotiations). Following the same purpose, we introduce the “Nash-in-Nash with Prior Competition for Slots” (NNPCS) framework in which the downstream firm is auctioning a limited number of slots before negotiating wholesale contracts with upstream firms according to the “Nash-in-Nash” solution.⁴⁰ We show that the NNPCS provides an alternative microfoundation for the NNTR solution.

For the sake of exposition, we consider the same market structure as in Section 3 where U_1 and U_2 supply products H and M respectively.⁴¹ To distribute these products on the market, D has a stocking capacity of either one or two slots.⁴² In addition to Assumptions A1 and A2, we consider the following sequence of decisions. In an *ex ante* stage (Stage 0), a restriction on D ’s stocking capacity may be required. This restriction can either result from an exclusive dealing requirement or from D ’s decision to reduce its stocking capacity to one slot. Subsequently, firms behave according to the NNPCS model which can be described by the following three-stage game:

⁴⁰It is worth noticing that this framework is closely related to [Marx and Shaffer \(2010b\)](#). However, in contrast to us, they consider that bilateral negotiations take place sequentially.

⁴¹Considering a more sophisticated market structure as in Section 4 does not affect the analysis. We refer to a previous version of this article for further details (see [Chambolle and Molina, 2020](#)).

⁴²As in [Marx and Shaffer \(2010b\)](#), we consider that the sale of a product requires exactly one slot (that is, a slot enables a manufacturer to satisfy any amount of consumer demand for its product).

- Stage 1: U_1 and U_2 simultaneously offer slotting fees (non-negative lump sum payments) to secure a slot. Then, D publicly announces its product assortment decision.⁴³
- Stages 2 and 3 remain as in Section 2.

Competition for slots and bargaining protocol. As pointed out by the [Federal Trade Commission \(2001\)](#), slotting fees: “may serve as devices for retailers to auction their shelf space and efficiently determine its highest-valued use.” The “auction” for slots conducted by D in stage 1 is modelled as an asymmetric Bertrand competition, which is known to have a multiplicity of Nash equilibria. To select among equilibria, we rely on [Selten’s \(1975\)](#) concept of trembling hand perfection. Furthermore, we use the “Nash-in-Nash” bargaining solution to determine terms of trade in stage 2. Proceeding backwards, we solve the above NNPCS model.

Bargaining stage. As already discussed in Section 2, bilateral efficiency prevails implying that stages 2 and 3 can be gathered in a unique stage where each pair $D - U_i$ bargains over a fixed fee to divide the integrated industry profit. If D has selected the product assortment HM , each manufacturer deals with D and the surplus obtained by each firm from bilateral negotiations is given by (3). Alternatively, if D has selected the product assortment $X \in \{H, M\}$, only one bilateral negotiation takes place and the corresponding fixed fee \hat{F}_i^X is determined by the Nash bargaining solution as follows:

$$\max_{\hat{F}_i^X} (\Pi^X - \hat{F}_i^X)^\alpha (\hat{F}_i^X)^{1-\alpha} \quad (11)$$

where the gains from trade of D and U_i are $\Pi^X - \hat{F}_i^X$ and \hat{F}_i^X respectively. From (11), we find that the surplus obtained by D and U_i from this bilateral negotiation is respectively given by $\hat{\pi}_D^X = \alpha \Pi^X$ and $\hat{\pi}_i^X = \hat{F}_i^X = (1 - \alpha) \Pi^X$.

⁴³Slotting fees are used here in their broad sense. As mentioned by the [Federal Trade Commission \(2003\)](#), researchers use the term “slotting fees” to describe both “introduction fees” which are paid for new products and “pay-to-stay fees” which are paid to maintain shelf presence for continuing products.

Competition for slots. The competition for slots in stage 1 depends on the size of D 's stocking capacity. Absent any restriction on D 's stocking capacity, a slot is available for each product. As D is strictly better off distributing both products rather than just one ($\pi_D^{HM} > \hat{\pi}_D^X$), it always offers the product assortment HM . Hence, regardless of its rival's slotting fee, a manufacturer has no incentive to offer a positive slotting fee to secure one slot for its product. Note also that a manufacturer has no incentive either to offer a positive slotting fee to monopolize D 's slots (see Appendix F.1 for a proof). Therefore, absent any restriction on D 's stocking capacity, each manufacturer offers a slotting fee equal to $S_i^{HM} = 0$ with $i = 1, 2$.

Consider now that a restriction on D 's stocking capacity is imposed. To secure D 's unique slot, each manufacturer can at most offer what it would gain from trading with D in the bargaining stage, that is $\hat{\pi}_1^H$ for U_1 and $\hat{\pi}_2^M$ for U_2 . As $\hat{\pi}_D^H + \hat{\pi}_1^H > \hat{\pi}_D^M + \hat{\pi}_2^M \Leftrightarrow \Pi^H > \Pi^M$, U_1 can always offer a slotting fee to secure D 's slot for H . As the competition for slots is tantamount to an asymmetric Bertrand competition, U_1 offers a slotting fee such that D is indifferent between selecting H or replacing it with M , that is $\hat{\pi}_D^H + S_1 = \hat{\pi}_D^M + \hat{\pi}_2^M \Leftrightarrow S_1 = \max\{\Pi^M - \alpha\Pi^H, 0\}$.⁴⁴ U_1 's slotting fee is thus equivalent to the compensation C paid to D for not selling M instead of H as described in Section 3. This slotting fee is positive whenever D 's bargaining power vis-à-vis manufacturers is sufficiently weak ($\alpha_c > \alpha$).

The solution of the NNPCS model yields the following proposition:

Proposition 3 *The equilibrium surplus division in the NNPCS model coincides with the NNTR bargaining solution.*

Proof. Under a restriction on D 's stocking capacity, the NNPCS model yields a profit equal to $\hat{\pi}_D^H + S_1^H = \max\{\alpha\Pi^H, \Pi^M\} = \pi_D^H$ for D , $\hat{\pi}_1^H - S_1^H = \min\{(1-\alpha)\Pi^H, \Pi^H - \Pi^M\} = \pi_1^H$ for U_1 , and $\hat{\pi}_2^H = 0 = \pi_2^H$ for U_2 . Absent any restriction on D 's stocking capacity, the NNPCS model yields a profit equal to π_D^{HM} for D , π_1^{HM} for U_1 , and π_2^{HM} for U_2 . ■

In the NNPCS model, D always selects the product that generates the highest in-

⁴⁴While there exist other pure-strategy Nash equilibria, we show in Appendix F.2 that these alternative equilibria are not trembling-hand perfect.

dustry profit (here H).⁴⁵ This efficiency result provides theoretical grounds for the stability condition required in the NNTR solution. Moreover, the NPPCS model enables to explain why in the NNTR bargaining solution the downstream firm can threaten its upstream trading partner to deal with an excluded alternative one at its reservation tariff.⁴⁶ Hence, leveraging on recent microfoundations for the “Nash-in-Nash” solution (Collard-Wexler, Gowrisankaran and Lee, 2019; Rey and Vergé, 2020), Proposition 3 implies that the NNPCS model provides a noncooperative foundation for the NNTR bargaining solution. As a consequence, we derive the following corollary:

Corollary 4 *Under the NNPCS model, exclusive dealing is profitable for U_1 when $\alpha > \alpha_{ED}$ whereas D profitably narrows its product assortment when $\alpha_D > \alpha$.*

Our exclusionary mechanism is well suited to industries in which the downstream firm plays off upstream firms against one another by going “back and forth” between them during negotiations as, for instance, in the health care sector (Ho and Lee, 2019). Corollary 4 further shows that it can also apply to markets in which firms behave according to the NNPCS framework. For instance, this reflects well the conduct of firms in the retail industry where manufacturers frequently provide retailers with upfront payments for the carriage of their products.⁴⁷ Hence, in addition to offering a new theoretical foundation for the NNTR solution, the NNPCS framework developed in this section extends the scope of our exclusionary mechanism to industries where upfront payments (e.g., slotting fees) are prevalent.⁴⁸

⁴⁵The manufacturer of the most efficient product is indeed always able to offer a slotting fee such that D selects its product.

⁴⁶More specifically, it might not be obvious why in the NNTR bargaining solution an excluded upstream firm has no bargaining power vis-à-vis the downstream firm when being used as a threat of replacement.

⁴⁷For instance, Hristakeva (2020) estimate that such payments correspond to 20 percent of retailers’ variables profits in the U.S. grocery yogurt market. Elberg and Noton (2021) also provide empirical evidence on the substantial magnitude of upfront payments in the Chilean supermarket industry.

⁴⁸For instance, our “leverage theory” of bundling fits particularly well with the EC claim that “making the supply of the strongest TCCC brands conditional upon the purchase of less-selling Carbonated Soft Drinks (CSDs) and non-CSDs [...] has the effect of making sales space in outlets harder to obtain for rival suppliers and of raising sale space prices for those suppliers.”

8 Conclusion

This article offers a unified theory to the analysis of exclusive dealing and exclusionary bundling. We consider a framework with two competing manufacturers which interact with a powerful retailer in a two-stage game. First, manufacturers choose whether or not to impose a vertical restriction on the retailer's purchases (i.e., exclusive dealing or bundling) which then selects its product assortment accordingly. Second, trade takes place following the "Nash-in-Nash with Threat of Replacement" bargaining protocol à la [Ho and Lee \(2019\)](#). A key condition for the emergence of exclusive dealing or bundling is that the manufacturer holds a must have product or brand portfolio. When this condition is met, we show that the presence of buyer power facilitates the emergence of exclusive dealing and bundling, which leads to the exclusion of an efficient rival manufacturer at the expense of the retailer, the industry profit, and consumers. Our main contribution is thus to provide a unifying framework which, through a single parameter capturing the retailer's buyer power, either supports or rejects the Chicago School argument for both exclusive dealing and bundling practices.

From a competition policy perspective, our theory highlights that a large buyer power which countervails the exercise of upstream market power paradoxically favors the emergence of anticompetitive practices by manufacturers. This results sharply contrasts with the classic competition policy view on the procompetitive effects of buyer power as stated, for instance, in the EU guidelines on vertical restraints. More generally, our article provides guidance for the antitrust treatment of buyer power which has become a major issue these last decades.

Finally, we introduce a game-theoretic framework, referred to as "Nash-in-Nash with Prior Competition for Slots" (NNPCS), in which manufacturers compete for getting access to the retailer's limited number of slots before bargaining takes place. We argue that the NNPCS offers a new noncooperative foundation for the NNTR solution as well as a tractable building block which provides interesting perspectives for future research.

Appendix

A Proof of Propositions 1 and 2

Proof of Proposition 1. Absent exclusive dealing, U_1 always obtains a profit equal to $(1-\alpha)(\Pi^{HM}-\Pi^M)$. Under exclusive dealing, U_1 obtains a profit equal to $(1-\alpha)\Pi^H$ when $\alpha > \alpha_C$. Under Assumption A1, it is straightforward that exclusive dealing is always profitable in this case. When $\alpha_C > \alpha$, U_1 obtains a profit equal to $\Pi^H - \Pi^M$ under exclusive dealing, which is profitable whenever $\alpha > \alpha_{ED}$. Note that $\alpha_C \geq \alpha_{ED} \Leftrightarrow \Pi^M(\Pi^{HM} - \Pi^M) \geq \Pi^H(\Pi^{HM} - \Pi^H) \Leftrightarrow (\Pi^H - \Pi^M)(\Pi^H + \Pi^M - \Pi^{HM}) \geq 0$ which is always satisfied under Assumptions A1 and A2.

Proof of Proposition 2. Under a component strategy, U_1 always obtains a profit equal to $(1-\alpha)(\Pi^{HM} - \Pi^M)$. Under bundling, U_1 obtains a profit equal to $(1-\alpha)\Pi^{HL}$ when $\alpha > \tilde{\alpha}_C$. Under Assumption A2, it is straightforward that bundling is always profitable in this case. When $\tilde{\alpha}_C > \alpha$, U_1 obtains a profit equal to $\Pi^{HL} - \Pi^M$ under bundling, which is profitable whenever $\alpha > \alpha_B$. Note that $\tilde{\alpha}_C \geq \alpha_B \Leftrightarrow \Pi^M(\Pi^{HM} - \Pi^M) \geq \Pi^{HL}(\Pi^{HM} - \Pi^{HL}) \Leftrightarrow (\Pi^{HL} - \Pi^M)(\Pi^{HL} + \Pi^M - \Pi^{HM}) \geq 0$ which is always satisfied under Assumptions A1 and A2.

B Exclusive dealing and bundling harm the downstream firm

This section shows that D is always harmed whenever U_1 imposes an exclusive dealing or a bundling restriction. To this end, we demonstrate that U_1 and D always bargain to share a (weakly) lower joint profit under exclusive dealing or bundling. As a result, whenever exclusive dealing or bundling is profitable for U_1 , it must be to the detriment of D .

Exclusive dealing. Absent exclusive dealing, the amount of surplus divided between D and U_1 is given by $\Pi^{HM} - \tilde{F}_2^{HM} = \alpha\Pi^{HM} + (1-\alpha)\Pi^H$. Under exclusive dealing, this surplus equals Π^H . By Assumption A1, we obtain that the surplus shared between D and U_1 is strictly lower under exclusive dealing.

Bundling. When U_1 chooses a component selling strategy, the amount of surplus divided between D and U_1 is given by $\Pi^{HM} - \tilde{F}_2^{HM} = \alpha\Pi^{HM} + (1-\alpha)\Pi^H$ if $\alpha > \frac{\Pi^{HL}-\Pi^H}{\Pi^{HM}-\Pi^H}$ and $\Pi^{HM} - \tilde{F}_2^{HM} = \Pi^{HL}$ otherwise. When U_1 chooses instead a bundling strategy, this surplus equals Π^{HL} . If $\frac{\Pi^{HL}-\Pi^H}{\Pi^{HM}-\Pi^H} > \alpha$, the surplus shared

between D and U_1 is not affected by U_1 's selling strategy. If $\alpha > \frac{\Pi^{HL} - \Pi^H}{\Pi^{HM} - \Pi^H}$, it is straightforward that the surplus shared between D and U_1 is strictly lower when U_1 chooses a bundling strategy.

C Proof of Remark 1

In this section, we prove that Proposition 2 holds if the first part of Assumption A1 ($\Pi^H > \Pi^M > \Pi^L > 0$) is replaced by $\Pi^{HL} > \Pi^M > \Pi^H > \Pi^L > 0$. To this end, we first show that bargaining outcomes determined by (6), (7), and (9) are unaffected. As previously discussed, two conditions are required for applying the NTTR solution to these bilateral negotiations: (i) firms involved in each negotiation have positive gains from trade taking as given their other agreements (if any), (ii) each product for which the tariff is negotiated generates a higher bilateral surplus than any product used by D as a replacement threat taking as given all other agreements (if any). Under the negotiation described by (6), the first condition requires that $\Pi^{HM} > \Pi^H$ and $\Pi^{HL} > \Pi^H$ (Assumption A2) and the second condition requires that $\Pi^{HM} > \Pi^{HL}$ (second part of Assumption A1). Similarly, under the negotiation described by (7), the first condition requires that $\Pi^{HM} > \Pi^M$ (Assumption A2). Finally, under the negotiation described by (9), the first condition requires that $\Pi^{HL} > 0$ and $\Pi^M > 0$ (Assumption A1) and the second condition requires $\Pi^{HL} > \Pi^M$ (first part of Assumption A1). Hence, reversing the ranking between Π^H and Π^M does not affect any bargaining outcome.

Furthermore, from the comparison of U_1 's profit in (8) and (10), Proposition 2 requires that $\Pi^{HM} > \Pi^{HL}$ (second part of Assumption A1) and $\Pi^{HM} > \Pi^M$ (Assumption A2). Consequently, relaxing the first part of Assumption A1 by using the weaker condition on M 's surplus $\Pi^{HL} > \Pi^M > \Pi^H > \Pi^L > 0$ does not affect any of our results.

D Proof of Remark 2: Bundling of complementary products

In this section, we show that bundling may arise in equilibrium when M and L are complements to H . To this end, let us keep Assumption A1 unchanged and modify Assumption A2 as follows:

Assumption A2' *Products M and L are imperfect complements to H and independent or imperfect substitutes to each other:*

$$\begin{aligned}\Pi^{HX} &> \Pi^H + \Pi^X > \Pi^H \text{ with } X \in \{M, L\} \\ \Pi^M + \Pi^L &\geq \Pi^{ML} > \Pi^M\end{aligned}$$

Moreover, we introduce the following restriction on the form of product complementarity:

Assumption A4 *The complementarity between products H and M is limited as follows:*

$$\Pi^{HL} + \Pi^M \geq \Pi^{HM}$$

The presence of complementarity across products implies that the marginal contribution of a manufacturer's product to the industry profit is greater when other agreements have been formed (e.g., $\Pi^{HM} - \Pi^M > \Pi^H$). As highlighted in [Collard-Wexler, Gowrisankaran and Lee \(2019\)](#), this may prevent the existence of an equilibrium in which all agreements are formed at tariffs determined by the "Nash-in-Nash" solution because some agreements would be rejected.⁴⁹ Indeed, as shown below, D may have an incentive to reject one of its agreement at the NNTR tariffs in the component strategy case. By limiting the form of complementarity between products, Assumption A4 plays the same role as the feasibility assumption in [Collard-Wexler, Gowrisankaran and Lee \(2019\)](#) and ensures that D always prefers maintaining all of its agreements at the NNTR tariffs.

As in Section 4, we solve the subgames in which U_1 chooses a component and a bundling strategy before analyzing the profitability of bundling.

Component strategy. Consider first the case in which U_1 chooses a component strategy, implying that D may either select the assortment HM , HL , or ML . The use of Assumption A2' instead of Assumption A2 does not affect the result that HM is the unique stable product assortment (see Appendix C for a detailed discussion on the stability conditions in this case). Hence, D always engages in bilateral negotiations with U_2 for M and U_1 for H when the latter chooses a component selling strategy. These negotiations are determined by the NNTR solution as in (6) and (7) respectively, implying that the surplus division is similar to (8). However, the fact that the marginal contribution of H (resp., M) to the industry profit is greater when M (resp., H) is also offered (Assumption A2') implies that D may obtain a negative profit. Indeed, (8) shows that $\pi_D^{HM} = \Pi^{HM} - \tilde{F}_1^{HM} - \tilde{F}_2^{HM} = \max\{(2\alpha - 1)\Pi^{HM} + (1 - \alpha)(\Pi^H + \Pi^M), \Pi^{HL} - (1 - \alpha)(\Pi^{HM} - \Pi^M)\}$ which, under Assumptions A1 and A2', is increasing in α (i.e., $\frac{\partial \pi_D^{HM}}{\partial \alpha} > 0$). When $\alpha = 0$, we have that $\pi_D^{HM} = \Pi^{HL} - \Pi^{HM} + \Pi^M$ which may be negative in the presence of a large complementarity between H and M . Thus, by limiting the degree of complementarity, Assumption A4 ensures that D always gets a positive profit from dealing with both U_1 and U_2 at tariffs determined by the NNTR solution.

Bundling strategy. Consider now the case in which U_1 chooses a bundling strategy, implying that D may either select the assortment HL or M . Again, the use of Assumption A2' instead of Assumption A2 does not affect the result that HL is the unique stable product assortment (see also Appendix C). Hence, D always engages in a bilateral negotiation with U_1 for HL when the latter chooses a bundling strategy.

⁴⁹More precisely, this violates the weak conditional decreasing marginal contribution assumption of [Collard-Wexler, Gowrisankaran and Lee \(2019\)](#).

Such a negotiation is determined by the NNTR solution as in (9) and the surplus division is similar to (10).

The comparison of U_1 's profit in (8) and (10) leads to Proposition 2 in a setting with bundling of complementary products. The proof is as follows. Under a component strategy, U_1 always obtains a profit equal to $(1 - \alpha)(\Pi^{HM} - \Pi^M)$. Under bundling, U_1 obtains a profit equal to $(1 - \alpha)\Pi^{HL}$ when $\alpha > \tilde{\alpha}_C$. Under Assumption A4, it is straightforward that bundling is always profitable in this case. When $\tilde{\alpha}_C > \alpha$, U_1 obtains a profit equal to $\Pi^{HL} - \Pi^M$ under bundling, which is profitable whenever $\alpha > \alpha_B$. Note that $\tilde{\alpha}_C > \alpha_B \Leftrightarrow (\Pi^{HL} - \Pi^M)(\Pi^{HL} + \Pi^M - \Pi^{HM}) \geq 0$ which is always satisfied under Assumptions A1, A2', and A4.

E Endogenous product assortment size

In this section, we extend our “leverage theory” of bundling by allowing D to strategically expand its product assortment to counteract the harmful effect of U_1 's bundling practices (the exclusive dealing case is entirely treated in Section 6.3). Consider the same framework as developed in Section 2 and solved in Section 4 with the following three-stage game. In stage 1, U_1 decides whether or not to impose a bundling requirement to D . Then, D publicly announces its product assortment which may be expanded to include all products. Stages 2 and 3 remain as in Section 2.

Component strategy. Consider first that U_1 chooses a component selling strategy. In this case, D either selects the assortment HML or HM . If D selects HML , it engages in bilateral negotiations with U_1 for HL and U_2 for M , implying that the NNTR solution yields the same outcome as the “Nash-in-Nash” solution. The fixed fee negotiated between D and U_1 is thus determined as follows:

$$\max_{\tilde{F}_1^{HML}} (\Pi^{HML} - \tilde{F}_1^{HML} - \tilde{F}_2^{HML} - (\Pi^M - \tilde{F}_2^{HML}))^\alpha (\tilde{F}_1^{HML})^{1-\alpha} \quad (12)$$

where $\Pi^{HML} - \tilde{F}_1^{HML} - \tilde{F}_2^{HML} - (\Pi^M - \tilde{F}_2^{HML})$ and \tilde{F}_1^{HML} correspond to the gains from trade of D and U_1 respectively.⁵⁰ Similarly, the fixed fee between D and U_2 is determined as follows:

$$\max_{\tilde{F}_2^{HML}} (\Pi^{HML} - \tilde{F}_1^{HML} - \tilde{F}_2^{HML} - (\Pi^{HL} - \tilde{F}_1^{HML}))^\alpha (\tilde{F}_2^{HML})^{1-\alpha} \quad (13)$$

where $\Pi^{HML} - \tilde{F}_1^{HML} - \tilde{F}_2^{HML} - (\Pi^{HL} - \tilde{F}_1^{HML})$ and \tilde{F}_2^{HML} correspond to the gains from trade of D and U_2 respectively. From (12) and (13), we obtain that U_1 's fixed fee is $\tilde{F}_1^{HML} = (1 - \alpha)(\Pi^{HML} - \Pi^M)$ and U_2 's fixed fee is $\tilde{F}_2^{HML} = (1 - \alpha)(\Pi^{HML} - \Pi^{HL})$. As a result, the equilibrium profit of D , U_1 , and U_2 are

⁵⁰We assume here that there is a unique fixed fee negotiated for both H and L as in the bundling case. An alternative modeling approach would be to consider that D and U_1 engage in two separate and simultaneous negotiations for each product (i.e., each firm sends two delegates to negotiate fixed fees on their behalf). This would imply, however, that U_1 competes against itself, thereby conferring a higher status quo payoff to D which would decrease U_1 's profit.

respectively given by:

$$\tilde{\pi}_D^{HML} = \Pi^{HML} - \tilde{F}_1^{HML} - \tilde{F}_2^{HML}; \quad \tilde{\pi}_1^{HML} = \tilde{F}_1^{HML}; \quad \tilde{\pi}_2^{HML} = \tilde{F}_2^{HML}. \quad (14)$$

Alternatively, if D selects HM , it engages in bilateral negotiations with U_1 for H and U_2 for M and the equilibrium outcome is given by (8). Comparing D 's profit in (8) and (14), we obtain that D selects the assortment HML when $\alpha > \min\{\frac{\Pi^{HL}-\Pi^H}{\Pi^{HM}-\Pi^H}, \tilde{\alpha}'_D\}$ where $\tilde{\alpha}'_D \equiv \frac{\Pi^{HML}-\Pi^{HM}}{2\Pi^{HML}-\Pi^{HL}-\Pi^{HM}}$; otherwise, D selects HM .

Bundling strategy. Consider now that U_1 chooses a bundling strategy. In this case, D either selects the assortment HML or HL . If D selects HML , it engages in bilateral negotiations with U_1 for HL and U_2 for M and the equilibrium outcome is given by (14). Instead, if D selects HL , it engages in a bilateral negotiation with U_1 for HL and the equilibrium outcome is given by (10). Comparing D 's profit in (10) and (14), we obtain that D selects the assortment HML when $\alpha > \min\{\tilde{\alpha}_C, \tilde{\alpha}_D\}$ where $\tilde{\alpha}_D \equiv \frac{\Pi^{HML}-\Pi^{HL}}{2\Pi^{HML}-\Pi^{HL}-\Pi^M}$; otherwise, D selects HM .

Profitability of bundling. Given D 's product assortment choice, we analyze U_1 's incentive to bundle its products:

- (i) When $\min\{\tilde{\alpha}_C, \tilde{\alpha}_D, \frac{\Pi^{HL}-\Pi^H}{\Pi^{HM}-\Pi^H}, \tilde{\alpha}'_D\} > \alpha$, D selects HM if U_1 chooses a component strategy and HL if U_1 chooses a bundling strategy. Comparing U_1 's profit in (8) and(10), we obtain that U_1 chooses a bundling strategy if $\alpha > \alpha_B$.
- (ii) When $\min\{\frac{\Pi^{HL}-\Pi^H}{\Pi^{HM}-\Pi^H}, \tilde{\alpha}'_D\} > \alpha > \min\{\tilde{\alpha}_C, \tilde{\alpha}_D\}$, D selects HM if U_1 chooses a component strategy and HML if U_1 chooses a bundling strategy. Comparing U_1 's profit in (8) and(14), we obtain that U_1 always chooses a bundling strategy.
- (iii) When $\min\{\tilde{\alpha}_C, \tilde{\alpha}_D\} > \alpha > \min\{\frac{\Pi^{HL}-\Pi^H}{\Pi^{HM}-\Pi^H}, \tilde{\alpha}'_D\}$, D selects HML if U_1 chooses a component strategy and HL if U_1 chooses a bundling strategy. Comparing U_1 's profit in (10) and(14), U_1 has an incentive to choose a bundling strategy only if $\alpha > \frac{\Pi^{HML}-\Pi^{HL}}{\Pi^{HML}-\Pi^M} > \tilde{\alpha}_D$ which contradicts the initial condition. Hence, when $\min\{\tilde{\alpha}_C, \tilde{\alpha}_D\} > \alpha > \min\{\frac{\Pi^{HL}-\Pi^H}{\Pi^{HM}-\Pi^H}, \tilde{\alpha}'_D\}$, U_1 always chooses a component strategy.
- (iv) When $\alpha > \max\{\min\{\tilde{\alpha}_C, \tilde{\alpha}_D\}, \min\{\frac{\Pi^{HL}-\Pi^H}{\Pi^{HM}-\Pi^H}, \tilde{\alpha}'_D\}\}$, D select HML regardless of U_1 's selling strategy implying that the latter is indifferent between opting for a component or a bundling strategy.⁵¹

Given (i) and (ii), bundling arises in equilibrium when $\min\{\frac{\Pi^{HL}-\Pi^H}{\Pi^{HM}-\Pi^H}, \tilde{\alpha}'_D\} > \alpha > \alpha_B$. Moreover, given (i), such a selling strategy excludes U_2 from the market when $\min\{\tilde{\alpha}_C, \tilde{\alpha}_D, \frac{\Pi^{HL}-\Pi^H}{\Pi^{HM}-\Pi^H}, \tilde{\alpha}'_D\} > \alpha > \alpha_B$.

⁵¹Absent any gain from bundling, we consider that U_1 chooses a component strategy as a tie-breaking rule.

F Equilibrium slotting fees in the “Nash-in-Nash” with Prior Competition for Slots model

F.1 Equilibrium slotting fees absent restriction on D 's stocking capacity

We show that there exists a unique equilibrium in which $S_1^{HM} = S_2^{HM} = 0$.

No deviation towards monopolization of D 's slots. We show that a manufacturer has no incentive to deviate in offering a positive slotting fee to monopolize D 's slots with its product. In stage 2, U_1 would be better off if D carries only its product H instead of HM . Indeed, $\hat{\pi}_1^H - \pi_1^{HM} = (1 - \alpha)\Pi^H - (1 - \alpha)(\Pi^{HM} - \Pi^M) > 0$ under Assumption A2. Hence, U_1 may attempt to monopolize the market with its product H . To this end, U_1 has to offer a fee at least equals to $\pi_D^H + \check{S}^H = \pi_D^{HM} + S_2^{HM} \Leftrightarrow \check{S}^H = \pi_D^{HM} - \pi_D^H + S_2^{HM}$. When $S_2^{HM} = 0$, this fee boils down to $\check{S}^H = (1 - \alpha)\Pi^M - (1 - 2\alpha)(\Pi^{HM} - \Pi^H)$. However, the deviation profit $\hat{\pi}_1^H - \check{S}^H$ is lower than π_1^{HM} under Assumption A2. Similarly, in stage 2, U_2 is better off if D carries only M instead of HM . However, by the same reasoning, it is not profitable to pay a slotting fee to monopolize the market with its product M .

No deviation towards positive slotting fees. If $S_i > 0$, as $\pi_D^{HM} + S_i > \hat{\pi}_D^X + S_i$, D always selects both products in its assortment even if U_i 's rival does not offer a positive slotting fee.

F.2 Equilibrium slotting fees under a restriction on D 's stocking capacity

As previously mentioned, when a restriction on D 's stocking capacity is required, the first stage in the NNPCS model is modelled as an asymmetric Bertrand competition which has a multiplicity of pure-strategy Nash equilibria. Indeed, it can be shown that D keeps selecting H even if U_2 offers any slotting fee $\check{S}_2 \in]S_2, \hat{\pi}_1^H + \hat{\pi}_D^H - \hat{\pi}_D^M]$ and U_1 offers $\check{S}_1 = \check{S}_2 + \hat{\pi}_D^M - \hat{\pi}_D^H$. However, these alternative equilibria rely on weakly dominated strategies and the equilibrium $S_1 = \max\{\Pi^M - \alpha\Pi^H, 0\}$ and $S_2 = \hat{\pi}_2^M$ can be obtained from the trembling-hand selection criterion.

G Quasi-linear quadratic utility specification

In this section, we show that our illustrative examples developed in Section 3 and 4 can be obtained from a generalized version of the quasi-linear quadratic utility model pioneered by [Shubik and Levitan \(1980\)](#). Following the notations of [Choné and Linnemer \(2020\)](#), we consider a representative consumer whose utility from consuming $n + 1$ products is specified as follows:

$$U(\mathbf{q}, q_0) = \mathbf{a}^\top \mathbf{q} - \frac{1}{2} \mathbf{q}^\top \mathbf{B} \mathbf{q} + q_0 \quad (15)$$

where q_0 is the quantity consumed of the numéraire good, \mathbf{q} is a n -dimensional vector of quantity consumed of each of the n other products, \mathbf{a} is a n -dimensional vector of parameters capturing the marginal quality of each of these products, and \mathbf{B} is a $n \times n$ positive definite matrix of parameters capturing the pattern of substitution among these products. We consider that the diagonal elements of \mathbf{B} equal 1 while the off-diagonal elements equal b_{XY} with $X \neq Y$ (these elements capture the pattern of substitutability and complementarity among products). Based on (15), the representative consumer maximizes his utility of follows:

$$\max_{\mathbf{q}, q_0} U(\mathbf{q}, q_0) \quad \text{such that} \quad \mathbf{p}^\top \mathbf{q} + p_0 q_0 = m \quad (16)$$

where \mathbf{p} is a n -dimensional vector of prices, p_0 is the price of the numéraire that we normalize to 1, and m denotes the consumer's wealth. Alternatively, (16) can be written as: $\max_{\mathbf{q}} U(\mathbf{q}) - \mathbf{p}^\top \mathbf{q} + m$, which yields the following vector of direct demand: $\mathbf{q}(\mathbf{p}) = \mathbf{B}^{-1}(\mathbf{a} - \mathbf{p})$.

Exclusive dealing. In the framework developed in Section 3, there are at most two products offered on the market, that is, either the assortment HM or $X \in \{H, M\}$. Hence, we have $\mathbf{q} = (q_H, q_M)^\top$, $\mathbf{p} = (p_H, p_M)^\top$, $\mathbf{a} = (a_H, a_M)^\top$, and $\mathbf{B} = \begin{pmatrix} 1 & b_{HM} \\ b_{HM} & 1 \end{pmatrix}$ when the assortment HM is offered. Otherwise, we have $\mathbf{q} = q_X$, $\mathbf{p} = p_X$, $\mathbf{a} = a_X$, and $\mathbf{B} = 1$. The vector of direct demand when HM is offered is given by:

$$\begin{pmatrix} q_H \\ q_M \end{pmatrix} = \frac{1}{1 - b_{HM}^2} \begin{pmatrix} a_H - p_H - b_{HM}(a_M - p_M) \\ a_M - p_M - b_{HM}(a_H - p_H) \end{pmatrix}$$

and the direct demand when only $X \in \{H, M\}$ is offered is given by: $q_X = a_X - p_X$. Maximizing $\mathbf{p}^\top \mathbf{q}(\mathbf{p})$ with respect to \mathbf{p} , the industry profit is given by $\Pi^{HM} = \frac{a_H^2 - 2b_{HM}a_Ha_M + a_M^2}{4 - 4b_{HM}^2}$ when HM is offered and $\Pi^X = \frac{a_X^2}{4}$ when X is offered.⁵² The parameter values $b_{HM} = \frac{2\sqrt{3}-\sqrt{2}}{5}$, $a_H = 4$, and $a_M = 2\sqrt{3}$ lead to $\Pi^{HM} = 5$,

⁵²Without loss of generality, we set the marginal cost of each product to 0.

$\Pi^H = 4$, and $\Pi^M = 3$.

Bundling. In the framework developed in Section 4, there are also at most two products that can be offered on the market: that is, either HM , or HL , or ML , or $X \in \{H, M, L\}$. When either HM or X is offered, the expression for the vector of direct demand and the industry profit are as in the exclusive dealing framework described above. When YL is offered with $Y \in \{H, M\}$, we have $\mathbf{q} = (q_Y, q_L)^\top$, $\mathbf{p} = (p_Y, p_L)^\top$, $\mathbf{a} = (a_Y, a_L)^\top$, and $\mathbf{B} = \begin{pmatrix} 1 & b_{YL} \\ b_{YL} & 1 \end{pmatrix}$. The vector of direct demand is thus given by:

$$\begin{pmatrix} q_Y \\ q_L \end{pmatrix} = \frac{1}{1 - b_{YL}^2} \begin{pmatrix} a_Y - p_Y - b_{YL}(a_L - p_L) \\ a_L - p_L - b_{YL}(a_Y - p_Y) \end{pmatrix}$$

Maximizing $\mathbf{p}^\top \mathbf{q}(\mathbf{p})$ with respect to \mathbf{p} , the industry profit is given by $\Pi^{YL} = \frac{a_Y^2 - 2b_{YL}a_Ya_L + a_L^2}{4 - 4b_{YL}^2}$ when YL is offered. The parameter values $a_H = 4$, $a_M = 2\sqrt{3}$, and $a_L = 2$ lead to $\Pi^H = 4$, $\Pi^M = 3$, and $\Pi^L = 1$. Furthermore, the case of independent products can be obtained by setting $b_{HM} = b_{HL} = b_{ML} = 0$.

References

- Aghion, Philippe, and Patrick Bolton.** 1987. "Contracts as a Barrier to Entry." *American Economic Review*, 77(3): 388–401.
- Beckert, Walter, Howard Smith, and Yuya Takahashi.** 2021. "Competition in a spatially-differentiated product market with negotiated prices." Unpublished. Available at: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3723569.
- Bedre-Defolie, Özlem, and Gary Biglaiser.** 2017. "Contracts as a Barrier to Entry in Markets with Nonpivotal Buyers." *American Economic Review*, 107(7): 2041–2071.
- Bernheim, Douglas B., and Michael D. Whinston.** 1985. "Common Marketing Agency as a Device for Facilitating Collusion." *RAND Journal of Economics*, 16(2): 269–281.
- Bernheim, Douglas B., and Michael D. Whinston.** 1998. "Exclusive Dealing." *Journal of Political Economy*, 106(1): 64–103.
- Binmore, Kenneth George.** 1985. "Game-Theoretic Models of Bargaining." Chapter 13: Bargaining and coalitions, 269–304. Cambridge University Press.
- Binmore, Kenneth George, Avner Shaked, and John Sutton.** 1989. "An Outside Option Experiment." *Quarterly Journal of Economics*, 104(4): 753–770.
- Bolton, Patrick, and Michael D. Whinston.** 1993. "Incomplete Contracts, Vertical Integration, and Supply Assurance." *Review of Economic Studies*, 60(1): 121–148.
- Bork, Robert H.** 1978. *Antitrust Paradox: A Policy at War With Itself*. Basic Books.
- Calzolari, Giacomo, and Vincenzo Denicolò.** 2013. "Competition with Exclusive Contracts and Market-Share Discounts." *American Economic Review*, 103(6): 2384–2411.
- Calzolari, Giacomo, and Vincenzo Denicolò.** 2015. "Exclusive Contracts and Market Dominance." *American Economic Review*, 105(11): 3321–3351.
- Calzolari, Giacomo, Vincenzo Denicolò, and Piercarlo Zanchettin.** 2020. "The demand-boost theory of exclusive dealing." *RAND Journal of Economics*, 51(3): 713–738.
- Carlton, Dennis W., and Michael Waldman.** 2002. "The Strategic Use of Tying to Preserve and Create Market Power in Evolving Industries." *RAND Journal of Economics*, 33(2): 194–220.
- Carlton, Dennis W., and Michael Waldman.** 2012. "Upgrades, Switching Costs and The Leverage Theory of Tying." *Economic Journal*, 122(561): 675–706.
- Chambolle, Claire, and Hugo Molina.** 2020. "Buyer Power, Upstream Bundling, and Foreclosure." Unpublished. Available at: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3511692.

- Choi, Jay Pil.** 1996. "Preemptive R&D, Rent Dissipation, and the "Leverage Theory"." *Quarterly Journal of Economics*, 111(4): 1153–1181.
- Choi, Jay Pil.** 2004. "Tying and Innovation: A Dynamic Analysis of Tying Arrangements." *Economic Journal*, 114(492): 83–101.
- Choi, Jay Pil.** 2006. *Recent Developments in Antitrust: Theory and Evidence*. Vol. 1, The MIT Press.
- Choi, Jay Pil, and Christodoulos Stefanadis.** 2001. "Tying, Investment, and the Dynamic Leverage Theory." *RAND Journal of Economics*, 32(1): 52–71.
- Choi, Jay Pil, and Doh-Shin Jeon.** 2021. "A Leverage Theory of Tying in Two-Sided Markets with Non-Negative Price Constraints." *American Economic Journal: Microeconomics*, 13(1): 283–337.
- Choné, Philippe, and Laurent Linnemer.** 2015. "Nonlinear pricing and exclusion: I. buyer opportunism." *RAND Journal of Economics*, 46(2): 217–240.
- Choné, Philippe, and Laurent Linnemer.** 2020. "Linear Demand Systems for Differentiated Goods: Overview and User's Guide." *International Journal of Industrial Organization*, 73: 102663.
- Collard-Wexler, Allan, Gautam Gowrisankaran, and Robin S. Lee.** 2019. "Nash-in-Nash" Bargaining: A Microfoundation for Applied Work." *Journal of Political Economy*, 127(1): 163–195.
- de Cornière, Alexandre, and Greg Taylor.** 2021. "Upstream Bundling and Leverage of Market Power." *Economic Journal*, 131(640): 3122–3144.
- Elberg, Andrés, and Carlos Noton.** 2021. "What Do Trade Allowances look like? Evidence from Actual Payments to a Big-Box Retailer." Unpublished. Available at: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3452974.
- Federal Trade Commission.** 2001. "Report on the Federal Trade Commission Workshop on Slotting Allowances and Other Marketing Practices in the Grocery Industry." Federal Trade Commission Report.
- Federal Trade Commission.** 2003. "Slotting Allowances in the Retail Grocery Industry: Selected Case Studies in Five Product Categories." Federal Trade Commission Report.
- Fumagalli, Chiara, and Massimo Motta.** 2006. "Exclusive Dealing and Entry, when Buyers Compete." *American Economic Review*, 96(3): 785–795.
- Fumagalli, Chiara, Massimo Motta, and Claudio Calcagno.** 2018. *Exclusionary Practices. The economics of Monopolisation and Abuse of Dominance*. Cambridge University Press.
- Ghili, Soheil.** Forthcoming. "Network Formation and Bargaining in Vertical Markets: The Case of Narrow Networks in Health Insurance." Forthcoming at *Marketing Science*.

- Greenlee, Patrick, David Reitman, and David S. Sibley.** 2008. “An antitrust analysis of bundled loyalty discounts.” *International Journal of Industrial Organization*, 26(5): 1132–1152.
- Ho, Justin, Katherine Ho, and Julie Holland Mortimer.** 2012a. “Analyzing the Welfare Impacts of Full-line Forcing Contracts.” *Journal of Industrial Economics*, 60(2): 468–498.
- Ho, Justin, Katherine Ho, and Julie Holland Mortimer.** 2012b. “The Use of Full-Line Forcing Contracts in the Video Rental Industry.” *American Economic Review*, 102(2): 686–719.
- Ho, Katherine, and Robin S. Lee.** 2019. “Equilibrium Provider Networks: Bargaining and Exclusion in Health Care Markets.” *American Economic Review*, 109(2): 473–522.
- Horn, Henrik, and Asher Wolinsky.** 1988. “Bilateral Monopolies and Incentives for Merger.” *RAND Journal of Economics*, 19(3): 408–419.
- Hristakeva, Sylvia.** 2020. “Vertical Contracts with Endogenous Product Selection: An Empirical Analysis of Vendor Allowance Contracts.” Unpublished. Available at: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3506265.
- Ide, Enrique, and Juan-Pablo Montero.** 2019. “A Theory of Must-Have.” Unpublished. Available at: <https://sites.google.com/site/jpmontero1812/research/working-papers-and-work-in-progress/Must-have.pdf?attredirects=0&d=1>.
- Ide, Enrique, Juan-Pablo Montero, and Nicolás Figueroa.** 2016. “Discounts as a Barrier to Entry.” *American Economic Review*, 106(7): 1849–1877.
- Inderst, Roman, and Greg Shaffer.** 2007. “Retail Mergers, Buyer Power and Product Variety.” *Economic Journal*, 117(516): 45–67.
- Liebman, Eli.** 2018. “Bargaining in Markets with Exclusion: An Analysis of Health Insurance Networks.” Unpublished. Available at: <https://docs.google.com/viewer?a=v&pid=sites&srcid=ZGVmYXVsdGRvbWFpbnxlbGlibGllYm1hbnoxneDoxMzd1Njg2ZWRhMwV1NzM3>.
- Manea, Mihai.** 2018. “Intermediation and Resale in Networks.” *Journal of Political Economy*, 126(3): 1250–1301.
- Martimort, David, and Salvatore Piccolo.** 2010. “The Strategic Value of Quantity Forcing Contracts.” *American Economic Journal: Microeconomics*, 2(1): 204–229.
- Marx, Leslie M., and Greg Shaffer.** 1999. “Predatory Accommodation: Below-Cost Pricing without Exclusion in Intermediate Goods Markets.” *RAND Journal of Economics*, 30(1): 22–43.

- Marx, Leslie M., and Greg Shaffer.** 2010a. "Break-up fees and bargaining power in sequential contracting." *International Journal of Industrial Organization*, 28(5): 451–463.
- Marx, Leslie M., and Greg Shaffer.** 2010b. "Slotting Allowances and Scarce Shelf Space." *Journal of Economics & Management Strategy*, 19(3): 575–603.
- Mathewson, G. Frank, and Ralph A. Winter.** 1987. "The Competitive Effects of Vertical Agreements: Comment." *American Economic Review*, 77(5): 1057–1062.
- Miklós-Thal, Jeanine, and Greg Shaffer.** 2016. "Naked Exclusion with Private Offers." *American Economic Journal: Microeconomics*, 8(4): 174–194.
- Montez, João V.** 2007. "Downstream mergers and producer's capacity choice: why bake a larger pie when getting a smaller slice?" *RAND Journal of Economics*, 38(4): 948–966.
- Nalebuff, Barry.** 2004. "Bundling as an Entry Barrier." *Quarterly Journal of Economics*, 119(1): 159–187.
- Nash, John F.** 1950. "The Bargaining Problem." *Econometrica*, 18(2): 155–162.
- Nocke, Volker, and Patrick Rey.** 2018. "Exclusive dealing and vertical integration in interlocking relationships." *Journal of Economic Theory*, 177: 183–221.
- O'Brien, Daniel P., and Greg Shaffer.** 2005. "Bargaining, Bundling, and Clout: The Portfolio Effects of Horizontal Mergers." *RAND Journal of Economics*, 36(3): 573–595.
- Osborne, Martin J., and Ariel Rubinstein.** 1990. *Bargaining and Markets*. Academic Press.
- Peitz, Martin.** 2008. "Bundling may blockade entry." *International Journal of Industrial Organization*, 16(1): 41–58.
- Posner, Richard A.** 1976. *Antitrust Law: An Economic Perspective*. University of Chicago Press.
- Rasmusen, Eric B., J. Mark Ramseyer, and John S. Jr. Wiley.** 1991. "Naked Exclusion." *American Economic Review*, 81(5): 1137–1145.
- Rey, Patrick, and Jean Tirole.** 1986. "The Logic of Vertical Restraints." *American Economic Review*, 76(5): 921–939.
- Rey, Patrick, and Joseph Stiglitz.** 1995. "The Role of Exclusive Territories in Producers' Competition." *RAND Journal of Economics*, 26(3): 431–451.
- Rey, Patrick, and Thibaud Vergé.** 2008. "Economics of Vertical Restraints." In *Handbook of Antitrust Economics*. 353–390. MIT Press.

- Rey, Patrick, and Thibaud Vergé.** 2020. "Secret contracting in multilateral relations." Unpublished. Available at: https://www.tse-fr.eu/sites/default/files/TSE/documents/doc/by/rey/744_version2020.pdf.
- Segal, Ilya R., and Michael D. Whinston.** 2000. "Naked Exclusion: Comment." *American Economic Review*, 90(1): 296–309.
- Selten, Reinhard.** 1975. "Reexamination of the Perfect Concept for Equilibrium Points in Extensive Games." *International Journal of Game Theory*, 4(1): 25–55.
- Shaked, Avner, and John Sutton.** 1984. "Involuntary Unemployment as a Perfect Equilibrium in a Bargaining Model." *Econometrica*, 52(6): 1351–1364.
- Shubik, Martin, and Richard Levitan.** 1980. *Market Structure and Behavior*. Harvard University Press.
- Simpson, John, and Abraham L. Wickelgren.** 2007. "Naked Exclusion, Efficient Breach, and Downstream Competition." *American Economic Review*, 97(4): 1305–1320.
- Spier, Kathryn E., and Michael D. Whinston.** 1995. "On the Efficiency of Privately Stipulated Damages for Breach of Contract: Entry Barriers, Reliance, and Renegotiation." *RAND Journal of Economics*, 26(2): 180–202.
- Thomas, Charles J.** 2018. "An Alternating-Offers Model of Multilateral Negotiations." *Journal of Economic Behavior & Organization*, 149: 269–293.
- Whinston, Michael D.** 1990. "Tying, Foreclosure, and Exclusion." *American Economic Review*, 80(4): 837–859.
- Whinston, Michael D.** 2001. "Exclusivity and Tying in U.S. v. Microsoft: What We Know, and Don't Know." *Journal of Economic Perspectives*, 15(2): 63–80.
- Wright, Julian.** 2009. "Exclusive Dealing and Entry, when Buyers Compete: Comment." *American Economic Review*, 99(3): 1070–1081.