New Product Introduction and Slotting Fees*

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Abstract

The availability of a new product in a store creates, through word-of-mouth advertising, an informative spillover that may go beyond the store itself. We show that, because of this spillover, each retailer is able to extract a slotting fee from the manufacturer, at product introduction. Slotting fees may discourage innovation by an incumbent or an entrant and in turn harm consumer surplus and welfare. We further show that a manufacturer is likely to pay lower slotting fees when it can heavily advertize or when it faces a larger buyer. Finally, we prove that our results hold when introducing retail competition, when firms are forward looking and when the innovator is a potential entrant rather than an incumbent.

KeyWords: Buyer Power, Innovation, Slotting Fees, Informative Advertising.

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1 Introduction

Slotting fees are upfront payments from the manufacturer to the retailer, paid to secure a slot for a new product in retailers' shelves.[1] Their amount and frequency have rapidly grown since the mid-1980s. Outside of case studies conducted by the FTC[2], there is practically no data available on slotting fees.[3] The FTC interviewed seven retailers, six manufacturers and two food brokers on five categories of products.[4] According to the surveyed suppliers 80% to 90% of their new product introductions in the relevant categories triggered the payment of such fees in 2000. In their opinion, 50% to 90% of all new grocery products would trigger the payment of slotting allowances. The FTC further mentions that: "[...] slotting allowances for introducing a new product nationwide could range from a little under [$]1 million to over 2 million, depending on the product category."

Following this thorough investigation, the FTC still refrains from issuing slotting allowance guidelines. In contrast, several paragraphs of the European Guidelines on vertical restraints in 2010 are devoted to upfront access payments which comprise slotting allowances, and recommend a case by case analysis if the retailer or the manufacturer concerned has a market share larger than 30%.[5] The attitude of competition authorities reflects the conflicting views on the effect of slotting fees expressed by both the economic literature and practitioneers.

Manufacturers often see slotting allowances as rent paid to increasingly powerful retailers that may foreclose efficient innovation. However, buyer power in itself is not enough to explain why

[1]As in the Federal Trade Commission (2001), we make a clear distinction between slotting fees (for new products) and pay-to-stay fees (for continuing products) as well as advertising and promotional allowances, or introductory allowances and other per unit discounts.

[2]See Federal Trade Commission (2003)

[3]A recent paper by Hristakeva (2018) attempts to assess the amount of slotting allowances in the US. However, the definition of slotting allowances in this paper is broader than the FTC's definition, as it comprises all lump-sum transfers to retailers.

[4]These categories were fresh bread, hot-dogs, ice-cream and frozen novelties, pasta, and salad dressing.

[5]See the European Commission's "Guidelines on Vertical Restraints" (2010), p.59, paragraphs 203-208.

retailers would be able to capture an extra rent for new product introduction as compared to other products. Moreover, the European Commission (2010) has expressed concerns that “upfront access payments may soften competition and facilitate collusion between distributors.” On the bright side, retailers often justify slotting allowances as a risk-sharing mechanism and a means to screen the most profitable innovations. They also argue that slotting allowances are a natural way to compensate the higher retailing costs that result from new product introduction.

Our paper provides a new rationale for the use of slotting fees. Our starting point is that the demand for a new product depends first and foremost on consumers' knowledge of its existence. Among other sources of information about the new product, consumers are informed through word-of-mouth communication with consumers who already bought the new product. Several studies ackowledge the importance of word-of-mouth communication in the purchase of a new product.[6] Therefore, the presence of a new product in a given store creates a form of informative spillover that may go beyond the store itself and reach consumers who visit stores in other markets. In other words, by making available the new product in a given market, a retailer offers, as a by-product, an informative advertising service to the manufacturer. This paper shows that the retailer is able to extract a slotting fee from the manufacturer for this service. Although this slotting fee is only paid once, at introduction, it may deter the manufacturer's incentive to launch a new product.

We analyze the relationship between an upstream monopolist and multiple retailers each active on a separate market. The manufacturer can always sell a well-known good to all retailers. It may also offer a new good of better quality provided it pays a fixed cost of innovation. We adopt a

[6] According to a worldwide study by Nielsen (2013) the two main channels that push a consumer to purchase a new product are friends and family (77%) and seeing it in the store (72%). The same study highlights that 59% of consumers like to tell others about new products. According to McKinsey (2010), “word-of-mouth is the primary factor behind 20 to 50 % of all purchasing decisions. Its influence is greatest when consumers are buying a product for the first time". According to Jack Morton (2012), 49% of U.S. consumers say friends and family are their top sources of brand awareness .

two-period game. In the first period, the manufacturer chooses to innovate or not and then bargains with each retailer to sell its product. In the second period, the manufacturer bargains with each retailer to sell the well-known good – absent innovation – or the new good – in case of innovation. In each period, we consider a sequential bargaining among each pair following the specification of Stole and Zwiebel (1996). On the demand side, we introduce an "informative spillover": when the manufacturer launches a new product, selling through one outlet increases demand in all other outlets in which the product is sold in the first period. If the new product was launched in the first period in all markets, then in the second period, the product is mature and the informative spillover no longer plays a role. This informative spillover builds on the literature on informative advertising following the seminal paper by Grossman and Shapiro (1984) as only consumers informed about the new product existence may have a positive demand for the good. [7]

We show that when the manufacturer launches a new product, it successfully bargains with all retailers in both periods. Moreover, the retailer is able to extract a slotting fee from the manufacturer in the introduction period. Indeed, when bargaining over a new product, the manufacturer must compensate each retailer for the positive informative spillover it generates on all other markets. The presence of a spillover in the first period is thus a new source of buyer power; in the second period, as the new product is mature, retailers no longer benefit from the informative spillover. As a result, informative spillover may deter innovation as it decreases the manufacturer's profit when launching a new product. We show that innovation deterrence is harmful for both consumer surplus and welfare. We then highlight that an informative advertising campaign at introduction is likely to lower the amount of slotting fees paid to retailers. Therefore, slotting fees are less likely

[7]Moreover, it also directly relates to a large literature which, following Telser (1960), hinges on the public good nature of retail services. See Motta (2004) for a survey of this literature. In contrast with this literature, in our paper, the informative spillover is not strategic; it is costless and only a by-product of the decision to sell the good.

to deter innovation when the manufacturer is able to heavily advertise its new product at low cost.

Further, we show that, surprisingly, the presence of a large buyer may reduce the magnitude of slotting fees paid by the manufacturer and reinforce the manufacturer's innovation incentives. This result contrasts with the standard result that buyer power comes from buyer size.

We then develop a variant of our base model in which slotting fees are explicit, i.e. negative upfront fees, which enables us to derive some implications of our results in terms of competition policy. Our results call for a ban on slotting fees to limit innovation deterrence.

Finally, we show that our main results hold when introducing retail competition and when the new product is introduced by a potential entrant rather than an incumbent. In addition, although in our main model, firms are myopic with respect to their decision to innovate and in the bargaining process, we explore the more complex case in which firms are forward-looking. We highlight that the amount of slotting fees is likely to be larger in that context.

Our work is first related to the industrial organization and marketing literature on slotting fees. A first strand of literature relates the existence of slotting fees to buyer power and highlights diverse potential anticompetitive effects. Shaffer (1991) shows that when differentiated retailers buy from perfectly competitive manufacturers, they obtain a contract with slotting fees (*i.e.* negative franchise fees) in exchange for high wholesale prices that enable to relax retail competition.[8] In a slightly different framework in which a dominant firm and a competitive fringe coexist at the upstream level, Shaffer (2005) shows that because of slotting fees, the dominant firm may obtain scarce shelf space and foreclose more efficient rivals.

These articles, however, do not take into account the peculiarities of new products in their analysis. Recent papers have taken into account one of these peculiarities by enriching the usual

[8]See also Foros and Kind (2008) for an extension of Shaffer (1991) taking into account procurement alliances.

two-part tariff contracts. Marx and Shaffer (2007) explicitely differentiate slotting fees, defined as lump-sum payments not conditioned by an effective sale, from franchise fees, paid only if the product is effectively sold. By allowing for such three-part tariffs, they explicitly take into account shelf access fees, which are a common feature of all first listings of products at a retailer. Marx and Shaffer (2007) highlight that slotting fees may facilitate retail foreclosure: a powerful retailer can use slotting fees to exclude its weaker rival. [9] Marx and Shaffer (2010) highlight that capturing the rent of manufacturers through slotting fees may also push retailers to restrict their shelf space. Slotting fees then reduce the variety of products offered to consumers.

A second strand of literature, which rather emphasizes efficiency effects of slotting fees, more explicitely relates slotting fees to the additional costs associated to new product introduction. As shown by Chu (1992) or Lariviere and Padmanabhan (1997), slotting fees can be an efficient way for privately informed manufacturers to convey information about the likelihood of success of their new product. The retailer simply uses slotting fees as a screening device. Kelly (1991) argues that slotting fees may be used to share the risk of launching a new product between manufacturer and retailer. Sullivan (1997) and Lariviere and Padmanabhan (1997) show that slotting fees may be used to compensate the retailer for extra retail costs inherent to the launching of a new product. Foros, Kind and Sand (2009) show that, when the retailer is powerful, slotting fees make up for a high wholesale price that raises incentives for the manufacturer to promote its new product through demand-enhancing investments. Slotting fees therefore enable a better coordination of investment decision within the vertical chain. To the exception of Desai (2000) who extends the idea of using slotting fees as a screening device to a framework with retail competition, this literature generally

[9] Note that Miklós-Thal, Rey and Vergé (2011) and Rey and Whinston (2013) show that this result may be reversed allowing for contracts that are contingent on the relationship being exclusive or not, or with a menu of tariffs.

considers a one-to-one relationship.

We first depart from this literature who mainly consider a one-to-one relationship because the presence of multiple retailers is key in our setting to explain the role of informative spillovers and slotting fees. Moreover, our results are opposed to that literature because when the information spillover among retailers generates slotting fees they are a source of inefficiency. In that sense our paper is complementary to this strand of literature.

To the best of our knowledge, Yehezkel (2014) is the only article that both takes into account informative peculiarities of new products and exhibits a harmful welfare effect of slotting fees. Again our paper departs from Yehezkel (2014) who considers a one-to-one relationship between a buyer and a seller and consumers imperfectly informed about the quality of the new product.

Finally, previous work in the industrial organization literature has studied the positive impact of buyer size on buyer power on the one hand (see *e.g.* Chipty and Snyder (1999); Inderst and Wey (2003) and Inderst and Shaffer (2007); Montez (2007); Smith and Thanassoulis (2012)), and the negative impact of buyer power on upstream innovation incentives on the other hand (see *e.g.* Battigalli, Fumagalli and Polo (2007); Chen (2014); Chambolle and Villas-Boas (2015)). In contrast, in our framework, we show that buyer size may lower the magnitude of slotting fees paid at new product introduction and thus facilitate upstream innovation.

The paper is organized as follows. Section 2 derives the model. Section 3 shows that, due to the informative spillover, slotting allowances are paid for a new product, at introduction, and highlights their consequences on innovation, consumer surplus and welfare. We then explore the effect of the presence of a large buyer on slotting fees in Section 4. Section 5 discusses some implications for competition policy. Section 6 shows that our main results are robust when considering retail competition, forward looking firms and potential entry by an innovator. Section 7 concludes.

2 The Model

An upstream firm U may offer a good to final consumers through $i \in \{1, \cdots, N\}$ symmetric retailers located on N independent markets. U can always offer a well-known good of quality q^- to all retailers. It may also offer a new (unknown) good of better quality $q^+ > q^-$. Due to a capacity constraint on its shelf space, a retailer can only sell one of these two goods. Production and retailing costs are normalized to 0.

First in subsection 2.1, we present a reduced form model by giving our assumptions on the market revenues for a well-known as well as a new good. Then, in subsection 2.2 we wholly describe the microfoundations of these market revenues. This second part requires the introduction of numerous notations that will not be used again and can therefore be read separately from the rest of the paper. Subsection 2.3, we describe our game and the bargaining setting and extensively discuss our bargaining procedure in 2.4.

2.1 Reduced-form model

The presence of an informative spillover results in a difference in the revenue generated in a given market through the sale of a new and a well-known good. We consider a two-period game in which periods are indexed by $t \in \{1, 2\}$. We describe these market revenues[10] in turn for each period.

Revenue in $t = 1$. We denote by υ^n the revenue earned in each outlet $i \in \{1, ..., n\}$ when U sells a new product of quality q^+ through n markets in $t = 1$. The revenue υ^n is naturally increasing with respect to q^+. We make the following assumption:

[10]A market revenue is here equivalent to a market profit as all production and retailing costs are normalized to 0.

Assumption 1. *If U sells a new good through $n \in \{1,...,N\}$ outlets in $t = 1$, the revenue earned in each outlet is υ^n. For all $n \in \{1,...,N\}$, $\upsilon^n \geq \upsilon^{n-1}$, and $\upsilon^0 = 0$.*

The assumption $\upsilon^0 = 0$ means that the product generates no revenue when it is not sold. Assumption 1 reflects the presence of an informative spillover: an increase in the number of outlets n that actually sell the new good in $t = 1$ (introduction) increases the revenue that the new good is able to generate on each active market. Indeed, as more markets sell the new good, there are more informative channels for a given consumer to discover its existence and, although markets are independent, information can circulate from one market to the other thereby increasing demand on all markets.[11]

The total industry revenue for a new product sold in n outlets at introduction is as follows:

$$R^n \equiv n\upsilon^n. \tag{1}$$

Note that υ^N (resp. R^N), that is the revenue when all consumers are informed of the existence of the good, is the largest revenue that can be generated in a given market (resp. on N markets).

If a well-known good of quality q^- is sold on a given market $i \in \{1,...,n\}$ in $t = 1$, consumers on all N markets are already aware of its existence: the informative spillover has no role to play. We thus make the following assumption:

Assumption 2. *The revenue earned in outlet $i \in \{1,\cdots,n\}$ when U sells a well-known good through any number $n \in \{1,...,N\}$ of markets is $\upsilon^- < \upsilon^N$.*

The total industry revenue for a well-known good sold in n outlets is thus $n\upsilon^-$.

[11] Friends and family do not need to visit the same store to talk with each other about a new product.

Revenue in $t = 2$ If the new product was not launched in $t = 1$, then in $t = 2$ the old product is sold, and the revenue generated by the old product is as defined in Assumption 2. If the new product was launched in $t = 1$, then we make the following assumption:

Assumption 3. *If U launched a new good in $t = 1$ on n markets, the revenue earned in each outlet when U sells the new good through any number $n' \in \{1,...,N\}$ of markets in $t = 2$ is* $\max\{\upsilon^n, \upsilon^{n'}\}$.

If the new good was sold only on $n < N$ markets in $t = 1$, then information is capitalized but the informative spillover can still increase the revenue whenever $n' > n$. If U has launched the new product on all N markets in $t = 1$, then the new good becomes mature and the revenue generated on each market is υ^N for any $n' \in \{1,...,N\}$ markets. As we show below, if a new good is launched in equilibrium, it is always sold on N retail markets in $t = 1$, which clearly differentiates $t = 1$ as the introduction period from $t = 2$ the maturity period.

2.2 Microfoundations

We now describe how Assumptions 1, 2 and 3 can naturally derive from reasonable assumptions on utility and information of consumers regarding the existence of the new product.

Assume that on each market i, there is a mass of potential consumers, which we normalize to 1. A representative consumer earns utility $u(q,x)$ from consuming a quantity x of a good of quality q. We make standard assumptions on $u(q,x)$, that is $u(q,x) \geq 0$, $\frac{\partial u}{\partial x} > 0$, $\frac{\partial^2 u}{\partial x^2} < 0$ and $\frac{\partial u}{\partial q} > 0$.

All consumers are aware of the existence of the well-known good, while some consumers may be uninformed about the new product's existence. A consumer aware of the existence of a product maximizes $u(q,x_i) - p_i x_i$, which generates an individual demand $x_i(q,p_i)$, with p_i the price of the good on market i. A consumer unaware of the new good existence has no demand for it.

Demand in $t = 1$. If the new good is launched in $t = 1$, a consumer has a probability $\xi(n)$ of being aware of its existence on each $i \in \{1,...n\}$ markets, with $n \in \{1,...,N\}$ the number of markets in which the good is actually sold.[12] This model is in the spirit of Grossman and Shapiro (1984)'s seminal paper on informative advertising. In their paper the probability ξ is controlled by the manufacturer through advertising investments. In contrast, in our model, this probability is only a function of the number of open markets on which the new product is sold, n. This reflects the word-of-mouth communication process. It also reflects the impossibility for a retailer to appropriate the informative retail service it provides to consumers. We make two key assumptions on $\xi(n)$.

Assumption 1'. *The probability that a consumer is aware of the existence of the new good when n retailers sell it, $\xi(n)$, is non-decreasing with respect to n, with $\xi(0) \in [0,1)$ and $\xi(N) = 1$.*

When the new good is sold by n retailers, the demand on market i is $X_i(q^+, n, p_i) = \xi(n)x_i(q^+, p_i)$. Assumption 1' induces that $X_i(q^+, n, p_i)$ is non-decreasing with respect to n.

Remark 1. *$\xi(n)$ is not affected by the quantity of the new good sold on the n open markets.*

Although a correlation between the quantity sold and the strength of the informative spillover would make sense, it creates additional interactions between markets which we want to rule out in our analysis.[13] Remark 1 induces that $X_i(q^+, n, p_i)$ is independent of prices on other markets.

Assuming that the revenue on a given market i has a unique maximum, we have:

$$\upsilon^n \equiv \max_{p_i} X_i(q^+, n, p_i)p_i. \tag{2}$$

[12] This is one among several possible micro-foundations for our demand function. Alternatively $\xi(n)$ could represent a level of trust of consumers regarding the quality of the new product. As more retailers offer the product, consumers are more inclined to purchase it. In this case, the utility function could instead be written in the following way: $u(\xi(n)q, x_i) - p_i x_i$.

[13] Note also that it would only be relevant to take into account such a correlation if the retailers sold different quantities. In our framework, as the same quantity is sold *ex post* on all markets, the effect of quantity (if it exists) is entirely captured through the number of retailers.

Appendix A shows that Assumption 1' then implies Assumption 1.

Similarly, Assumption 2 derives from the following assumption:

Assumption 2'. *Regardless of the number of open markets, all consumers are aware of the existence of a well-known good.*

The demand for a well-known good on market i is thus $X_i(q^-, N, p_i) = x_i(q^-, p_i)$ even if the good is not sold on all markets. Therefore, we have:

$$\upsilon^- \equiv \max_{p_i} x_i(q^-, p_i) p_i. \tag{3}$$

Demand in $t = 2$. Finally, Assumption 3 derives from the following assumption:

Assumption 3'. *If U sells the new good on n markets in $t = 1$ and on n' markets in $t = 2$, the probability for a consumer to be aware of the existence of the new good in $t = 2$ is* $\max(\xi(n), \xi(n'))$.

If a new good was sold only on n markets in $t = 1$, then the spillover is capitalized and the demand cannot be lower than $X_i(q^+, n, p_i)$. However, the spillover can still increase the demand in $t = 2$ when U sells the new good on $n' > n$ markets. The demand becomes $X_i(q, n', p_i)$ in $t = 2$. The optimal revenue earned in outlet $i \in \{1, \cdots, n'\}$ in that case is $\max\{\upsilon^n, \upsilon^{n'}\}$.

2.3 Timing of the game and bargaining framework

In $t = 1$, we consider the following two-stage game:

- Stage 1: the manufacturer chooses whether or not to innovate. If it innovates it pays K once and for all, and can then produce the well-known good of quality q^- and the new good of quality $q^+ > q^-$, with no additional cost. If it does not innovate, it can only produce the well-known good of quality q^-.

- Stage 2: the manufacturer bargains sequentially with each retailer i over a fixed fee T_{it} to share the market revenue from the selling of the new (in case of innovation) or the well-known good (otherwise).[14]

Both qualities q^- and q^+ are common knowledge. In $t = 2$, we merely repeat Stage 2.[15]

In Stage 2, we consider a sequential bargaining protocol *à la* Stole and Zwiebel (1996). This equilibrium concept is known to be independent of the order of negotiations. In the sequence of negotiations, the success or failure of any negotiation is common knowledge. Therefore, each retailer knows how many negotiations have succeeded when bargaining with the manufacturer U. Besides, in case of failure of the negotiation between one retailer and U, the failing pair can never negotiate again, and all other pairs renegotiate their contracts from scratch. In our model an increase in the number of retailers agreeing to launch the new product mechanically raises the value generated by the new product. Our bargaining protocol thus reflects that each retailer takes into account this key element (i.e. the number of other retailers who agreed) in its own bargaining.

Each negotiation depends on the firms' respective bargaining weights and outside options. Without loss of generality we set the bargaining weights to $(\frac{1}{2}, \frac{1}{2})$ and in that case Stole and Zwiebel (1996) have shown that their non cooperative bargaining game coincides with the Shapley value of a cooperative game. We will further use directly the Shapley value when needed. If the revenue to share on market i is υ^n, and the disagreement payoff of i (resp. U) is d_i (resp. d_U), when U

[14]To reflect actual practices, we assume that long term negotiations over the two periods are not feasible.

[15]Note that this is not a restriction. We could have alternatively repeated the same two-stage game in the two periods. However, because only one innovation can take place, if profitable, innovation always occurs in $t = 1$.

bargains with i among n, the optimal fixed fee, T_{it} is given by:[16]

$$\upsilon^n - T_{it} - d_i = T_{it} + \sum_{j=1, j\neq i}^{n} T_{jt} - d_U. \tag{4}$$

The above negotiation succeeds if $\upsilon^n > d_i + d_U - \sum_{j=1,j\neq i}^{n} T_{jt}$, i.e. if the bilateral profit expected from an agreement exceeds the sum of status-quo profits. When U bargains with n retailers, each retailer is symmetric in the bargaining and behaves as the marginal retailer in its negotiation with U. Therefore, the equilibrium tariff, denoted T_t^n, is such that the following equality holds:

$$\upsilon^n - T_t^n - d_i = nT_t^n - d_U. \tag{5}$$

In what follows, we directly refer to the bargaining equation (5) to simplify notations.

There is a discount factor of δ between the two periods. To simplify our analysis, we first assume that firms are myopic, namely $\delta = 0$. This assumption reflects the difficulties of firms to accurately anticipate the shelf-life of a new product. Indeed, it is always possible that a more attractive product is introduced in a future period, thus annihilating the benefits of the former innovation. In contrast, the new product may yield additional profits for several periods in a row. In section 6.2 we analyze the complex case in which firms are perfectly forward looking, namely $\delta = 1$, and provide solid insights that our results would then be reinforced.

[16] Negotiating over a fixed tariff is here equivalent to negotiating over a standard two-part tariff. Indeed, assume that firms bargain over a contract (w_{it}, T_{it}), with w_{it} the unit wholesale price. In each period, each pair $U - i$ uses w_{it} to maximize their joint profit and T_{it} to share it. The optimal wholesale price for each pair is set to the marginal cost, that is, $w_{it} = 0$. Indeed, in Subsection 2.2, we make the simplifying assumption that the informative spillover only depends on the number of open markets n and not on the quantities sold on these markets. As a consequence there are no externalities through quantities among markets, which ensures that $w_{it} = 0$.

2.4 Discussion on the bargaining procedure

Stole and Zwiebel (1996) first developed a wage bargaining setting between a firm and a pool of n employees. The firm sets an order of negotiations with the n employees and then bargains bilaterally and sequentially over non binding contracts following this sequence. In case of a breakdown, the firm restarts all negotiations following the same order and without the failing employee. They show that the unique equilibrium of this non cooperative bargaining game is independent of the chosen order of negotiations and coincides with the Shapley value of a cooperative game among the firm and the n employees.[17] In our model we have chosen to follow this Stole and Zwiebel (1996) bargaining procedure with sequential bilateral Nash bargaining over non-binding contracts and equal bargaining weights. We are also close in spirit to Montez (2007) who directly uses the Shapley value to determine the profit sharing among firms in a vertical chain with an upstream monopolist supplying n downstream firms each active on separate markets.

Inderst and Wey (2003) have developed an alternative bargaining procedure among vertically related firms in which each producer-retailer pair simultaneously bargains over a binding contract which is contingent on the network structure. They show that their equilibrium coincides with the Shapley value. Therefore, we could alternatively consider that each manufacturer-retailer pair simultaneously bargains over contingent and binding contracts and obtain the same equilibrium.

In contrast, adopting instead a Nash-in-Nash bargaining setting *à la* Horn and Wolinsky (1988) or Chipty and Snyder (1999), i.e. simultaneous bargaining by pair on non-contingent binding contracts would dramatically affect our results. Indeed, when contracts are non-contingent and binding, each retailer fails to make its own agreement conditional on the success or failure of the

[17] Bedre-Defolie (2012) and Chambolle and Villas-Boas (2015) have later used this sequential bargaining framework in a vertical chain with competition at the downstream level. de Fontenay and Gans (2014) have used this bargaining procedure in a vertical chain with imperfect competition at both levels.

other retailers. Overall, our results hold either if contracts are non-contingent but non-binding (sequential negotiation *à la* Stole and Zwiebel (1996)) or if contracts are contingent and binding following the approach of Inderst and Wey (2003).

3 Slotting fees for a new product

In section 3.1 we determine the equilibrium of the bargaining subgames depending on whether the manufacturer has chosen to innovate or not in $t = 1$. We then solve our first stage game in section 3.2 and derive comparative statics in section 3.3.

3.1 Bargaining stage

The manufacturer does not innovate When the manufacturer does not innovate, the two periods are identical. For $t \in \{1,2\}$, the manufacturer bargains with N retailers to sell the well-known product of quality q^-. In this case, the revenue in each outlet is υ^-. All negotiations are thus independent of one another, which implies that the tariff is the same regardless of the number of open markets n. As the manufacturer's profit strictly increases with n, U bargains in equilibrium with N retailers. In the negotiation between U and each retailer, outside options are $d_i = 0$ and $d_U = (N-1)\frac{\upsilon^-}{2}$. Therefore, in equilibrium U obtains a profit $N\upsilon^-/2$ and the profit of each retailer $i \in \{1,...,N\}$ is $\upsilon^-/2$.

We denote $\underline{\Pi}$ the equilibrium profit of the manufacturer in any period $t \in \{1,2\}$ when selling the well-known product of quality q^-. We obtain the following lemma:

Lemma 1. *When the manufacturer offers a well-known product over the two periods, its per-period equilibrium profit is* $\underline{\Pi} = \frac{N\upsilon^-}{2}$ *for any* $t \in \{1,2\}$.

Proof. Straightforward. □

The manufacturer innovates If the manufacturer has innovated at cost K in $t = 1$, due to the spillover, the two periods now differ and we thus solve the game backward. We denote the tariffs and profits respectively by T_t^n and Π_t^n when $n \in \{1,...,N\}$ markets are open in period t.

Assume that the new product was effectively sold in N markets in $t = 1$[18], then, in $t = 2$, regardless of n, the new product generates a revenue υ^N on each market $i \in \{1,...,n\}$ since the informative spillover has already played its role in $t = 1$. Again all negotiations are independent of one another which implies that T_2^n is the same for all $n \in \{1,...N\}$. Still, an important difference remains compared to the case of a well-known product. In case of a breakdown in one pair's negotiation, the manufacturer is still able to bargain over the well-known product with the retailer and therefore i and U respectively obtain a disagreement payoff $d_i = \frac{\upsilon^-}{2}$ and $d_U = \frac{\upsilon^-}{2} + (N-1)T_2^N$. As by assumption $q^+ > q^-$, we have $R^N > N\upsilon^-$. Therefore, because there is extra surplus to share, any negotiation between U and $i \in \{1,....,N\}$ over the new product succeeds, and $\upsilon^N = \frac{R^N}{N}$ is shared according to equation (5). The equality $\frac{R^N}{N} - T_2^N - \frac{\upsilon^-}{2} = T_2^N - \frac{\upsilon^-}{2}$ gives the optimal fixed fee. As the term $\frac{\upsilon^-}{2}$ cancels out, the equilibrium in $t = 2$ is such that N retailers sell the new product and pay the same tariff $T_2^N = \frac{R^N}{2N}$. The manufacturer thus earns a profit $\Pi_2^N = R^N/2$, the profit earned when selling a mature product of quality q^+ through N outlets.

We now solve the negotiation in $t = 1$. Due to the informative spillover, negotiations are no longer independent of one another. In this case, the outside option of U with retailer i amounts to the profit it would earn in negotiating with all $n-1$ retailers except i over the new product, plus the profit obtained from bargaining over the well-known product on market i. The same reasoning

[18] We prove further that if innovation takes place, in $t = 1$ the new good is sold by all N retailers in equilibrium.

applies when U bargains with $n-1$ retailers, etc. Let us thus first consider the case in which U bargains with only one retailer ($n=1$). In this case, both disagreement payoffs are $d_i = d_U = \frac{\upsilon^-}{2}$: U can still bargain with the retailer to sell the well-known product. Equation (5) can be rewritten as follows:

$$R^1 - T_1^1 - \frac{\upsilon^-}{2} = T_1^1 - \frac{\upsilon^-}{2} \tag{6}$$

It is immediate that this negotiation fails when $R^1 \leq \upsilon^-$, and succeeds otherwise. We generalize the breakdown condition in the following lemma:

Lemma 2. *There always exists a cut-off number of retailers $\hat{n} \in \{1, \cdots, N\}$, such that negotiations succeed if and only if the manufacturer bargains with at least $\hat{n}$ retailers. The cut-off level $\hat{n}$ satisfies the following condition:*

$$\upsilon^{\hat{n}-1} \leq \upsilon^- < \upsilon^{\hat{n}} \tag{7}$$

Proof. Straightforward from Assumption 1 since $\upsilon^0 = 0$ and $R^N > N\upsilon^-$. □

Solving the negotiations for all $n \geq \hat{n}$, we determine by recurrence the equilibrium profit depending on $\hat{n}$. The corresponding profit is given by $\Pi_1^n \equiv nT_1^n$. We summarize the equilibrium profit of the manufacturer on the two-period subgame in the following lemma:

Lemma 3. *In case of innovation in $t=1$, the manufacturer bargains with all N retailers in each period $t \in \{1,2\}$, and its profit is $\Pi_1^N = \frac{1}{N+1}\sum_{i=\hat{n}}^{N} R^i + \frac{\hat{n}(\hat{n}-1)}{N+1}\frac{\upsilon^-}{2}$ in $t=1$ where $\hat{n} \in \{1, \cdots, N\}$ is defined by (7) and $\Pi_2^N = \frac{R^N}{2}$ in $t=2$.*

Proof. See Appendix B.1. □

Slotting fees at introduction Because of the spillover which plays a role only in $t=1$, the profit obtained by the manufacturer who sells the new good is different in the two periods.

Proposition 1. *When launching a new product, the manufacturer obtains a smaller profit in $t=1$ than in $t=2$ $\left(\Pi_2^N - \Pi_1^N > 0\right)$ because each retailer is able to extract a slotting fee for the informative spillover it creates on all other markets at the introduction period.*

Proof. Assumption 1 implies that $\frac{R^i}{i} < \frac{R^N}{N}$, $\forall i$. Therefore:

$$\sum_{i=\hat{n}}^{N} R^i < \frac{R^N}{N} \sum_{i=\hat{n}}^{N} i = \frac{(N(N+1) - \hat{n}(\hat{n}-1))R^N}{2N}$$

Besides, we know that $N\upsilon^- < R^N$, and therefore we obtain:

$$\Pi_1^N = \frac{1}{N+1} \sum_{i=\hat{n}}^{N} R^i + \frac{\hat{n}(\hat{n}-1)}{N+1} \frac{\upsilon^-}{2} < \frac{(N(N+1) - \hat{n}(\hat{n}-1))R^N}{2N(N+1)} + \frac{\hat{n}(\hat{n}-1)}{N+1} \frac{R^N}{2N} = \frac{R^N}{2} = \Pi_2^N.$$

□

In order to explain how the retailer is able to capture a rent at the expense of the manufacturer who launches the new product, note first that, since in equilibrium N retailers sell the new product in $t=1$, the joint industry profit is the same in both periods, and equal to R^N. The sharing of this profit, however, is affected in $t=1$ by the informative spillover.

In $t=1$, for any number of open markets n, negotiations are symmetric as each retailer considers itself marginal in its negotiation with the manufacturer. For all $n \geq 2$, in case of a breakdown in the negotiation with one retailer, the profit realized on each remaining market is strictly lower than in case of success, as there is less spillover, i.e. the demand is lower when $n-1$ outlets sell the new product than when n do (from Assumption 1). Because of our renegotiation setting, this is common knowledge to all players, therefore each retailer is able to extract some rent from its marginal extra-contribution (the spillover) to total industry profit.

As a consequence of the spillover and renegotiation effects, the manufacturer has to pay slotting fees to each retailer to introduce a new product.

Note here that, in contrast to Shaffer (1991), Marx and Shaffer (2007) and Miklós-Thal, Rey and Vergé (2011), slotting fees do not materialize through negative fixed fees in equilibrium, and we do not distinguish formally the franchise fee from a slotting fee in a three-part tariff. In our approach, slotting fees are lump-sum rebates on standard franchise fees that result in lower total payment from the retailer to the manufacturer in the introduction period. We believe that given the lack of information on the contracts signed between manufacturers and retailers it may be difficult in practice to distentangle slotting fees from others franchise fees.[19] In Section 5, we also develop an alternative game in which slotting fees are negative fixed fees which arise explicitly in an upfront bargaining stage as a result of the informative spillover. Making slotting fees explicit then enables us to dicuss some implications of our results for competition policy.

Interestingly, Proposition 1 can be well illustrated through a geometrical analysis. This representation will also be particularly insightful when considering advertising issues in Section 3.3. We draw the total industry revenue as a function of the number of open markets n (in abscissa), that is respectively R^n in $t=1$ and $\frac{nR^N}{N}$ in $t=2$ for two different cut-off values, $\hat{n}=1$ and $\hat{n}=5$. For simplicity, we will henceforth refer to the graphical representation of the industry revenue function as the "revenue curve", even if the revenue function is discrete.[20] Then, since Assumption 1 implies that $R^i < \frac{i}{N}R^N$, the revenue curve in the presence of a spillover (in $t=1$) is below the revenue curve without spillover (in $t=2$).

[19]The FTC (2003) mentions that "most retailers maintain databases containing information on all promotional payments made to the retailer for a particular supplier or a supplier's products [...]. For this reason, it is very difficult to determine how much of the promotional payments made to a retailer are for slotting fees, or to which specific products the payments correspond." (p.64)

[20]Note that representing the revenue function as a weakly convex function is a symplifying assumption. We show in section 4 that the shape of the revenue function matters when analysing retail concentration.

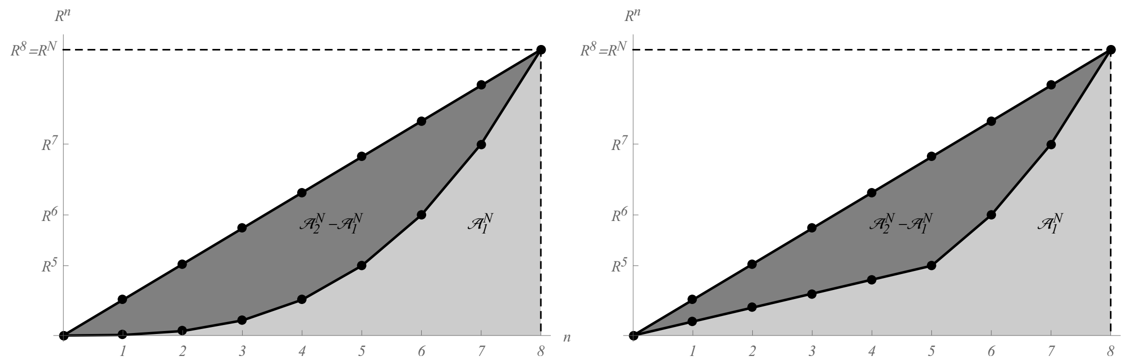

Figure 1: Graphic representation of the revenue curve with or without spillover for $N = 8$. Left: $\hat{n} = 1$; Right: $\hat{n} = 5$.

Graphically, when $\hat{n} = 1$ (the graph on the left in Figure 1) the area below the revenue curves in $t = 1$ is denoted $\mathscr{A}_1^N$. Analytically, $\mathscr{A}_1^N = \sum_{i=1}^N R^i - \frac{R^N}{2} = (N+1)\Pi_1^N - \frac{R^N}{2}$. The area below the revenue curve in $t = 2$ is denoted $\mathscr{A}_2^N = \frac{NR^N}{2} = (N+1)\Pi_2^N - \frac{R^N}{2}$. We obtain:

$$\mathscr{A}_2^N - \mathscr{A}_1^N \equiv \sum_{i=1}^{N} \left[\frac{iR^N}{N} - R^i \right] = \frac{R^N}{N} \sum_{i=1}^{N} i - \sum_{i=1}^{N} R^i > 0. \tag{8}$$

Therefore, modulo the multiplication factor $(N+1)$, the difference between the two areas exactly represents the difference between the second- and first-period profits of the manufacturer that is the amount of slotting fees. It is immediate that $\mathscr{A}_2^N - \mathscr{A}_1^N > 0$. The graphical demonstration also extends to any $\hat{n} > 1$ (for instance, on the graph on the right in Figure 1, $\hat{n} = 5$).

Let us now partly relax Assumption 1 by assuming that a new product only needs to be present in a large enough share (lower than 100%) of the market to reach all its potential consumers. For instance assume that the informative spillover entirely disappears once the manufacturer has reached $N-1$ markets in $t = 1$, i.e. $\upsilon^{N-1} = \upsilon^N$. Though there is no extra-contribution of the marginal retailer when bargaining for a new product (as the spillover effect disappears), retailers still obtain slotting fees from the manufacturer. Indeed, because of the cumulative effect of the spillover, the status-quo profit of the manufacturer that results from negotiations with $N-1$ retailers is still lower in $t=1$ than in $t=2$. Therefore in equilibrium, the manufacturer still obtains a profit lower than $\frac{R^N}{2}$.[21] Our result is thus robust to such a variation in the spillover effect (the same reasoning applies whenever the spillover stops after $n \geq 2$ successful negotiations).

3.2 Slotting fees and innovation deterrence

Consider now the decision of the manufacturer to innovate in $t=1$. Note first that an innovation is profitable for the (wholly integrated) industry for any $K < R^N - N\upsilon^-$. Moreover, whenever the innovation is profitable for the industry, it also increases consumer surplus and total welfare.[22]

Given that $\delta = 0$, the manufacturer innovates if the net benefit it yields in $t=1$, as compared to selling a well-known good, exceeds the cost of innovation, that is if $\Pi_1^N - \underline{\Pi} \geq K$.

We thus obtain the following proposition:

Proposition 2. *In equilibrium, due to slotting fees, efficient innovations are deterred for any fixed cost of innovation K such that:*

$$K \in \left[\Pi_1^N - \underline{\Pi}, \frac{R^N}{2} - \underline{\Pi}\right].$$

Innovation deterrence always damages consumer surplus and welfare.

Proof. The lower bound is obtained by comparing the manufacturers' profit, with innovation, $\Pi_1^N - K$, and without, $\underline{\Pi}$. The upper bound derives from the comparison of the profit the manufacturer would obtain by selling a new product, with innovation but absent the spillover effect,

[21] From eq (5), in $t=1$, given symmetry among retailers and since $d_i = \frac{\upsilon^-}{2}$ and $d_U = \frac{\upsilon^-}{2} + \Pi_1^{N-1}$, we have $(N+1)T_1^N = \frac{R^N}{N} + \Pi_1^{N-1}$. As long as $\Pi_1^{N-1} < \frac{R^{N-1}}{2}$, that is as long as some spillover exists, the profit of the manufacturer is $NT_1^N < \frac{R^N}{2}$.

[22] Spence (1975) shows that innovation can be harmful to consumers when it increases the marginal cost of production for the good. The cost of innovation being fixed in our model, any innovation benefits consumers.

$\frac{R^N}{2} - K$, and without innovation, $\underline{\Pi}$. $\square$

Proposition 2 shows that the need for the manufacturer to compensate each marginal buyer for the informative spillover deters the introduction of some efficient innovations on the market.

As long as $q^+ > q^-$, when dealing with N retailers we always have $\Pi_1^N > \underline{\Pi}$. Therefore, absent innovation costs, it is always profitable for the manufacturer to introduce the new product when it can use the well-known good as a threat point in its bargaining with the retailers: without innovation cost, an efficient innovation is always launched in equilibrium. However, for any $K \in \left[\Pi_1^N - \underline{\Pi}, \frac{R^N}{2} - \underline{\Pi}\right]$, the cost of innovation is too high compared to the profit of the manufacturer, and the innovation is deterred only because of the spillover.

Note that a standard hold-up effect arises for $K \in \left[\frac{R^N}{2} - \underline{\Pi}, R^N - N\upsilon^-\right]$. Indeed, even absent spillover, since the manufacturer has to leave half of the rent of innovation to retailers while incurring all the cost, it naturally renounces to invest in this interval.

Innovation deterrence resulting from the slotting fees damages the industry profit: although the manufacturer prefers to sell the well-known good, the loss inflicted on the retailers is clearly larger than the gain for the manufacturer. It also damages consumer surplus because efficient innovation would increase the quality of the product offered to consumers.

The deterrence effect of slotting fees paid for the introduction of new products was pointed out by the FTC in its 2003 report on slotting allowances: "*roughly 10 percent of ice cream products fail to earn enough revenue in their first year to cover their slotting fees.*" There exists some clear evidence that slotting fees are taken into account at the innovation stage in the total cost of launching a new product in Sudhir and Rao (2006): "Over the past two decades, [slotting allowances] have gained increasing prominence and have emerged as a major share of new product development costs. According to Deloitte & Touche (1990), slotting allowances account for more than 16% of a new product's introductory costs, whereas research and development and market analysis expenditures account for approximately 14%".

3.3 Spillover Intensity and Advertising

We first define a variation in spillover intensity as follows:

Definition 1. *Consider a change in the distribution of revenues from* $\{\upsilon^1,...,\upsilon^{N-1},\upsilon^N\}$ *to* $\{\bar{\upsilon}^1,...,\bar{\upsilon}^{N-1},\upsilon^N\}$. *The informative spillover decreases if* $\forall n \in \{1,...,N-1\}$ $\bar{\upsilon}^n \geq \upsilon^n$ *and* $\exists n \in \{1,...,N-1\}$ *such that* $\bar{\upsilon}^n > \upsilon^n$. *Conversely, it increases if* $\forall n \in \{1,...,N-1\}$ $\bar{\upsilon}^n \leq \upsilon^n$ *and* $\exists n \in \{1,...,N-1\}$ *such that* $\bar{\upsilon}^n < \upsilon^n$.

When the informative spillover decreases, information across markets through the sales in retailers' outlets has a smaller role to play to boost demand. Among all potential consumers on a given market, fewer can be captured through word of mouth and/or more consumers are prompt to purchase the new product as soon as it appears in their store. As a result, the gap between the revenue curves on Figure 1 shrinks and we obtain the following corollary:

Corollary 4. *A decrease (resp. increase) in the informative spillover weakly reduces (resp. reinforces) the magnitude of slotting fees,* $\frac{\Pi_2^N-\Pi_1^N}{\Pi_2^N}$*, paid by the manufacturer for the new product introduction. It weakly softens (resp. reinforces) innovation deterrence.*

Proof. See Appendix B.2 □

Consider now that the manufacturer can affect the informative spillover intensity, for instance by launching an advertising campaign to inform consumers about its new product. The standard informative advertising model by Grossman and Shapiro (1984), which we introduced in section 2.2, is here useful to present our insights. Let a be the advertising expenditures by the manufacturer. Assume that the probability that a consumer is aware of the existence of the product on each market is a function $\xi(n,a)$ increasing in a. For a given n, a strong level of advertising increases the market revenue $\upsilon^n = \max_{p_i} \xi(n,a)x_i(p_i,q^+)$ and thus decreases the informative spillover. The manufacturer then faces a trade-off between the ex-ante advertising expenditures and the ex-post reduction in slotting fees. We obtain the following corollary:

Corollary 5. *Manufacturers may advertise their new products in order to reduce the magnitude of slotting fees paid to the retailers.*

This result is well illustrated by the findings of the Food Marketing Institute in 2003 which mentions that “*Manufacturers that perform thorough market research and support new products with strong advertising campaign often do not pay allowance.*"[23] We concur here with results previously highlighted in the literature. In the risk-sharing literature, advertising reduces the risk of failure of the product, and therefore the need for any risk-sharing process among producers and retailers through slotting fees. In our model, advertising also increases the likelihood of success of a new product (the likelihood that each consumer will be aware of the product’s existence), which makes the manufacturer less dependent on retailers to vehicle this information. As a consequence, the rent that retailers are able to capture through slotting fees is reduced. Our paper thus offers a new argument, entirely based on the presence of multiple and not necessarily competing retailers, which must be taken as a complement to previous theories on risk sharing.

[23]FMI,"Slotting Allowances in the Supermarket Industry", section 6, p3.

4 Buyer size and slotting fees

This section highlights how slotting fees paid by the manufacturer vary with respect to retailers' size. We focus here only on retail concentration on the input market since outlets are, by assumption, active on separate markets. In order to account for a size effect, we assume now that the manufacturer faces one large retailer that owns k outlets and $N-k$ single-outlet retailers. We also assume that a large retailer bargains over all its outlets at the same time and thus cannot decide to sell the new product in only part of them.[24] As previously, we avoid a size effect through quantities.

We denote by $\Pi_t^{k,n}$ the profit of a manufacturer selling through n outlets with one retailer of size k and $n-k$ retailers of size 1 in period t. Since the asymmetry among retailers makes the recurrence cumbersome, we directly use the Shapley value to determine the profit of the manufacturer. In addition, for the sake of simplicity but without loss of generality, we assume here that $\hat{n}=1$. Again, in equilibrium, the manufacturer deals with all retailers and sells the good through N outlets, and therefore, the profit of the manufacturer is:[25]

$$\Pi_1^{k,N} = \begin{cases} \frac{\sum_{n=1}^{N-k}(N-k-n+1)R^n + \sum_{n=k}^{N}(n-k+1)R^n}{(N-k+2)(N-k+1)} & \text{if } k > \frac{N}{2}, \\ \\ \frac{\sum_{n=1}^{k-2}(N-k+1-n)R^n + (N-2k+2)\sum_{n=k-1}^{N-k+1} R^n + \sum_{n=N-k+2}^{N}(n-k+1)R^n}{(N-k+2)(N-k+1)} & \text{otherwise.} \end{cases}$$

We now compare this profit with the manufacturer's profit obtained with N small retailers, that is $\Pi_1^{1,N} = \Pi_1^N$ given in lemma 3. We obtain the following result.

Proposition 3. *A manufacturer pays no slotting fee in case of full retail concentration. When the*

[24]Regardless of the effect of buyer size on slotting fees, the literature on buyer power highlights various reasons why a large retailer would have an incentive to use its size as a leverage in its bargaining with manufacturers; See for instance Inderst and Wey (2003).

[25]See Appendix C.1 for a proof.

spillover is such that the cumulative revenue function is weakly convex, total slotting fees paid by the manufacturer strictly decreases as the size of the large group increases.

Proof. See Appendix C. □

To explain this result, it is useful to first note that, because a large retailer bargains over all its outlets at the same time, it applies the average spillover uniformly across its own outlets.

If the retail market is monopolized, i.e. $k = N$, there is no slotting fee. Indeed, as there is no firm outside the group, the spillover plays no role. Therefore, the monopolization of the retail sector always implies zero slotting fee and thus benefits the manufacturer.

Consider now for instance that the manufacturer faces a retailer of size 2 and $N-2$ retailers of size 1. When the manufacturer bargains with 2 independent outlets it takes into account the marginal contribution of each outlet. In contrast, when bargaining with a large retailer of size 2, it takes into account the total contribution of the two outlets. When the revenue curve is convex, the inframarginal contribution is lower than the marginal contribution and therefore the manufacturer earns a lower share of the revenue when facing only small retailers. In other words, in presence of a large buyer, more of the informative spillover is internalized, and slotting fees decrease.

The convexity of the industry revenue imposes some restriction on the informative spillover. For instance in the framework of Section 2.2, $x_i(q^+, p_i)$ and the optimal price p^* are both independent of n. The industry revenue when the product is sold on n markets, $R^n = n\xi(n)x_i(q^+, p^*)p^*$, is thus convex with respect to n if $n\xi(n)$ is convex with respect to n, that is if $2\xi'(n) + n\xi''(n) > 0$. Because by assumption $\xi'(n) \geq 0$, it is immediate that if $\xi(n)$ is linear with respect to n (for instance $\xi(n) = n/N$), this condition is satisfied. This condition further holds whenever $\xi(n)$ is not to concave, that is, $\xi''(n) > -2\xi'(n)/n$.

5 Implications for Competition Policy

The innovation deterrence effect we highlight adds on to the list of harmful effects of slotting fees. We have also shown that manufacturers who cannot advertise their new products are likely to pay more slotting fees to retailers. This issue is likely to affect small manufacturers more, as they have limited access to liquidity, and therefore to advertising.

Another argument against slotting fees may be derived from the EU report on Unfair Trade Practices, which states that “one party should not ask the other party for advantages or benefits of any kind without performing a service related to the advantage or benefit asked".[26] In our model, it is not the retailer who performs the informative spillover but rather the consumers through word-of-mouth. As this service is only a by-product of the retailer’s activity, slotting fees could be considered here as an unfair trading practice. In that sense, the FTC (2001) report provides some evidence of payments that are not clearly explained by a service offered by retailers: "Interestingly, two suppliers explained that although some suppliers claim not to pay any slotting, they make other payments (i.e., \$25,000 for a \$10,000 advertisement) that provide compensation over and above specific costs incurred by the retailer.", (see, p61).

The above arguments rather call for a ban on slotting fees. We thus study the effect of such a ban in our framework. In our base model, we do not explicitly distinguish slotting fees (paid by the manufacturer to the retailer) from franchise fees (paid by the retailer to the manufacturer): slotting fees are a simple discount on franchise fees. In practice it might be difficult for a court to disentangle different types of transfers between a producer and a retailer which may take the form of under-the-table payments, rebates, or other allowances. However, to properly analyze the effect

[26]See §88 of the “Report from the Commission to the European Parliament and the council on unfair business-to-business trading practices in the food supply chain", COM(2016)32.

of a ban on slotting fees and derive the policy implications of our result, we develop here a variant of our base model that formally separates slotting fees (negative upfront fees) from franchise fees.

The stage game is closely inspired from Marx and Shaffer (2010).[27] Assumptions on demand are unchanged. In $t=1$, Stage 1 is unchanged and Stage 2 and 3 are as follows:

- Stage 2: the manufacturer bargains with each retailer i on slotting fees $S_i \geq 0$ to obtain a slot for its new product. In case of agreement, S_i is paid by the manufacturer to retailer i.
- Stage 3: the manufacturer bargains simultaneously over a franchise fee F_i with each retailer i to share the market revenue for the new product (resp. well-known good) in case of agreement (resp. disagreement) in Stage 2.

The total transfer from retailer i to the manufacturer is $T_i = F_i - S_i$. We solve the game in $t=1$.

In Stage 3, if n retailers have successfully bargained over the sale of the new product in Stage 2, $(N-n)$ retailers have failed and still offer the well-known product. Assuming that the successful retailers are the first n retailers, the manufacturer simultaneously bargains over $\frac{R^n}{n}$ with each $i \in \{1,...,n\}$ and over υ^- with each $i \in \{n+1,...,N\}$. As a consequence there are two equilibrium tariffs, which we denote F^S for "successful" retailers who launch the new product and F^F for retailers with which the bargaining "failed". These tariffs are given by:

$$\frac{R^n}{n} - F^S = F^S \;\Rightarrow\; F^S = \frac{R^n}{2n}, \qquad \upsilon^- - F^F = F^F \;\Rightarrow\; F^F = \frac{\upsilon^-}{2}.$$

Therefore, if n retailers have successfully bargained over slotting fees in Stage 2, the equilibrium profit of the manufacturer is $\Pi^n = \frac{R^n}{2} + (N-n)\frac{\upsilon^-}{2}$, a successful retailer obtains $\pi^{nS} = \frac{R^n}{2n} + S_i^n$

[27] In their setting, take-it-or-leave-it slotting fees are offered in an upfront stage, and then, within the network of selected firms, simultaneous Nash bargaining takes place over two-part tariff contracts.

whereas, a retailer who failed gets $\pi^{nF} = \frac{\upsilon^-}{2}$.

In Stage 2, If U bargains successfully with n retailers, each retailer is symmetric in the bargaining and behaves as the marginal retailer in its negotiation with U. The corresponding symmetric equilibrium slotting fee is denoted S^n.

We first write the negotiation between the manufacturer and one retailer when all the other have failed $\left(\pi^{1S} + S^1\right) - \pi^{0F} = \left(\Pi^1 - S^1\right) - \Pi^0$. The left term represents the profit earned by the retailer in case of an agreement with the manufacturer in Stage 2, $\pi^{1S} + S^1$, minus its profit without agreement, π^{0F}. The right term represents the profit earned by the manufacturer in case of agreement with retailer 1, $\Pi^1 - S^1$, minus its profit in case of failure, Π^0. Assuming that $R^1 > \upsilon^-$, i.e. that $\hat{n} = 1$, we obtain $S^1 = 0$.

Now, if the manufacturer bargains with two retailers while all other negotiations have failed, the negotiation is $\left(\pi^{2S} + S^2\right) - \pi^{1F} = \left(\Pi^2 - 2S^2\right) - \left(\Pi^1 - S^1\right)$ and therefore $S^2 = \frac{R^2}{12} - \frac{R^1}{6}$.

When 2 firms have accepted to launch the new product, the manufacturer therefore obtains $\Pi^2 = \frac{R^1+R^2}{3} + (N-2)\frac{\upsilon^-}{2}$. Solving the recurrence, it is then straightforward that the manufacturer pays a slotting fee to each of the N firms in equilibrium and gets the Shapley value, $\Pi^N = \frac{1}{N+1}\sum_{i=1}^{n} R^i$. Note that, as in the previous sections, this result generalizes to any $\hat{n} > 1$.

In $t = 2$, playing stages 2 and 3 again, there is no informative spillover left and thus no slotting fee. We obtain the following proposition:

Proposition 4. *When launching a new product, the manufacturer pays a slotting fee to each retailer at product introduction.*

Propositions 2 to 3 also hold in this new setting. Having explicitly distinguished slotting fees paid by the manufacturer to the retailer from the franchise fee paid by the retailer to the manufacturer. We can therefore derive the consequences of a ban on slotting fees. Assume that a ban imposes that $S_i = 0$. Keeping our game unchanged, in Stage 3, franchise fees are, again, F^S for retailers who agreed to launch the new product, and F^F for those who did not. Profits are respectively π^{nS} and π^{nF}. In Stage 2, because no slotting fee can be negotiated, a retailer accepts to launch the new product as long as $\pi^{nS} > \pi^{nF}$, which is always the case for $n = N$. Therefore, in case of a ban on slotting fees, the manufacturer obtains $\frac{R^N}{2} > \Pi^N$.

Our results thus call for a ban on slotting fees: whenever innovation deterrence occurs, a ban on slotting fees would benefit consumers and the manufacturer but also retailers. Indeed, if it were possible, the retailer would commit itself to not using slotting fees before the manufacturer decides to innovate. If innovation occurs absent the ban, then banning slotting fees would simply transfer part of the retailers' profit to the manufacturer, without changing welfare.

6 Robustness

6.1 Retail Competition

Proposition 1 shows that the informative spillover across retailers entirely explains the payment of slotting fees by the manufacturer. Such slotting fees should therefore be independent of the retail market structure. In the above analysis, we have shown in Figure 1 that the area between the industry revenue curves in the introduction period and in the mature period is proportional to the amount of slotting fees paid in equilibrium by the manufacturer to the retailers. Intuitively, competition should affect both curves in the same way, provided that the market structure is constant over the two periods. Since the informative spillover affects only the introduction-period revenue curve, it remains below the mature-period revenue curve. Retail competition thus does not have any direct effect on our mechanism, and our results should hold regardless of the intensity of competition.

In a framework with retail competition, however, the retail market structure may differ across the two periods. In our secret contracting framework, the manufacturer bargains bilaterally with each retailer and equilibrium contracts are still cost based because of the fear of opportunism, i.e. that a rival retailer obtains better contracting terms (See Hart and Tirole (1990)). However, cost-based contracts imply that each manufacturer-retailer pair now bargains to share a competititive industry profit instead of the monopoly industry profit in our baseline model. The industry profit to be shared thus decreases with the intensity of competition. Therefore, it may become optimal for the manufacturer to provoke a breakdown in bargaining with a subset of retailers in order to limit competition (see Chambolle and Villas-Boas (2015)). This may happen in both periods, but the equilibrium number of active retailers is likely to be different in the two periods due to the informative spillover.

We now provide an illustration in a case in which several retailers are competing on a single market following the specification presented in section 2.2. In the absence of spillover, the inverse demand function is $P(X) = q^+ - X$, with $X = \sum_{i=1}^{n} x_i$ the total output sold on the market when $n \in \{1,...,N\}$ firms are active. With spillovers represented by $\xi(n)$, the inverse demand function becomes $P(X) = q^+ - \frac{X}{\xi(n)}$. We use the following specification of the spillover: $\xi(n) = \frac{n}{N}$. We also assume from now on that $q^+ = 1$ and that the total profit obtained with the old product is 0.

No spillover ($t = 2$). Assume first that the manufacturer has innovated in $t = 1$ and that the product is mature. If n retailers are active, each firm i maximizes $x_i(1 - X)$, and thus sets $x_i = 1/(n+1)$ which generates an industry revenue $R_2^n = n/(n+1)^2$.

From Lemma 3, the profit of the manufacturer is:

$$\Pi_2^n = \frac{1}{n+1} \sum_{i=1}^{n} \frac{i}{(i+1)^2}. \tag{9}$$

Note that the number of active firms may be limited, as the manufacturer may wish to provoke a breakdown to limit the competition effect when $R_2^n < \Pi_2^{n-1}$. For $N \leq 3$ there is no breakdown and all existing retailers are active in equilibrium. In contrast, when $N \geq 4$ a breakdown occurs and only three retailers are active in equilibrium.

With spillovers ($t = 1$). Assume that U chooses to innovate in $t = 1$. In Stage 3, output choices not only depend on the market structure, but also on the spillover. If n retailers are active, each firm i maximizes $x_i(1 - X/\xi(n))$ and thus sets $x_i = n/(N(n+1))$, which generates an industry revenue $R_1^n = n^2/(N(n+1)^2)$ which strictly increases in n. From Lemma 3, the manufacturer's profit is:

$$\Pi_1^n = \frac{1}{n+1} \sum_{i=1}^{n} \frac{i^2}{N(i+1)^2} \tag{10}$$

No breakdown occurs with spillovers, as $R_1^n > \Pi_1^{n-1}$ for all N and for all $n \in \{1,...,N\}$. Note that this is because our spillover function is linear, and in choosing instead a concave spillover function the market structures could be more similar across periods. Comparing the profit of the manufacturer in both periods, we obtain the following proposition:

Proposition 5. *In the presence of retail competition, retailers extract a slotting fee from the manufacturer at product launching.*

Proof. Straightforward from comparing profits obtained in equations (9) and (10). □

For instance, if $N = 3$, all firms are active both in periods 1 and 2, and therefore the product is mature in $t = 2$. From equations (9) and (10), we obtain $\Pi_2 = 95/576 \approx 0.165$ and $\Pi_1 = 181/1728 \approx 0.105$. The difference is fully due to the slotting fees paid by the manufacturer to each retailer in $t = 1$. Indeed, each retailer respectively obtains $\pi_2 = 13/1728 \approx 0.008$ and $\pi_1 = 143/5184 \approx 0.028$.

Now, if $N = 4$, all firms are active in $t = 1$, so that the product is mature in $t = 2$. However, only three firms are active in $t = 2$. From equations (9) and (10), we obtain $\Pi_2 = 95/576 \approx 0.165$ and $\Pi_1 = 6829/72000 \approx 0.095$. In this case, however, the difference is due to two effects: spillovers and the change in retail structure (drop from 4 to 3 active retailers between the two periods). Still, each active retailer earns a higher profit in $t = 1$ than in $t = 2$. If we were to increase N, the number of active retailers in equilibrium would remain 3 in $t = 2$, whereas all retailers would still be active in $t = 1$, thus enhancing the change in market structure across periods. At some point, the structural change is likely to overwhelm the positive effect of the spillover for retailers: the few retailers still active would be better off in $t = 2$ with less competition and no spillover than in $t = 1$ with spillovers but fierce competition. Innovation deterrence however remains a concern as the manufacturer is always better off in $t = 2$ than in $t = 1$.

Our bargaining assumption à la Stole and Zwiebel (1996) limits our analysis to a small number of retailers, which is realistic, as competition is generally very limited on a given retail market.[28] If consumers were heterogeneous in their valuation for quality, the innovative and the old products could also coexist on the market. Although the analysis would be more complex the informative spillover mechanism would not be directly affected and our results are thus likely to hold.

[28] National concentration ratios are high in the food retail sector, but these ratios are even higher in a given retailer's catchment area (see Allain et al. (2017)).

6.2 Firms are forward looking

If we assume that $\delta = 1$, then in $t = 1$ firms are able to take into account in their bargaining the future net gain (or loss) in $t = 2$. We thus rewrite (5), that is the bargaining program in $t = 1$, as follows:

$$\frac{R^n}{n} - T_1^n - d_i + \Delta_i^n = nT_1^n - d_U + \Delta_U^n \tag{11}$$

We neglect the well-known good in this section ($d_i = 0$). The outside option of the manufacturer, d_U is determined as before by solving the nested negotiations. Δ_i^n and Δ_U^n denote the respective net gain (or loss) of retailer i and the manufacturer in $t = 2$ if the n^{th} negotiation in $t = 1$ succeeds.

We first compute Δ_i^n and Δ_U^n, which we derive from the subgame equilibrium in $t = 2$. Let $n_1 \leq N$ be the number of successful negotiations in $t = 1$. Any negotiation program in $t = 2$, involves a number n_2^S (resp. n_2^F) of firms with which the negotiation succeeded (resp. failed) in $t = 1$. By assumption, we have $n_2^S \leq n_1$ and $n_2^F \leq N - n_1$. For any vector (n_1, n_2^S, n_2^F), $T_2^S(n_1, n_2^S, n_2^F)$ (resp. $T_2^F(n_1, n_2^S, n_2^F)$) are the tariff paid in $t = 2$ by a retailer with which negotiation in $t = 1$ was successful (resp. failed), with $n_2^S + n_2^F \leq N$ the number of negotiations that succeed in $t = 2$.

Let $\Pi_2(n_1, n_2^S, n_2^F)$, $\pi_2^S(n_1, n_2^S, n_2^F)$ and $\pi_2^F(n_1, n_2^S, n_2^F)$ respectively be the profits of the manufacturer, a successful retailer in $t = 1$ and a retailer who failed in $t = 1$, when bargaining in $t = 2$.

By definition, we have:

$$\begin{aligned}
\Pi_2(n_1, n_2^S, n_2^F) &= n_2^S T_2^S(n_1, n_2^S, n_2^F) + n_2^F T_2^F(n_1, n_2^S, n_2^F), &(12)\\
\pi_2^S(n_1, n_2^S, n_2^F) &= \frac{R^{n_1 + n_2^F}}{n_1 + n_2^F} - T_2^S(n_1, n_2^S, n_2^F), &(13)\\
\pi_2^F(n_1, n_2^S, n_2^F) &= \frac{R^{n_1 + n_2^F}}{n_1 + n_2^F} - T_2^F(n_1, n_2^S, n_2^F). &(14)
\end{aligned}$$

Note that the per-market revenue shared in $t=2$, $\frac{R^{n_1+n_2^F}}{n_1+n_2^F}$, is independent of n_2^S. Indeed, regardless of the number of firms $n_2^S \leq n_1$ that actually succeed in their negotiation with the manufacturer in $t=2$, their informative spillover has played its role in $t=1$. Only firms that have failed in $t=1$ and now succeed in $t=2$, i.e. n_2^F firms trigger an informative spillover that increases the per-market revenue in $t=2$. As a consequence, firms are asymmetric in $t=2$ and for all relevant values of n_2^S and n_2^F, tariffs $T^S(n_1,n_2^S,n_2^F)$ and $T^F(n_1,n_2^S,n_2^F)$ are the solution to the following system of bargaining equations:

$$\begin{aligned}
\pi_2^S(n_1,n_2^S,n_2^F) &= \Pi_2(n_1,n_2^S,n_2^F)-\Pi_2(n_1,n_2^S-1,n_2^F), && (15)\\
\pi_2^F(n_1,n_2^S,n_2^F) &= \Pi_2(n_1,n_2^S,n_2^F)-\Pi_2(n_1,n_2^S,n_2^F-1)., && (16)\\
\Pi_2(n_1,0,0) &= 0
\end{aligned}$$

In $t=1$, for a given number of firms n, the tariff T_1^n is the solution of the negotiation program given by equation (11), with $\Delta_1^n = \pi_2^S(n,n,N-n) - \pi_2^F(n-1,n-1,N-n+1)$, $\Delta_U^n = \Pi_2(n,n,N-n) - \Pi_2(n-1,n-1,N-n+1)$ and $d_U = (n-1)T_1^{n-1}$.

In what follows, we solve the negotiation in $t=1$, as defined by equation (11), in two polar cases, namely (i) when all but one negotiation have failed ($n=1$), i.e. the first of all nested negotiations that takes place in $t=1$ and (ii) when all but one negotiation have succedeed ($n=N-1$), i.e. the last of all nested negotiations in $t=1$. These two polar cases are sufficient to provide solid insights that if firms were forward looking, our results would be reinforced: the rent extracted by the retailers at product introduction would further increase.

Negotiation in $t = 1$ when only one firm succeeds. Starting from a situation in which all firms but one, say retailer 1, have failed in their negotiation in $t = 1$, $d_U = 0$ and the negotiation is given by the following equation $R^1 - T_1^1 + \Delta_1^1 = T_1^1 + \Delta_U^1$. We then obtain the following lemma:

Lemma 4. *If all but one negotiations have failed in $t = 1$, $\Delta_1^1 < \Delta_U^1$, which implies that the out-of-equilibrium profit of the manufacturer when firms are forward looking is strictly lower than when firms are myopic.*

Proof. See Appendix D.1. □

If $\Delta_1^1 - \Delta_U^1 < 0$, then U has a higher gain from trade in $t = 1$ with retailer 1 when firms are forward looking rather than myopic: U therefore earns a lower profit. The economic insight is clear. In case of breakdown between retailer 1 and U in $t = 1$, all the informative spillover remains to play a role in $t = 2$ which weakens the manufacturer towards retailers in $t = 2$.

Negotiation in $t = 1$ when all but one firm have succeeded. Starting from a case in which all firms but one, say retailer 1, have already succeeded in their negotiation in $t = 1$, the negotiation is given by the following equation $\frac{R^N}{N} - T_1^N + \Delta_1^N = NT_1^N - d_U + \Delta_U^N$. We obtain the following lemma:

Lemma 5. *If all but one negotiation have succeeded in $t = 1$, $\Delta_1^N < \Delta_U^N$, which implies that, assuming that d_U is not higher than the status-quo in the case of myopia, the resulting equilibrium profit of the manufacturer is strictly lower than in the case of myopia.*

Proof. See Appendix D.2. □

From the first nested negotiation, $\Delta_1^1 < \Delta_U^1$ implies that d_U is lower for $n = 2$ when firms are forward looking than when they are myopic. Therefore, for subsequent nested negotiations, we believe that two effects combine: for all $n \in \{1, \cdots, N\}$ we will still have $\Delta_1^n - \Delta_U^n < 0$, which further increases the U's profit loss in $t = 1$ with respect to the case of myopia; In addition, the status-quo profit of the manufacturer in each subsequent negotiation is lower absent myopia than with myopia. These conjectures are true in particular for $N \in \{2, 3, 4\}$ (See Appendix D).

6.3 A new product is launched by an entrant

Assume now that the new product of quality q^+ is launched by a potential entrant, denoted E, in $t = 1$, while the incumbent manufacturer, denoted I, sells at best sells the good of quality q^-. We denote by $\tilde{T}_t^n$ the equilibrium tariff paid by each retailer to E in period t when n markets are open, $\tilde{\Pi}_t^n$ the corresponding profit of the entrant.

In $t = 2$, if E entered in $t = 1$, then we prove further that its product is sold in N markets in $t = 1$. Therefore in $t = 2$, E sells a mature good which generates a revenue $\frac{R^N}{N}$ on each market. Since negotiations are independent of one another, the equilibrium tariff $\tilde{T}_2^n$ for all n is determined by the following equation: $\frac{R^N}{N} - \tilde{T}_2^n - \frac{\upsilon^-}{2} = \tilde{T}_2^n \Leftrightarrow \tilde{T}_2^n = \frac{1}{2N}\left(R^N - \frac{N\upsilon^-}{2}\right)$. In equilibrium E obtains:

$$\tilde{\Pi}_2^N \equiv N\tilde{T}_2^N = \frac{1}{2}\left(R^N - \frac{N\upsilon^-}{2}\right) \tag{17}$$

In $t = 2$, the profit obtained by E is lower than the profit obtained by an innovative incumbent ($\tilde{\Pi}_2^N < \Pi_2^N$), because E has no status-quo profit whereas the innovative incumbent could still obtain a positive profit from selling the good of quality q^-.

In $t = 1$, if all negotiations but one have failed with E, the optimal fixed fee denoted $\tilde{T}_1^1$ is:

$$R^1 - \tilde{T}_1^1 - \frac{\upsilon^-}{2} = \tilde{T}_1^1 \Leftrightarrow \tilde{T}_1^1 = \frac{1}{2N}\left(R^1 - \frac{N\upsilon^-}{2}\right). \tag{18}$$

This negotiation breaks if $R^1 \leq \frac{\upsilon^-}{2}$. Therefore, as in the previous case, there exists a cut-off value $\tilde{n}$ that represents a minimum number of negotiations that must take place in order to succeed. Here, the cut-off value is defined by:

$$\frac{R^{\tilde{n}-1}}{\tilde{n}-1} \leq \frac{\upsilon^-}{2} < \frac{R^{\tilde{n}}}{\tilde{n}} \tag{19}$$

Comparing eqs (7) and (19), we have $\tilde{n} \leq \hat{n}$: the sum of status-quo profits is lower ($d_i + d_U = \frac{\upsilon^-}{2}$) in a negotiation involving the entrant, while the revenue to be shared is unchanged. By recurrence, we determine the profit earned by E in $t = 1$ with $n \geq \tilde{n}$ retailers :

$$\tilde{\Pi}_1^n \equiv \frac{1}{n+1}\left(\sum_{i=\tilde{n}}^{n} R^i - \frac{n(n+1) - \tilde{n}(\tilde{n}-1)}{2}\frac{\upsilon^-}{2}\right) \tag{20}$$

As N firms bargain with E in equilibrium, E obtains $\tilde{\Pi}_1^N < \Pi_1^N$. Indeed, despite the fact that $\tilde{n} < \hat{n}$, the absence of status-quo for E still prevails and it gets a lower share of the joint profit in equilibrium. We summarize our results in the following proposition:

Proposition 6. *Due to slotting fees efficient innovations by an entrant are deterred for any innovation cost such that* $K \in \left[\tilde{\Pi}_1^N, \tilde{\Pi}_2^N\right]$. *A new entrant always has higher incentives to launch a new product than an incumbent manufacturer.*

Proof. See Appendix E. □

Our proposition confirms that slotting fees may also have a deterrence effect on innovation by an entrant. It is easier, however, for an entrant than an incumbent to launch a new product. The insight is as follows. Although $\tilde{\Pi}_1^N < \Pi_1^N$, absent the cost K, E has an incentive to launch the new product as soon as it yields a positive profit. In contrast, the incumbent firm must ensure that it yields a larger profit than $\underline{\Pi}$ and thus $\tilde{\Pi}_1^N > \Pi_1^N - \underline{\Pi}$ which means that the Arrow replacement effect reduces the net gain of launching a new product for the incumbent.

7 Conclusion

This paper provides new theoretical grounds for the payment of slotting fees by the manufacturer when introducing a new product. Each retailer is able to obtain a rent - a slotting fee - from the manufacturer in exchange for the informative spillover it creates on all other markets by selling the new product.

Our main result constitutes an interesting twist as compared to the existing literature. Indeed, the existing literature that relates slotting fees to information issues (risk sharing, screening) mostly enhances its efficiency effects in a one-to-one buyer-seller relationship. In contrast, we show that slotting fees that rely on the presence of an informative spillover across mutiple retailers may deter efficient innovation and reduce industry profits and consumer surplus. Moreover, in contrast with a large literature which confirms that buyer size increases buyer power, we show in our model that slotting fees decrease with buyer size under reasonable conditions. The main insight is that when the size of the large retail group increases, more of the informative spillover is internalized, and therefore slotting fees decrease. In terms of competition policy, our results call for a ban on slotting fees, which may benefit all actors on the market by encouraging efficient innovation.

We have also shown that our results were robust to retail competition, to firms being forward looking and when the innovator is an entrant rather than an incumbent.

References

Allain, Marie-Laure, Claire Chambolle, Stéphane Turolla, and Sofia B. Villas-Boas. 2017. "Retail Mergers and Food Prices: Evidence from France." *The Journal of Industrial Economics*, 65(3): 469–509.

Battigalli, Pierpaolo, Chiara Fumagalli, and Michele Polo. 2007. "Buyer power and quality improvements." *Research in Economics*, 61(2): 45 – 61.

Bedre-Defolie, Özlem. 2012. "Vertical coordination through renegotiation." *International Journal of Industrial Organization*, 30(6): 553–563.

Chambolle, Claire, and Sofia Berto Villas-Boas. 2015. "Buyer power through the differentiation of suppliers." *International Journal of Industrial Organization*, 43(1): 56–65.

Chen, Zhiqi. 2014. "Supplier Innovation in the Presence of Buyer Power."

Chipty, Tasneem, and Christopher M. Snyder. 1999. "The Role of Firm Size in Bilateral Bargaining: A Study of the Cable Television Industry." *The Review of Economics and Statistics*, 81(2): 326–340.

Chu, Wujin. 1992. "Demand Signalling and Screening in Channels of Distribution." *Marketing Science*, 11(4): 327–347.

de Fontenay, Catherine C., and Joshua S. Gans. 2014. "Bilateral Bargaining with Externalities." *Journal of Industrial Economics*, 62(4): 756–788.

Desai, Preyas S. 2000. "Multiple Messages to Retain Retailers: Signaling New Product Demand." *Marketing Science*, 19(4): 381–389.

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.

Foros, Øystein, and Hans Jarle Kind. 2008. "Do Slotting Allowances Harm Retail Competition?" *Scandinavian Journal of Economics*, 110(2): 367–384.

Foros, Øystein, Hans Jarle Kind, and Jan Yngve Sand. 2009. "Slotting Allowances and Manufacturers' Retail Sales Effort." *Southern Economic Journal*, 76(1): 266–282.

Grossman, Gene M., and Carl Shapiro. 1984. "Informative Advertising with Differentiated Products." *The Review of Economic Studies*, 51(1): 63–81.

Hart, Oliver, and Jean Tirole. 1990. "Vertical Integration and Market Foreclosure." *Brookings Papers on Economic Activity*, 21(1990 Microeconomics): 205–286.

Horn, Henrik, and Asher Wolinsky. 1988. "Bilateral Monopolies and Incentives for Merger." *RAND Journal of Economics*, 19(3): 408–419.

Hristakeva, Sylvia. 2018. "Vertical Contracts with Endogenous Product Selection: An Empirical Analysis of Vendor Allowance Contracts." Unpublished.

Inderst, Roman, and Christian Wey. 2003. "Bargaining, Mergers, and Technology Choice in Bilaterally Oligopolistic Industries." *RAND Journal of Economics*, 34(1): 1–19.

Inderst, Roman, and Greg Shaffer. 2007. "Retail Mergers, Buyer Power and Product Variety." *Economic Journal*, 117(516): 45–67.

Jack Morton. 2012. "New realities 2012." Jack Morton.

Kelly, Kenneth. 1991. "The Antitrust Analysis of Grocery Slotting Allowances: The Procompetitive Case." *Journal of Public Policy & Marketing*, 10(1): 187–198.

Lariviere, Martin A., and V. Padmanabhan. 1997. "Slotting Allowances and New Product Introductions." *Marketing Science*, 16(2): 112–128.

Marx, Leslie, and Greg Shaffer. 2007. "Upfront Payments and Exclusion in Downstream Markets." *RAND Journal of Economics*, 38(3): 823–843.

Marx, Leslie, and Greg Shaffer. 2010. "Slotting Allowances and Scarce Shelf Space." *Journal of Economics & Management Strategy*, 19(3): 575–603.

McKinsey. 2010. "A new way to measure word-of-mouth marketing." McKinsey.

Miklós-Thal, Jeanine, Patrick Rey, and Thibaud Vergé. 2011. "Buyer Power and Intrabrand Coordination." *Journal of the European Economic Association*, 9(4): 721–741.

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.

Motta, Massimo. 2004. *Competition Policy: Theory and Practice.* Cambridge University Press.

Nielsen. 2013. "Nielsen Global New Products Report 2013." Nielsen.

Rey, Patrick, and Michael D. Whinston. 2013. "Does retailer power lead to exclusion?" *RAND Journal of Economics*, 44(1): 75–81.

Shaffer, Greg. 1991. "Slotting Allowances and Resale Price Maintenance: A Comparison of Facilitating Practices." *RAND Journal of Economics*, 22(1): 120–135.

Shaffer, Greg. 2005. "Slotting Allowances and Optimal Product Variety." *Advances in Economic Analysis & Policy*, 5(1): 1–26.

Smith, Howard, and John Thanassoulis. 2012. "Upstream uncertainty and countervailing power." *International Journal of Industrial Organization*, 30(6): 483 – 495.

Spence, A. Michael. 1975. "Monopoly, Quality, and Regulation." *The Bell Journal of Economics*, 6(2): 417–429.

Stole, Lars A., and Jeffrey Zwiebel. 1996. "Intra-firm Bargaining under Non-binding Contracts." *Review of Economic Studies*, 63(3): 375–410.

Sullivan, Mary W. 1997. "Slotting Allowances and the Market for New Products." *The Journal of Law & Economics*, 40(2): 461–494.

Telser, Lester G. 1960. "Why Should Manufacturers Want Fair Trade?" *The Journal of Law & Economics*, 3: 86–105.

Yehezkel, Yaron. 2014. "Motivating a Supplier to Test Product Quality." *Journal of Industrial Economics*, 62(2): 309–345.

Appendix

A Assumption 1' and Assumption 1

We define $p_i^*(q,n)$ as follows:

$$p_i^*(q,n) \equiv \arg\max_{p_i} X_i(q,n,p_i)p_i$$

Following equation (3), we can write:

$$\begin{aligned}
\upsilon^n - \upsilon^{n-1} &= X_i(q^+,n,p_i^*(q^+,n))p_i^*(q^+,n) - X_i(q^+,n-1,p_i^*(q^+,n-1))p_i^*(q^+,n-1) \\
&= \underbrace{X_i(q^+,n,p_i^*(q^+,n))p_i^*(q^+,n) - X_i(q^+,n,p_i^*(q^+,n-1))p_i^*(q^+,n-1)}_{(i)} \\
&+ \underbrace{[X_i(q^+,n,p_i^*(q^+,n-1)) - X_i(q^+,n-1,p_i^*(q^+,n-1))]p_i^*(q^+,n-1)}_{(ii)} \geq 0
\end{aligned}$$

(i) cannot be negative because $p_i^*(q^+,n)$ maximizes $X_i(q^+,n,p_i)p_i$. (ii) is non negative because of Assumption 1': since $\xi(n) \geq \xi(n-1)$, $X_i(q^+,n,p_i)$ is non decreasing with respect to n. Assumption 1' thus implies Assumption 1.

B Proofs of Section 3

B.1 Proof of Lemma 3

If the manufacturer bargains with $\hat{n}$ retailers in $t = 1$, with $\hat{n}$ defined by (7), the negotiation with the $\hat{n}^{\text{th}}$ retailer for a tariff $T_1^{\hat{n}}$ is as follows:

$$\frac{R^{\hat{n}}}{\hat{n}} - T_1^{\hat{n}} - \frac{\upsilon^-}{2} = \hat{n}T_1^{\hat{n}} - \hat{n}\frac{\upsilon^-}{2}.$$

and the manufacturer obtains:

$$\Pi_1^{\hat{n}} \equiv \hat{n}T_1^{\hat{n}} = \frac{R^{\hat{n}}}{\hat{n}+1} + \frac{\hat{n}(\hat{n}-1)}{\hat{n}+1}\frac{\upsilon^-}{2}.$$

This profit is the status-quo profit of the manufacturer in its bargaining with $\hat{n}+1$ retailers. Assume that when U bargains with $n > \hat{n}$ retailers, we have:

$$\Pi_1^n = \frac{1}{n+1}\sum_{i=\hat{n}}^{n} R^i + \frac{\hat{n}(\hat{n}-1)}{n+1}\frac{\upsilon^-}{2}$$

When bargaining with $n+1$ retailers, the negotiation is as follows:

$$\left(\frac{R^{n+1}}{n+1} - T_1^{n+1}\right) - \frac{\upsilon^-}{2} = (n+1)T_1^{n+1} - \Pi_1^n - \frac{\upsilon^-}{2}.$$

We obtain:

$$(n+2)T_1^{n+1} = \frac{1}{n+1}\sum_{i=1}^{n+1} R^i - \frac{\hat{n}(\hat{n}-1)}{n+1}\frac{\upsilon^-}{2}.$$

As $\Pi_1^{n+1} = (n+1)T_1^{n+1}$, we obtain:

$$\Pi_1^{n+1} = \frac{1}{n+2}\sum_{i=\hat{n}}^{n+1} R^i + \frac{\hat{n}(\hat{n}-1)}{n+2}\frac{\upsilon^-}{2}.$$

By recurrence, we thus have shown that the equilibrium profit of the manufacturer when he bargains with all N retailers is the expression given in eq. (**??**), that is:

$$\Pi_1^{N} = \frac{1}{N+1}\sum_{i=\hat{n}}^{N} R^i + \frac{\hat{n}(\hat{n}-1)}{N+1}\frac{\upsilon^-}{2}.$$

B.2 Proof of Corollary 4

When the informative spillover decreases, from equation (1), the industry revenue becomes $\overline{R}^n \geq R^n$ for all $n \in [1, N-1]$ and $\exists n \leq N-1$ such that $\overline{R}^n > R^n$. Note that, since in $t = 2$ the profit of the manufacturer does not depend on the spillover intensity, the variation in the magnitude of slotting fees is fully explained by the impact of the spillover intensity on the profit of the manufacturer in $t = 1$, that is:

$$\Pi_1^{N} = \frac{1}{N+1}\sum_{i=\hat{n}}^{N} R^i + \frac{\hat{n}(\hat{n}-1)}{N+1}\frac{\upsilon^-}{2}.$$

Then, there are three cases:

- First, if $\frac{\overline{R}^n}{n} > \frac{R^n}{n}$ only for $n < \hat{n}$ and $\hat{n}$ is unchanged, the change does not affect the manufacturer's profit. Indeed, the term $\frac{1}{N+1}\sum_{i=\hat{n}}^{N} R^i$ is not affected and the second term is by definition independent of the spillover.

- Second, if $\frac{\overline{R}^n}{n} > \frac{R^n}{n}$ for $n < \hat{n}$ and $\hat{n}$ decreases as a result of the decrease in spillover, the profit of the manufacturer increases. Indeed, assume that initially $\hat{n} = k$, and only R^{k-1} changes and is now equal to $\overline{R}^{k-1}$, so that the new threshold is $\bar{\hat{n}} = k-1$. Then, the new profit of the manufacturer is:

$$\frac{1}{N+1}\sum_{i=k}^{N} R^i + \frac{\overline{R}^{k-1}}{N+1} + \frac{(k-1)(k-2)\upsilon^-}{2(N+1)} > \frac{1}{N+1}\sum_{i=k}^{N} R^i + \frac{k(k-1)\upsilon^-}{2(N+1)},$$

because $\frac{\overline{R}^{k-1}}{k-1} > \upsilon^-$.

- Finally, if there exists $n \geq \hat{n}$ such that $\frac{\overline{R}^n}{n} > \frac{R^n}{n}$, it is immediate that the profit of the manufacturer increases, as $\frac{1}{N+1}\sum_{i=\hat{n}}^{N} \overline{R}^i > \frac{1}{N+1}\sum_{i=\hat{n}}^{N} R^i$ whereas the second term is unchanged.

C Proofs of section 4

In case of full monopolization of the retail sector, the manufacturer obtains $\Pi_1^{N,N} = \frac{R^N}{2}$ in $t = 1$ which is exactly the profit obtained by the manufacturer in $t = 2$: the manufacturer pays no spillover. We now show that retail concentration always benefits the manufacturer when the revenue curve R^i is weakly convex.

C.1 Shapley value of U when facing one group of k outlets and $N-k$ single-outlet retailers

We first determine the profit of the manufacturer when it faces a large retailer of size k and $N-k$ small retailers, using the Shapley value. The Shapley value of U is:

$$\Pi_1^{k,N} = \sum_{Z \subseteq T, U \in Z} \frac{(N-k+2-|Z|)!(|Z|-1)!}{(N-k+2)!}(v(Z) - v(Z \setminus U)),$$

where T is the set of all players, that is the manufacturer, the large retailer and all $N-k$ single-outlett retailers.

We know that:

- The value of a coalition Z composed of U and n single-outlet retailers is $v(Z) = R^n$. There are $\begin{pmatrix} N-k \\ n \end{pmatrix}$ such coalitions.
- The value of a coalition Z composed of U, the large retailer and n single-outlet retailers is $v(Z) = R^{n+k}$. There are $\begin{pmatrix} N-k \\ n \end{pmatrix}$ such coalitions.
- The value of a coalition Z composed of U and the large retailer is $v(Z) = R^k$. There is one coalition.

We obtain the following profit:

$$\begin{aligned}
\Pi_1^{k,N} &= \frac{(N-k+2-2)!(2-1)!}{(N-k+2)!}R^k + \sum_{n=1}^{N-k} \begin{pmatrix} N-k \\ n \end{pmatrix} \frac{(N-k+2-(n+1))!(n+1)!}{(N-k+2)!}R^n \\
&\quad + \sum_{n=1}^{N-k} \begin{pmatrix} N-k \\ n \end{pmatrix} \frac{(N-k+2-(n+2))!(n+2)!}{(N-k+2)!}R^{n+k} \\
&= \frac{1}{(N-k+2)(N-k+1)} \left(R^k + \sum_{n=1}^{N-k} (N-k-n+1)R^n + \sum_{n=k+1}^{N} (n-k+1)R^n \right).
\end{aligned}$$

If $k > \frac{N}{2}$, we have:

$$\Pi_1^{k,N} = \frac{1}{(N-k+2)(N-k+1)} \left(\sum_{n=1}^{N-k} (N-k-n+1)R^n + \sum_{n=k}^{N} (n-k+1)R^n \right). \tag{21}$$

Otherwise we have:

$$\Pi_1^{k,N} = \frac{1}{(N+1-k)(N+2-k)} \left(\sum_{n=1}^{k-2} (N-k+1-n)R^n + (N-2k+2) \sum_{n=k-1}^{N-k+1} R^n + \sum_{n=N-k+2}^{N} (n-k+1)R^n \right). \tag{22}$$

C.2 Proof of Proposition 3

We compare this profit to the profit earned by a manufacturer facing N single-outlet retailers, which we can write as follows:

$$\Pi_1^N = \frac{1}{N+1} \sum_{n=1}^{N} (N-n+1)(R^n - R^{n-1}).$$

C.2.1 Difference $\Delta = \Pi_1^{k,N} - \Pi_1^N$.

We first express the difference between the two profits as follows:

$$\Delta = \sum_{i=1}^{N} \beta_i (R^i - R^{i-1}) \tag{23}$$

where β_i is given by the difference between coefficients of $(R^i - R^{i-1})$ in $\Pi_1^{k,N}$ and Π_1^N.

- Consider first the case in which $k > N/2$. Equation (21) can also be written as follows:

$$\begin{aligned} \Pi_1^{k,N} &= \sum_{n=k}^{N} \left(\tfrac{1}{2} - \tfrac{(n-k+1)(n-k)}{2(N-k+1)(N-k+2)} \right) \left(R^n - R^{n-1} \right) + \tfrac{1}{2} \sum_{n=N-k+1}^{k-1} \left(R^n - R^{n-1} \right) \\ &\quad + \sum_{n=1}^{N-k} \left(\tfrac{1}{2} - \tfrac{(N-n-k+2)(N-n-k+1)}{2(N-k+1)(N-k+2)} \right) \left(R^n - R^{n-1} \right). \end{aligned}$$

We thus obtain the following values for β_i:

$$\beta_i = \begin{cases} \frac{1}{2} - \frac{(i-k+1)(i-k)}{(N-k+1)(N-k+2)} - \frac{N-i+1}{N+1} & \text{if } i \geq k, \\ \frac{1}{2} - \frac{N-i+1}{N+1} & \text{if } i \in [N-k+1, k-1], \\ \frac{i((N+1)(i+1)-2k(N-k+2))}{2(N+1)(N-k+2)(N-k+1)} & \text{if } i \in [1, N-k]. \end{cases} \tag{24}$$

- Consider now the case in which $k \leq N/2$. Equation (22) can also be written as follows:

$$\begin{aligned} \Pi_1^{k,N} &= \frac{1}{(N-k+1)(N-k+2)} \Bigg[\sum_{n=N-k+2}^{N} \frac{(N-k+1)(N-k+2)-(n-k+1)(n-k)}{2} \left(R^n - R^{n-1}\right) \\ &+ \sum_{n=k-1}^{N-k+1} \left(\frac{(k-1)(2(2+N)-3k)}{2} + (N-n-k+2)(N-2k+2) \right) \left(R^n - R^{n-1}\right) \\ &+ \sum_{n=1}^{k} \left(\frac{n(-3+2k+n-2N)}{2} + N^2 + 3N + k^2 + 2 - k(2N+3) \right) \left(R^n - R^{n-1}\right) \Bigg] \text{ otherwise.} \end{aligned}$$

The value of β_i in that case is then given by:

$$\beta_i = \begin{cases} \frac{1}{2} - \frac{(i-k+1)(i-k)}{(N-k+1)(N-k+2)} - \frac{N-i+1}{N+1} & \text{if } i \leq N-k+2, \\ \frac{(k-1)k(2i-N-1)}{2(N+1)(N-k+1)(N-k+2)} & \text{if } i \in [k-1, N-k+1], \\ \frac{i(1+2k^2+N+i(N+1)-2k(N+2))}{2(N+1)(N-k+1)(N-k+2)} & \text{if } i \in [1, k-2]. \end{cases} \tag{25}$$

C.2.2 Sign of Δ

We show that, if R^i is weakly convex, then $\Delta > 0$ if:

$$\sum_{n=i+1}^{N} \beta_n \geq \max\{0, -\beta_i\}, \tag{26}$$

for all $i \in [1, N-1]$.

- If $\beta_N \geq \max\{0, -\beta_{N-1}\}$, then, since $R^N - R^{N-1} > R^{N-1} - R^{N-2}$, $\beta_N(R^N - R^{N-1}) + \beta_{N-1}(R^{N-1} - R^{N-2}) \geq 0$.

- If the former condition is true and $\beta_N + \beta_{N-1} \geq \max\{0, -\beta_{N-2}\}$, then:

$$\begin{aligned}&\beta_N(R^N - R^{N-1}) + \beta_{N-1}(R^{N-1} - R^{N-2}) + \beta_{N-2}(R^{N-2} - R^{N-3}) \\ &\geq (\beta_N + \beta_{N-1})(R^{N-1} - R^{N-2}) + \beta_{N-2}(R^{N-2} - R^{N-3}) \geq 0.\end{aligned}$$

- If the former conditions are true and $\beta_N + \beta_{N-1} + \beta_{N-2} \geq \max\{0, -\beta_{N-3}\}$, then:

$$\begin{aligned}&\beta_N(R^N - R^{N-1}) + \beta_{N-1}(R^{N-1} - R^{N-2}) + \beta_{N-2}(R^{N-2} - R^{N-3}) + \beta_{N-3}(R^{N-3} - R^{N-4}) \\ &\geq (\beta_N + \beta_{N-1} + \beta_{N-2})(R^{N-2} - R^{N-3}) + \beta_{N-3}(R^{N-3} - R^{N-4}) \geq 0.\end{aligned}$$

- Assume that there exists $\hat{i}$ such that for any $i > \hat{i}$:

$$\sum_{n=i}^{N} \beta_i \geq \max\{0, -\beta_{i-1}\} \text{ and } \sum_{n=i}^{N} \beta_i(R^n - R^{n-1}) \geq 0.$$

  Then we have:

$$\sum_{n=\hat{i}}^{N} \beta_n(R^n - R^{n-1}) = \sum_{n=\hat{i}+1}^{N} \beta_n(R^n - R^{n-1}) + \beta_{\hat{i}}(R^{\hat{i}} - R^{\hat{i}-1}) \geq (R^{\hat{i}+1} - R^{\hat{i}}) \sum_{n=\hat{i}+1}^{N} \beta_n + \beta_{\hat{i}}(R^{\hat{i}} - R^{\hat{i}-1}) \geq 0.$$

- Therefore, if for any $i \in [1, N-1]$ condition (26) is satisfied and R^n is weakly convex, then condition (23) is satisfied.

Given the values of β_i described in equations (24) and (25), this condition is true for all $i \in [1, N-1]$

and for all $k \in [2, N]$.

D Proof of Section 6.2

D.1 Proof of lemma 4

We know by definition that:

$$
\begin{aligned}
\Pi_2(n_1, n_2^S, n_2^F) &= n_2^S T_2^S(n_1, n_2^S, n_2^F) + n_2^F T_2^F(n_1, n_2^S, n_2^F), &(27)\\
\pi_2^S(n_1, n_2^S, n_2^F) &= \frac{R^{n_1+n_2^F}}{n_1+n_2^F} - T_2^S(n_1, n_2^S, n_2^F), &(28)\\
\pi_2^F(n_1, n_2^S, n_2^F) &= \frac{R^{n_1+n_2^F}}{n_1+n_2^F} - T_2^F(n_1, n_2^S, n_2^F). &(29)
\end{aligned}
$$

For all relevant values of n_1, n_2^S and n_2^F, we then want to solve the following system of equations:

$$
\begin{aligned}
\pi_2^S(n_1, n_2^S, n_2^F) &= \Pi_2(n_1, n_2^S, n_2^F) - \Pi_2(n_1, n_2^S - 1, n_2^F), &(30)\\
\pi_2^F(n_1, n_2^S, n_2^F) &= \Pi_2(n_1, n_2^S, n_2^F) - \Pi_2(n_1, n_2^S, n_2^F - 1). &(31)
\end{aligned}
$$

From this we obtain for any vector (n_1, n_2^S, n_2^F) the tariffs $T_2^S(n_1, n_2^S, n_2^F)$ and $T_2^F(n_1, n_2^S, n_2^F)$ paid by the two types of firms, as well as the manufacturer's profit $\Pi_2(n_1, n_2^S, n_2^F)$.

We now solve the bargaining program in $t = 2$ when $N \geq 2$ in two polar cases: first $n_1 = 1$ and second $n_1 = N - 1$.

Case in which $n_1 = 1$ Let us show by recurrence that the profit of the manufacturer in $t = 2$ when $n_2^S = 1$ retailer succeeded and n_2^F retailers failed in $t = 1$ is :

$$\Pi_2(1,1,n_2^F) = \frac{1}{(n_2^F+1)(n_2^F+2)} \sum_{i=1}^{n_2^F+1} \left[(n_2^F+2)(i-1)+i\right] \frac{R^i}{i}. \tag{32}$$

We also show that the tariff paid in $t = 2$ by the retailer with which the negotiation succeeded in $t = 1$ is then:

$$T_2^S(1,1,n_2^F) = \frac{R^{n_2^F+1}}{n_2^F+2} - \frac{1}{(n_2^F+1)(n_2^F+2)} \sum_{i=1}^{n_2^F} R^i \tag{33}$$

We first show that this is true for $n_2^F = 1$:

- If $(n_1, n_2^S, n_2^F) = (1,0,1)$, the bargaining program is given by:

$$\frac{R^2}{2} - T_2^F(1,0,1) = T_2^F(1,0,1) \Leftrightarrow T_2^F(1,0,1) = \Pi_2(1,0,1) = \frac{R^2}{4}.$$

- If $(n_1, n_2^S, n_2^F) = (1,1,0)$, the bargaining program is given by:

$$R^1 - T_2^S(1,1,0) = T_2^S(1,1,0) \Leftrightarrow T_2^S(1,1,0) = \Pi_2(1,1,0) = \frac{R^1}{2}.$$

- If $(n_1, n_2^S, n_2^F) = (1,1,1)$, the bargaining program is thus given by the following equations:

$$\frac{R^2}{2} - T_2^S(1,1,1) = T_2^S(1,1,1) + T_2^F(1,1,1) - \Pi_2(1,0,1),$$
$$\frac{R^2}{2} - T_2^F(1,1,1) = T_2^S(1,1,1) + T_2^F(1,1,1) - \Pi_2(1,1,0).$$

We then obtain:

$$T_2^S(1,1,1) = \frac{1}{2\times 3}\left(2R^2 - R^1\right), \qquad T_2^F(1,1,1) = \frac{1}{2}\left(\frac{R^2}{2\times 3} + \frac{2R^1}{3\times 1}\right),$$
$$\Pi_2(1,1,1) = \frac{1}{2\times 3}\left(R^1 + 5\frac{R^2}{2}\right).$$

Therefore, equations (32) and (33) are satisfied for $n_2^F = 1$.

Assume now that the above expressions are true for a given value of $n_2^F \geq 1$. We show that they are then true for $(n_2^F + 1)$. The bargaining program is given by the following equations:

$$\frac{R^{n_2^F+2}}{n_2^F+2} - T_2^S(1,1,n_2^F+1) = T_2^S(1,1,n_2^F+1) + (n_2^F+1)T_2^F(1,1,n_2^F+1) - \Pi_2(1,0,n_2^F+1),$$
$$\frac{R^{n_2^F+2}}{n_2^F+2} - T_2^F(1,1,n_2^F+1) = T_2^S(1,1,n_2^F+1) + (n_2^F+1)T_2^F(1,1,n_2^F+1) - \Pi_2(1,1,n_2^F),$$

Summing these two equations, we obtain:

$$T_2^F(1,1,n_2^F+1) = \frac{1}{n_2^F+3}\left(\frac{R^{n_2^F+2}}{n_2^F+2} + 2\Pi_2(1,1,n_2^F) - \Pi_2(1,0,n_2^F+1)\right), \tag{34}$$
$$T_2^S(1,1,n_2^F+1) = \frac{1}{n_2^F+3}\left(\frac{R^{n_2^F+2}}{n_2^F+2} + (n_2^F+2)\Pi_2(1,0,n_2^F+1) - (n_2^F+1)\Pi_2(1,1,n_2^F)\right) \tag{35}$$

In order to determine this expression, we need an expression of $\Pi_2(1,0,n_2^F)$, that is the profit of the manufacturer when it deals with n_2^F firms with which the negotiation had failed in $t=1$. Let us show, by recurrence, that it is equal to

$$\Pi_2(1,0,n_2^F) = \frac{1}{n_2^F+1}\sum_{i=2}^{n_2^F+1}\frac{(i-1)R^i}{i}. \tag{36}$$

- We have already shown that $\Pi_2(1,0,1) = \frac{R^2}{4} = \frac{(2-1)}{2}\frac{R^2}{2}$, and therefore (36) is true for $n_2^F = 1$.

- Assume now that (36) is true for $n_2^F - 1$ retailers, that is, $\Pi_2(1,0,n_2^F - 1) = \frac{1}{n_2^F}\sum_{i=2}^{n_2^F}\frac{(i-1)R^i}{i}$.

  The negotiation with n_2^F retailers is:

$$\frac{R^{n_2^F+1}}{n_2^F+1} - T_2(1,0,n_2^F) = n_2^F T_2(1,0,n_2^F) - \frac{1}{n_2^F}\sum_{i=2}^{n_2^F}\frac{(i-1)R^i}{i}$$
$$\Leftrightarrow (n_2^F+1)T_2(1,0,n_2^F) = \frac{R^{n_2^F+1}}{n_2^F+1} + \frac{1}{n_2^F}\sum_{i=2}^{n_2^F}\frac{(i-1)R^i}{i}.$$

  Therefore, the profit of the manufacturer is:

$$\Pi_2(1,0,n_2^F) = n_2^F T_2(1,0,n_2^F) = \frac{n_2^F}{n_2^F+1}\left(\frac{R^{n_2^F+1}}{n_2^F+1} + \frac{1}{n_2^F}\sum_{i=2}^{n_2^F}\frac{(i-1)R^i}{i}\right) = \frac{1}{n_2^F+1}\sum_{i=2}^{n_2^F+1}\frac{(i-1)R^i}{i}.$$

We have thus shown that equation (36) is true for all values of $n_2^F \leq N-n$.

We also need an expression of $\Pi_2(1,1,n_2^F)$, that is the profit of the manufacturer when it deals with 1 retailers with which the negotiation in $t=1$ succeeded and n_2^F firms with which it failed. By assumption in the recurrence, this expression is given by equation (32).

Replacing these two expressions in the system of equations (34) and (35), we obtain:

$$\Pi_2(1,1,n_2^F+1) = \frac{1}{(n_2^F+2)(n_2^F+3)}\sum_{i=1}^{n_2^F+2}\left[(n_2^F+3)(i-1)+i\right]\frac{R^i}{i},$$
$$T_2^S(1,1,n_2^F+1) = \frac{R^{n_2^F+2}}{n_2^F+3} - \frac{1}{(n_2^F+2)(n_2^F+3)}\sum_{i=1}^{n_2^F+1}R^i.$$

Therefore, equations (32) and (33) are true for all $n_2^F \leq N-1$.

In particular, this is true for $n_2^F = N-1$, and we therefore obtain the equilibrium profit in $t=2$

of the manufacturer and the retailer with which the negotiation is successful in $t=1$ when only one negotiation (over N) has succeeded in $t=1$:

$$
\begin{aligned}
\Pi_2(1,1,N-1) &= \frac{1}{N(N+1)}\sum_{i=1}^{N}[(N+1)(i-1)+i]\frac{R^i}{i}, \\
\pi_2^S(1,1,N-1) &= \frac{R^N}{N}-\left[\frac{R^N}{N+1}-\frac{1}{(N)(N+1)}\sum_{i=1}^{N-1}R^i\right].
\end{aligned}
$$

Gains from trade with and without myopia. Having defined the gains from a n^{th} success in $t=1$ by:

$$\Delta_1^n = \pi_2^S(n,n,N-n)-\pi_2^F(n-1,n-1,N-n+1), \tag{37}$$

$$\Delta_U^n = \Pi_2(n,n,N-n)-\Pi_2(n-1,n-1,N-n+1). \tag{38}$$

It is immediate that $\Delta_U^1-\Delta_1^1>0$, with Δ_1^1 and Δ_U^1 the respective net gains (or losses) of retailer 1 and U in $t=2$ if their negotiation in $t=1$ succeeds rather than breaks, which we compute:

$$
\begin{aligned}
\Delta_1^1 &= \pi_2^S(1,1,N-1)-\pi_2^F(0,0,N) \\
&= \left[\frac{R^N}{N}-\left(\frac{R^N}{N+1}-\frac{1}{N(N+1)}\sum_{i=1}^{N-1}R^i\right)\right]-\left[\frac{R^N}{N}-\frac{1}{N(N+1)}\sum_{i=1}^{N}R^i)\right], \\
&= \frac{1}{N(N+1)}\left(2\sum_{i}^{N-1}R^i-(N-1)R^N\right)=\frac{1}{N(N+1)}\sum_{i=1}^{N}R^i-\frac{R^N}{N+1}+\frac{1}{N(N+1)}\sum_{i=1}^{N-1}R^i, \\
\Delta_U^1 &= \Pi_2(1,1,N-1)-\Pi_2(0,0,N) \\
&= (\frac{(N^2+N-1)R^N}{N^2(N+1)}+\frac{R^1}{N(N+1)}+\frac{1}{N}\sum_{i=2}^{N-1}\left(\frac{i-1}{i}+\frac{1}{N+1}\right)R^i-\frac{1}{(N+1)}\sum_{i=1}^{N}R^i).
\end{aligned}
$$

In what follows, we prove that $\Delta_1^1 < \Delta_U^1$:

$$\begin{aligned}
\Delta_1^1 - \Delta_U^1 &= \frac{1}{N}\sum_{i=1}^{N} R^i - \frac{(2N^2+N-1)R^N}{N^2(N+1)} - \frac{1}{N}\sum_{i=2}^{N-1}\left(\frac{i-1}{i}\right)R^i, \\
&= \frac{1}{N}\sum_{i=2}^{N-1}\left(1-\left(\frac{i-1}{i}\right)\right)R^i + \frac{((N(N+1)-(2N^2+N-1))R^N}{N^2(N+1)} + \frac{R^1}{N}, \\
&= \frac{1}{N}\left[\sum_{i=1}^{N-1}\frac{R^i}{i} - \frac{(N-1)R^N}{N}\right] < 0.
\end{aligned}$$

If $\Delta_1^1 - \Delta_U^1 < 0$ then, for all N the profit of U in $t=1$ is lower when the manufacturer succeeds with only one retailer in $t=1$ is lower when firms are not myopic than when firms are myopic ($\frac{R_1}{2}$). The equilibrium profit of U is its status-quo profit in the negotiation with a second firm in the first period, etc. Therefore the lag accumulates and the equilibrium first period profit of the manufacturer is always lower when firms are not myopic.

D.2 Proof of lemma 5

Let us now show by recurrence that the profit of the manufacturer in $t=2$ when it $n_2^F = 1$ retailers failed in $t=1$ and n_2^S retailers succeeded, assuming that $n_1 \in \{n_2^S, \cdots, N-1\}$ negotiations succeeded in $t=1$, is given by:

$$\Pi_2(n_1, n_2^S, 1) = \frac{1}{6}\left(n_2^S\frac{R^{n_1}}{n_1} + (2n_2^S+3)\frac{R^{n_1+1}}{n_1+1}\right). \tag{39}$$

We also show that the tariff paid in $t=2$ by the retailer with which the negotiation has failed in $t=1$ is:

$$T_2^F(n, n_2^S, 1) = \frac{1}{6}\left(2n_2^S\frac{R^{n_1}}{n_1} + (3-2n_2^S)\frac{R^{n_1+1}}{n_1+1}\right). \tag{40}$$

We first show that it is true for $n_2^S = 1$:

- For all $n_1 \leq N-1$, if $(n_1, n_2^S, n_2^F) = (n, 0, 1)$, the bargaining program is given by:

$$\frac{R^{n+1}}{n+1} - T_2^F(n,0,1) = T_2^F(n,0,1) \Leftrightarrow T_2^F(n,0,1) = \Pi_2(n,0,1) = \frac{R^{n+1}}{2(n+1)}.$$

- For all $n_1 \leq N-1$ and $n_2^S \leq n$, if $(n_1, n_2^S, n_2^F) = (n, n_2^S, 0)$, the profit on each market, $\frac{R^n}{n}$, is equally shared between the manufacturer and the retailer, and therefore $T_2^S(n, n_2^S, 0) = \frac{R^n}{2n}$ and $\Pi_2(n, n_2^S, 0) = n - 2^S \frac{R^n}{2n}$.

- For all $n \leq N-1$, if $(n_1, n_2^S, n_2^F) = (n, 1, 1)$, the bargaining program is thus given by the following equations:

$$\begin{aligned}
\frac{R^{n+1}}{n+1} - T_2^S(n,1,1) &= T_2^S(n,1,1) + T_2^F(n,1,1) - \Pi_2(n,0,1), \\
\frac{R^{n+1}}{n+1} - T_2^F(n,1,1) &= T_2^S(n,1,1) + T_2^S(n,1,1) - \Pi_2(n,1,0).
\end{aligned}$$

  We then obtain:

$$\begin{aligned}
T_2^S(n,1,1) &= \frac{1}{3}\left(2\frac{R^{n+1}}{n+1} - \frac{1}{2}\frac{R^n}{n}\right), \qquad T_2^F(n,1,1) = \frac{1}{6}\left(\frac{R^{n+1}}{n+1} + 2\frac{R^n}{n}\right), \\
\Pi_2(n,1,1) &= \frac{1}{6}\left(\frac{R^n}{n} + 5\frac{R^{n+1}}{n+1}\right)
\end{aligned}$$

Therefore, equations (39) and (40) are satisfied for $n_2^S = 1$.

Assume now that the above expressions are true for a given value of $n_2^S \geq 1$. We show that they are then true for (n_2^S+1). The bargaining program is given by the following equations:

$$\frac{R^{n+1}}{n+1} - T_2^S(n,n_2^S+1,1) = (n_2^S+1)T_2^S(n,n_2^S+1,1) + T_2^F(n,n_2^S+1,1) - \Pi_2(n,n_2^S,1),$$
$$\frac{R^{n+1}}{n+1} - T_2^F(n,n_2^S+1,1) = (n_2^S+1)T_2^S(n,n_2^S+1,1) + T_2^F(n,n_2^S+1,1) - \Pi_2(n,n_2^S+1,0).$$

Summing these two equations, we obtain:

$$T_2^F(n,n_2^S+1,1) = \frac{1}{n_2^S+3}\left(\frac{R^{n+1}}{n+1} + (n_2^S+1)\Pi_2(n,n_2^S,1) - (n_2^S+2)\Pi_2(n,n_2^S+1,0)\right), \tag{41}$$
$$T_2^S(n,n_2^S+1,1) = \frac{1}{n_2^S+3}\left(\frac{R^{n+1}}{n+1} - 2\Pi_2(n,n_2^S,1) + \Pi_2(n,n_2^S+1,0)\right). \tag{42}$$

Replacing the expressions of $\Pi_2(n,n_2^S+1,0)$ and $\Pi_2(n,n_2^S,1)$ given above in these two equations, we obtain:

$$\Pi_2(n,n_2^S+1,1) = \frac{1}{6}\left((n_2^S+1)\frac{R^n}{n} + (2(n_2^S+1)+3)\frac{R^{n+1}}{n+1}\right),$$
$$T_2^F(n,n_2^S+1) = \frac{1}{6}\left[(1-2n_2^S)\frac{R^{n+1}}{n+1} + 2(n_2^S+1)\frac{R^n}{n}\right].$$

Therefore, equations (39) and (40) are true for all $n_2^S \leq n$. In particular, this is true for $n_2^S = n = N-1$, and we therefore obtain the equilibrium profit of the manufacturer and the retailer with which the negotiation fails in $t=2$, when only one negotiation failed in $t=1$:

$$\Pi_2(N-1,N-1,1) = \frac{NR^{N-1} + R^N(2N+1)}{6N},$$
$$T_2^F(N-1,N-1,1) = \frac{4(N-1)R^N - NR^{N-1}}{6N(N-1)}.$$

When negotiating with the last retailer in $t = 1$, assuming that all other negotiations have succeeded, the bargaining program is:

$$\frac{R^N}{N} - T_1 + \Delta_1^1 = NT_1 - d_U + \Delta_U^1$$

where Δ_1^1 and Δ_U^1 are defined above by (37). Again, U earns a lower profit (and retailers a larger profit) when firms are not myopic if $\Delta_1^1 - \Delta_U^1 < 0$. In order to show that this is true, we show that $\Delta_U^1 > 0$ and $\Delta_1^1 < 0$:

$$\Delta_1^1 = [(\pi_2(N,N,0) - (\frac{R^N}{N} - T_2^F(N-1,N-1,1))] = \frac{(4-N)R^N + NR^{N-1}}{3N} < 0,$$
$$\Delta_U^1 = [\Pi_2(N,N,0) - \Pi_2(N-1,N-1,1)] = \frac{-NR^{N-1} + R^N(N-1)}{6N} > 0.$$

where $\pi_2(N,N,0) = \frac{R^N}{2N}$ and $\Pi_2(N,N,0) = \frac{R^N}{2}$. With $d_U = \frac{1}{N}\sum_{i=1}^{N-1} R^i$, i.e. the status-quo value in the case with myopia, it is immediate that the first period profit for the manufacturer is lower when firms are forward looking rather than when they are myopic.

E Proof of Proposition 6

Assume that E offers a good of quality $q^+ > q^-$ and has access to n retailers. There exists $\tilde{n} \in \{1, \cdots, N\}$ such that:

$$\frac{R^{\tilde{n}-1}}{\tilde{n}-1} < \frac{\upsilon^-}{2} \leq \frac{R^{\tilde{n}}}{\tilde{n}}.$$

Consider that E bargains with $\tilde{n} > 1$ retailers. Status-quo profits are given by:

$$d_i = \frac{\upsilon^-}{2} \quad \forall i \in \{1, \cdots, \tilde{n}\}, \qquad\qquad d_E = 0.$$

From equation (5) we derive the result of the negotiation with each of the $\tilde{n}$ retailers:

$$\frac{R^{\tilde{n}}}{\tilde{n}} - \tilde{T}_1^{\tilde{n}} - \frac{\upsilon^-}{2} = \tilde{n}\tilde{T}_1^{\tilde{n}}, \qquad\qquad \tilde{\Pi}_1^{\tilde{n}} = \tilde{n}\tilde{T}_1^{\tilde{n}} = \frac{R^{\tilde{n}}}{\tilde{n}+1} - \frac{\tilde{n}}{\tilde{n}+1}\frac{\upsilon^-}{2}.$$

Assume now that there exists $n \in \{\tilde{n}, \cdots, N\}$ such that when E bargains with n retailers, its profit is:

$$\tilde{\Pi}_1^n = \frac{1}{n+1}\left(\sum_{i=\tilde{n}}^{n} R^i - \frac{n(n+1) - \tilde{n}(\tilde{n}-1)}{2}\frac{\upsilon^-}{2}\right).$$

Then, in the negotiation with $(n+1)$ retailers, status-quo profits are given by:

$$d_i = \frac{\upsilon^-}{2} \quad \forall i \in \{1, \cdots, \tilde{n}+1\}, \qquad\qquad d_E = \tilde{\Pi}_1^n.$$

The negotiation with each of the $n+1$ retailers gives:

$$\frac{R^{n+1}}{n+1} - \tilde{T}_1^{n+1} - \frac{\upsilon^-}{2} = (n+1)\tilde{T}_1^{n+1} - \tilde{\Pi}_1^n$$

which yields:

$$\tilde{\Pi}_1^{n+1} = (n+1)\tilde{T}_1^{n+1} = \frac{1}{n+2}\left(\sum_{i=\tilde{n}}^{n+1} R^i - \frac{(n+1)(n+2) - \tilde{n}(\tilde{n}-1)}{2}\frac{\upsilon^-}{2}\right).$$

Hence equation (20).

From Lemma (3) and equation (20), the difference $\tilde{\Pi}_1^N - \Pi_1^N$ is of the sign of the following expression:

$$\Delta' = \sum_{i=\tilde{n}}^{\hat{n}-1} R^i - \frac{N(N+1) - \tilde{n}(\tilde{n}-1) + 2\hat{n}(\hat{n}-1)}{2}\frac{\upsilon^-}{2}$$

In the interval $[\tilde{n}, \hat{n}-1]$, we always have $R^i < i\upsilon^-$, which we replace in Δ':

$$\Delta' < \sum_{i=\tilde{n}}^{\hat{n}-1} i\frac{\upsilon^-}{2} - \frac{N(N+1) - \tilde{n}(\tilde{n}-1) + 2\hat{n}(\hat{n}-1)}{2}\frac{\upsilon^-}{2}$$
$$\Delta' < \frac{2\hat{n}(\hat{n}-1) - 2\tilde{n}(\tilde{n}-1) - N(N+1) + \tilde{n}(\tilde{n}-1) - 2\hat{n}(\hat{n}-1)}{2}\frac{\upsilon^-}{2}$$
$$\Delta' < \frac{-\tilde{n}(\tilde{n}-1) - N(N+1)}{2}\frac{\upsilon^-}{2}$$

This is strictly negative and therefore the profit of E is always lower than that of an incumbent innovator. The difference between the net gains of launching the new product for E and for an incumbent innovator is simply given by $\tilde{\Pi}_1^N - [\Pi_1^N - \underline{\Pi}]$, which is of the sign of the following expression:

$$\Delta'' = \sum_{i=\tilde{n}}^{\hat{n}-1} R^i + \frac{2N(N+1) + \tilde{n}(\tilde{n}-1) - 2\hat{n}(\hat{n}-1)}{2}\frac{\upsilon^-}{2}$$

In the interval $[\tilde{n}, \hat{n}-1]$, we always have $R^i > i\frac{\upsilon^-}{2}$, which we replace in Δ'':

$$\Delta'' > \sum_{i=\tilde{n}}^{\hat{n}-1} i\frac{\upsilon^-}{2} + \frac{2N(N+1) + \tilde{n}(\tilde{n}-1) - 2\hat{n}(\hat{n}-1)}{2}\frac{\upsilon^-}{2}$$
$$\Delta'' > \frac{\hat{n}(\hat{n}-1) - \tilde{n}(\tilde{n}-1) + 2N(N+1) + \tilde{n}(\tilde{n}-1) - 2\hat{n}(\hat{n}-1)}{2}\frac{\upsilon^-}{2}$$
$$\Delta'' > \frac{2N(N+1) - \hat{n}(\hat{n}-1)}{2}\frac{\upsilon^-}{2} > 0$$

This is thus always positive: the net gain of launching a new product is higher for E than for an incumbent innovator.