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 and in turn harm consumer surplus and welfare. We further show that the spillover may facilitate the use of pay-to-stay fees by an incumbent to deter entry. Finally, a manufacturer is likely to pay lower slotting fees when it can heavily advertize or when it faces larger buyers.

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

JEL codes: L13, L42, M37.

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1 Introduction

Slotting fees are upfront payments from the producer to the retailer, paid to secure a slot for a new product in retailers' shelves.[1] Their amounts and frequency have rapidly grown since the mid-1980s. Outside of case studies conducted by the FTC (2003), there is practically no data available on slotting fees.[2] The FTC interviewed seven retailers, six manufacturers and two food brokers on five categories of products.[3] 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, between 50% and 90% of all new grocery products would trigger the payment of slotting allowances. The FTC (2003) 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."

Despite 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%.[4] The attitude of competition authorities reflects the conflicting views on the effect of slotting fees expressed by both the economic literature and practitioners. Indeed, slotting fees may have anticompetitive as well as efficiency enhancing effects.

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 natural cost shifters to pass on the higher retailing costs that result from the increasing flow of new products from suppliers. In contrast, producers often see slotting allowances as rent extracted by increasingly powerful retailers that may foreclose efficient products. However, buyer power in itself is not enough to explain why retailers would be able to

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[1] As in the FTC report (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] A recent paper by Hristakeva (2016) 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.

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

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

capture an extra rent for new product introduction. Finally, as explained by the European Commission (2010), "upfront access payments may soften competition and facilitate collusion between distributors."

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.[5] Among other sources of information about the new product, consumers are informed through word-of-mouth communication with consumers who have already bought the new product. Several studies acknowledge the importance of word-of-mouth communication in the purchase of a new product.[6] According to a worldwide study by Nielsen, in 2012 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%).[7] 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 across markets. In other words, by making the new product available in a given market, a retailer offers, as a by-product, an informative advertising service to the producer. We show 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 producer's incentive to launch a new product.

We analyze the relationship between an upstream monopolist and several retailers, each active on a separate market. We adopt a two-period game in which, in each period, the manufacturer chooses to innovate or not in a first stage and then bargains in a second stage with each retailer to sell its product. We consider bargaining among each pair following the specifications of Stole and Zwiebel (1996).[8] On the demand side, we introduce an "informative spillover": when the manufacturer launches a new product in period t, selling through one outlet increases demand in all other outlets in which the product is sold in this 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.

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[5]The marketing literature on the hierarchy of effects in advertising identifies three successive steps: cognitive, affective and conative. The cognitive step both includes awareness and knowledge about a new product (see Barry and Howard, 1990).

[6]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.

[7]The same study highlights that 59% of consumers like to tell others about new products.

[8]As shown by Stole and Zwiebel (1996), this solution concept gives rise to the Shapley value.

In equilibrium, when the manufacturer launches a new product, we show that it does so in the first period. In this case, comparing the bargaining between the producer and each retailer in the two periods, we show that the retailer is able to extract a slotting allowance from the manufacturer in the first period, that is, at introduction. We thus derive a new source of buyer power: when bargaining over a new product, the manufacturer must compensate each retailer for the positive informative spillover it creates on all other markets. As a result, informative spillover may deter innovation, as the manufacturer may earn a smaller profit, *i.e.* a smaller slice of a bigger pie, when launching a new product. We show that innovation deterrence is harmful for both consumer surplus and welfare.

We then compare these results to the results obtained when the new product can only be launched by an entrant, while the incumbent manufacturer cannot innovate. When the incumbent cannot offer exclusive dealing contracts to retailers prior to entry, we show that due to the Arrow replacement effect, innovation by an entrant is more likely than innovation by an incumbent. When the incumbent can offer pay-to-stay fees to part of the retailers prior to entry, we show that the informative spillover has an ambiguous effect on entry deterrence and innovation. On the one hand, it increases the amount of the pay-to-stay fee that the incumbent must offer to each retailer; on the other hand it reduces the number of retailers that the incumbent needs to lock in to deter entry. We find a sufficient condition for spillovers to facilitate entry deterrence.

We then vary some characteristics of the manufacturer and retailers and analyze their impact on the magnitude of slotting fees. We show that an informative advertising campaign at introduction is likely to lower the amount of slotting fees paid to retailers in period 1. Therefore, slotting fees are less likely to deter innovation when the manufacturer is able to heavily advertise its new product at a low cost, as would do for instance a well-known brand manufacturer. We also show that, surprisingly, retail concentration may reduce the magnitude of slotting fees per outlet. This result contrasts with the standard result that buyer power comes from buyer size. We thus exhibit a positive impact of retail concentration on the manufacturer's innovation incentives.

Our work is first related to the industrial organization and marketing literature on slotting fees. A first strand of the literature relates the existence of slotting fees to retail 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 them to relax retail competition.[9] Shaffer (2005) considers a framework in which imperfectly competitive retailers can either buy from a dominant firm or a competitive fringe. Because of slotting fees, the dominant firm may obtain scarce shelf space and foreclose more efficient rivals, for it is willing to pay a higher price to protect its rent.

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 two-part tariff contracts. Marx and Shaffer (2007) explicitly differentiate slotting fees, defined as lump-sum payments which are not conditioned by an effective sale, from franchise fees, which are paid only if the product is effectively sold. By allowing for such three-part tariffs, they typically 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. However, Miklos-Thal *et al.* (2011) and Rey and Whinston (2013) show that this result may be reversed, allowing for contracts which are contingent on the relationship being exclusive or not or a menu of tariffs. 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 instead emphasizes the efficiency effects of slotting fees, more explicitly relates slotting fees to the additionnal costs associated with new product introduction. As shown by Chu (1992) or Larivière 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) or Larivière 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 *et al.* (2009) show that, when the retailer is powerful, slotting fees make up for a high whole-

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

sale 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 decisions within the vertical chain.

To the best of our knowledge, Yehezkel (2014) is the only article that both takes into account the informative peculiarities of new products and exhibits a harmful welfare effect of slotting fees. In a context in which the manufacturer itself does not know the quality of its product, the optimal contract that gives incentives to the manufacturer to develop costly tests of its product quality includes a slotting fee. In the same vein, our article exhibits slotting fees which, by deterring efficient innovations, harm consumers and welfare. In contrast with the existing literature, we consider that information about the quality of the new product is perfect within the vertical chain. Consumers are, however, imperfectly informed about the existence of this new product. By offering the new product on its shelves, a retailer contributes to conveying information about the existence of the product to consumers, which has a positive spillover effect on the demand for the new product on other markets. We show that a retailer is therefore able to make the producer pay for this informative advertising service through slotting fees.

Our work also builds on the literature on informative advertising following the seminal paper by Grossman and Shapiro (1984), as only consumers informed about the new product's existence may have a positive demand for the good. In contrast with this literature, in which informative advertising is optimally chosen by the manufacturer, informative advertising in our model is a by-product of the sale of the new product by retailers.

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, 2007; Montez, 2007; Smith and Thanassoulis, 2012), and the negative impact of buyer power on upstream innovation incentives (see *e.g.* Batigalli *et al.*, 2007; Chen, 2014; Chambolle *et al.*, 2015). In contrast, in our framework, we show that buyer size may lower the magnitude of slotting fees paid at new product introduction and therefore facilitate upstream innovation.

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. Section 4 explores the case of new product introduction by an entrant. Section 5 analyzes the effects of an advertising

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campaign and of buyer size on slotting fees and innovation. Section 6 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 consumers. 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.

As we wish to exhibit slotting fees paid at the introduction of a new product, we consider a two-period game in which periods are indexed by $t \in \{1, 2\}$, and we neglect the discount factor ($\delta = 1$).

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. Finally, in subsection 2.3, we describe our game and the bargaining setting.

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 or a well-known good. We present these market revenues in turn for each period $t = \{1, 2\}$.

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

Assumption 1. *For all* $n \in \{1, ..., N\}$*,* $v^n \geq v^{n-1}$ *and* $v^0 = 0$.

The assumption $v^0 = 0$ simply 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 that actually sell the new good at 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 and increase demand on all markets.[10] Therefore,

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

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

Note that v^N is the largest revenue that can be generated in a given market, that is the revenue when all consumers are perfectly informed of the existence of the good. Therefore R^N is the largest industry revenue.

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 of quality q^- through any number $n \in \{1, ..., N\}$ of markets is $v^- < v^N$.*

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

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

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

This assumption implies that, if U has launched the new product on N markets in $t = 1$, then the new good becomes a well-known good and the revenue generated on each market is v^N for any $n \in \{1, ..., N\}$ markets. If the new product was sold only on $n < N$ markets in $t = 1$, then information is capitalized, but the spillover can still increase the revenue whenever $n' > n$. If the new good was sold on all N markets in $t = 1$, the total industry revenue for a new good sold in n' outlets in $t = 2$ is $n' \frac{R^N}{N}$.

For a well-known good, the revenue in $t = 2$ is the same as in $t = 1$.

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

2.2 Microfoundations

We now describe how Assumptions 1 and 2 can naturally derive from reasonable assumptions on utility and consumer information 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 the utility function, 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. In contrast, some consumers may be uninformed about the existence of the new product. When a consumer is aware of a product's existence, it maximizes $u(q, x_i) - p_i x_i$, which generates an individual demand $x(q, p_i)$, with p_i the price of the good on market i. A consumer who is not aware of the new product's existence has no demand for this good.

Demand in $t = 1$. If the new product is launched at the period $t = 1$, a consumer has a probability $\xi(n)$ of being aware of the existence of the new product, with $n \in \{1, ..., N\}$ the total number of markets in which the product is actually sold.[11] This model is in the spirit of the seminal paper by Grossmann and Shapiro (1984) on informative advertising. In their paper, the probability ξ is controlled by the manufacturer through advertising investments. In contrast, in our model, our probability is only a function of n the number of open markets on which the new product is sold in order to reflect the word-of-mouth communication process. We make two key assumptions on $\xi(n)$.

Assumption 1'. *The probability $\xi(n)$ 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 $X(q^+, n, p_i) = \xi(n)x(q^+, p_i)$. Assumption 1' induces that $X(q^+, n, p_i)$ is non-decreasing with respect to n.

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

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[11]This is one among several possible micro-foundations for our demand function. Another story could be that $\xi(n)$ represents 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. Note that in this case, the utility function could instead be written in the following way: $u(\xi(n)q, x_i) - Px_i$.

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.[12] Remark 1 induces that $X(q^+, n, p_i)$ is independent of the prices on other markets p_j, $j \neq i$.

Assuming that the revenue on a given market i when n markets are open has a unique maximum, we have:

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

Appendix A.1 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 $X(q^-, N, p_i) = x(q^-, p_i)$, even if the product is not sold on all markets. Therefore, we have:

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

Demand in $t = 2$.

Assumption 3′. *If U sells the new product 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 product in $t = 2$ is $\max(\xi(n), \xi(n'))$.*

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

2.3 Timing of the game and bargaining framework

In each period $t \in \{1, 2\}$, we consider the following two-stage game:

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[12] 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.

- In Stage 1, the manufacturer chooses whether or not to innovate. If it innovates, it pays F once and for all, and can then produce the old 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^-.

- In Stage 2, the upstream firm 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 product (otherwise).[13]

Both qualities q^- and q^+ are common knowledge.

In Stage 2, we consider sequential bargaining *à la* Stole and Zwiebel (1996). In the sequence of negotiations, the success or failure of any given negotiation is common knowledge. Therefore, each retailer knows how many negotiations have succeeded when bargaining with the manufacturer U. Besides, in case of a negotiation failure between one retailer and U, the failing pair can never negotiate again, and all other pairs renegotiate their contracts from scratch.[14]

In this framework, the value of T_{it} depends on the firms' respective bargaining weights and outside options. Without loss of generality we set the bargaining weights to $(\frac{1}{2}, \frac{1}{2})$.[15] If the revenue to share on market i is v, and the disagreement payoff of i (resp. U) is d_i (resp. d_U), when U bargains with i among n retailers, then the optimal fixed fee, T_{it} is given by:[16]

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

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 corresponding

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[13]In order to reflect actual practices, we assume that long term negotiations over tariffs are not possible.

[14]Note that this bargaining framework is equivalent to simultaneous bargaining in which the parties sign contracts which are contingent to the equilibrium market structure, that is, here, the number of active links in equilibrium.

[15]Note that the outcome of the negotiation coincides with the Shapley value.

[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 $w_{it} = 0$. If, in contrast, the informative spillover were to depend on the quantity sold on each market, each pair would have an incentive to set a wholesale price lower than the marginal cost in order to increase the quantity bought by each retailer and therefore increase revenues on all other markets. This would, however, not qualitatively change our results.

equilibrium tariff, denoted T_t^n, is such that the following equality holds:

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

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

3 Slotting allowance for a new product

As the cost of innovation is only paid once, whereas the revenue it generates can be at most cumulated over the two periods, it is immediate that, if ever, the manufacturer launches a new product in $t = 1$. Indeed, it can only be less profitable to launch the new product in $t = 2$.[17] Without loss of generality we thus restrict our analysis to the case in which the manufacturer makes its innovation decision in $t = 1$. In Section 3.1 we determine the equilibrium of the subgame in which the manufacturer has chosen not to innovate in $t = 1$ and thus sells a well-known product during the two periods. In section 3.2 we consider the equilibrium of the subgame in which the manufacturer has chosen to innovate in $t = 1$ and therefore sells the new good over the two periods. Finally, we compare both equilibria and derive the main results of the paper in Section 3.3.

3.1 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 manufacturers to sell the well-known product of quality q^-. In this case, the revenue in each outlet is v^-. All negotiations are thus independent of one another, which implies that the tariff is the same regardless of the number of open markets. As the manufacturer's profit strictly increases with the number of markets served, U bargains in equilibrium with N retailers. In the negotiation between U and each of the N retailers, outside options are $d_i = 0$ and $d_U = (N - 1)\frac{v^-}{2}$. Therefore, in equilibrium U obtains a profit $Nv^-/2$. When the manufacturer sells a well-known product, its profit is $Nv^-/2$, and the profit of each retailer $i \in \{1, ..., N\}$ is $v^-/2$.

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:

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[17]See Appendix A.2 for a formal proof.

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

Proof. Straightforward. □

3.2 The manufacturer innovates

If now the manufacturer has innovated at cost F, it bargains to sell the new product in $t \in \{1, 2\}$. 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. Due to the spillover, the two periods now differ, and we thus solve the game backward.

Assume that the new product was effectively sold in N markets in $t = 1$[18], then, in $t = 2$, regardless of the number of open markets n, the new product generates a revenue v^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 producer is still able to bargain over the well-known product with the retailer, and therefore each of them (U and i) obtains the same disagreement payoff $d_i = \frac{v^-}{2}$ whereas $d_U = \frac{v^-}{2} + (N-1)T_2^N$. As by assumption $q^+ > q^-$, $R^N > Nv^-$. Therefore, because there is extra surplus to share, any negotiation between the manufacturer and a retailer over the new product succeeds, and v^N is shared according to equation (5). The optimal fixed fee is thus given by:

$$\frac{R^N}{N} - T_2^N - \frac{v^-}{2} = T_2^N - \frac{v^-}{2}.$$

As the term $\frac{v^-}{2}$ cancels out, the equilibrium in $t = 2$ is such that N retailers sell the new product and pay the same tariff denoted $T_2^N = \frac{R^N}{2N}$. The manufacturer thus earns a profit $\Pi_2^N = R^N/2$, the profit earned when selling a well-known product of quality q^+ through N outlets.

We now solve the negotiation in $t = 1$. In this period, 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 if it were negotiating with all $n - 1$ retailers except for i over the new product, plus the profit obtained from bargaining over

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[18]We prove further that if the new product is sold in $t = 1$, it is always sold by all N retailers.

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

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

It is immediate that this negotiation fails when $R^1 \le v^-$, and succeeds otherwise. In general, we summarize 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 producer bargains with at least $\hat{n}$ retailers. The cut-off level $\hat{n}$ satisfies the following condition:*

$$\frac{R^{\hat{n}-1}}{\hat{n}-1} \le v^- < \frac{R^{\hat{n}}}{\hat{n}}. \tag{7}$$

Proof. Straightforward from Assumption 1, since $v^0 = 0$ and $R^N > Nv^-$. $\qquad\square$

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

Lemma 3. *In case the manufacturer innovates in $t = 1$, the manufacturer bargains with all N retailers in each period $t \in \{1, 2\}$, and its profit is $\Pi_1^N = \frac{1}{N+1} \sum_{i=\hat{n}}^{N} R^i + \frac{\hat{n}(\hat{n}-1)}{N+1} \frac{v^-}{2}$ 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. We give here a sketch of the proof. If the producer bargains with $\hat{n}$ retailers, the negotiation is as follows:

$$\frac{R^{\hat{n}}}{\hat{n}} - T_1^{\hat{n}} - \frac{v^-}{2} = \hat{n}T_1^{\hat{n}} - \hat{n}\frac{v^-}{2},$$

and the producer obtains the equilibrium profit:

$$\Pi_1^{\hat{n}} = \hat{n}T_1^{\hat{n}}(q^+, q^-) = \frac{R^{\hat{n}}}{\hat{n}+1} + \frac{\hat{n}(\hat{n}-1)}{\hat{n}+1}\frac{v^-}{2}.$$

This is the status-quo profit of the manufacturer when bargaining with $\hat{n}+1$ firms. By

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recurrence, the manufacturer bargains with N retailers in equilibrium and obtains a profit:

$$\Pi_1^N = \frac{1}{N+1} \sum_{i=\hat{n}}^{N} R^i + \frac{\hat{n}(\hat{n}-1)}{N+1} \frac{v^-}{2}. \tag{8}$$

Details of the recurrence are provided in Appendix A.2. □

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. We compare them formally in the next section.

3.3 Slotting fees at introduction

Comparing the profit obtained by U when selling the well-known good versus the new good in $t = 1$ and $t = 2$ and given by Lemmas 1 and 3 respectively, we obtain the following proposition:

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

Proof. See Appendix A.3. □

In order to explain how the retailer is able to capture a rent at the expense of the manufacturer who launches the new product in $t = 1$, 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 period 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. 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.

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For instance, assume $N = 2$ and the negotiation with retailer 1 has already taken place and succeeded. When bargaining in $t = 1$, in the case of a breakdown outside options are $d_U = \frac{v^1 + v^-}{2}$, as retailer 2 sells the well-known product and retailer 1 sells the new, and $d_2 = \frac{v^-}{2}$. In contrast, in $t = 2$, outside options are $d_U = \frac{v^2 + v^-}{2}$ and $d_2 = \frac{v^-}{2}$. Since the outside option of the manufacturer is strictly lower in $t = 1$ and the outside option of the retailer is unchanged, the share of the joint profit that the manufacturer is able to extract is lower in $t = 1$.

Assume now that $N = 3$. The equilibrium profit of the manufacturer obtained when $N = 2$ is nothing more than its outside option in the negotiation with the marginal retailer when $N = 3$. Therefore, applying the same reasoning as above, the equilibrium profit of the manufacturer is strictly lower than $\frac{R^3}{2}$, i.e. the profit it would earn with a well-known product. This cumulative lag in the status-quo profit of the manufacturer remains and keeps degrading the equilibrium manufacturer's profit for all $N > 3$.

Note that in a simultaneous bargaining setting *à la* Chipty and Snyder (1999), as a breakdown would not change the equilibrium tariffs paid by all remaining retailers to the manufacturer, the marginal retailer would not be able to extract a rent from the spillover.[19]

As a consequence of the spillover and renegotiation effects, each retailer pays a lower fixed fee to the manufacturer in $t = 1$ than in $t = 2$. Conversely, the manufacturer has to pay slotting fees to each retailer to introduce a new product. Note here that, in contrast to Shaffer (1991), slotting fees do not materialize through negative fixed fees in equilibrium. Moreover, in contrast with Marx and Shaffer (2007) and Miklos-Thal *et al.* (2011), 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 a lower total payment from the retailer to the manufacturer in the introduction period.

Interestingly, Proposition 1 can be well illustrated through a geometrical analysis. This representation will also be particularly insightful when considering advertising issues or retail concentration in Section 5. 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 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. Then, since Assumption 1 implies that $R^i < \frac{i}{N}R^N$, the revenue curve in the presence of a

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[19] In eq. (5), if the bargaining is simultaneous, $d_i = \frac{v^-}{2}$ and $d_U = \sum_{j \neq i} T_j + \frac{v^-}{2}$, and therefore $T_i = \frac{v^n}{2}$.

spillover (in t=1) is below the revenue curve without spillover (in t= 2).

[Figure 1 about here.]

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

$$\mathcal{A}_2^N - \mathcal{A}_1^N \equiv \sum_{i=1}^{N} \left[\frac{iR^N}{N} - R^i \right] = \frac{R^N}{N} \sum_{i=1}^{N} i - \sum_{i=1}^{N} R^i > 0. \tag{9}$$

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 $\mathcal{A}_2^N - \mathcal{A}_1^N > 0$. The graphical demonstration also extends to any $\hat{n} > 1$ (for instance, in 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 of 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. $v^{N-1} = v^N$. Although 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 its negotiation, the manufacturer still obtains a profit lower than $\frac{R^N}{2}$.[20] 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).

3.4 Innovation deterrence

Consider now the decision of the manufacturer to innovate at the first stage in $t = 1$. The manufacturer chooses to innovate if and only if the net benefit it yields (as compared to

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[20]From eq. (5), in $t = 1$, given symmetry among retailers and that $d_i = \frac{v^-}{2}$ and $d_U = \frac{v^-}{2} + \Pi_1^{N-1}$, 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 $(N + 1)T_1^N < \frac{R^N}{2}$.

selling a well-known product over the two periods) exceeds the cost of innovation, that is:

$$[\Pi_1^N + \Pi_2^N] - [2\underline{\Pi}] \geq F.$$

We thus obtain the following proposition:

Proposition 2. *In equilibrium, if innovation takes place, it occurs in $t = 1$. Due to slotting fees, efficient innovations are deterred for any fixed cost of innovation F such that:*

$$F \in \left[\Pi_1^N + \Pi_2^N - Nv^-, R^N - Nv^-\right].$$

Innovation deterrence always damages consumer surplus and welfare.

Proof. The lower bound is obtained by comparing the manufacturers' profit over the two periods, with innovation, $\Pi_1^N + \Pi_2^N - F$, and without, Nv^-. The upper bound is derived from the comparison of the profit the manufacturer would obtain by selling a new product over the two periods, with innovation but absent the spillover effect, $R^N - F$, and without innovation, Nv^-. □

Proposition 2 shows that the need for the manufacturer to compensate each 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 $\Pi_2^N > \Pi_1^N > \frac{Nv^-}{2}$. Therefore, absent innovation costs, it is always profitable for the producer to introduce the new product when it can use the well-known product as a threat point in its bargaining with the retailers: without innovation cost, an efficient innovation is always launched in equilibrium. The insight is that, by using the well-known product as a threat point, the manufacturer is by definition able to extract at least the profit it would get by selling the well-known product.

However, within the interval $\left[\Pi_1^N + \Pi_2^N - Nv^-, R^N - Nv^-\right]$, 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, outside of the above interval, a standard hold-up effect arises for $F \in \left[R^N - Nv^-, 2(R^N - Nv^-)\right]$. Indeed, even absent spillover, since the manufacturer has to leave half of the rent of innovation to retailers while incurring all of the cost, it naturally

renounces investing in this interval. Compounding this effect, we have shown that slotting fees reinforce the innovation deterrence.[21]

Such a 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.*" Our paper moreover shows that innovation deterrence resulting from the slotting fees damages the industry profit, as higher quality leads to larger industry profit: although the manufacturer prefers to sell the well-known product, the loss inflicted to the retailers is clearly larger than the gain for the manufacturer. Slotting fees also damage consumer surplus, because efficient innovation would increase the quality of the product offered to consumers. In terms of competition policy, our argument calls for a ban on slotting fees: whenever innovation deterrence occurs absent any regulation, a ban on slottings fees would benefit all parties, i.e. consumers and the manufacturer, as well as retailers. This also means that if it were possible, the retailer would commit itself to not using slotting fees before the manufacturer makes its decision to innovate. Only when innovation occurs absent the regulation does the regulation decrease the retailer's profit.

4 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, while the incumbent manufacturer, denoted I, cannot innovate and therefore at best sells the well-known product. Note that here the innovation stage in each period boils down to an entry decision stage by E. Again, it is always strictly more profitable for E to enter in period $t = 1$ than in $t = 2$, as it then gets a profit over the two periods. We thus restrict our attention to the case in which E chooses to enter in $t = 1$. When threatened by the entry of a rival, the incumbent may now wish to offer exclusive dealing agreements to (part of) the retailers to deter entry. Such "pay-to-stay fees" are, however, perceived as exclusionary conduct and may be prohibited in the US by Section 1-2 of the Sherman Act. In the EU, such practices fall under Article 101's prohibition of the "single branding" restrictions.

In what follows, we first analyze the decision to enter when pay-to-stay fees are not

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[21]In Section 5.3, we extend this result to the case of a variable cost of innovation instead of a fixed cost.

allowed, and compare innovation deterrence in the two cases in which innovation is made by I and E in Section 4.1. In Section 4.2, we then allow I to offer pay-to-stay fees to a subset of retailers and analyze how such a possibility affects innovation deterrence.

4.1 No pay-to-stay fee

Assume first that pay-to-stay fees are forbidden. 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.

Consider the period $t = 2$. If E has 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 well-known product 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 :

$$\frac{R^N}{N} - \tilde{T}_2^n - \frac{v^-}{2} = \tilde{T}_2^n \Leftrightarrow \tilde{T}_2^n = \frac{1}{2N}\left(R^N - \frac{Nv^-}{2}\right).$$

Therefore, in equilibrium E obtains in $t = 2$:

$$\tilde{\Pi}_2^N \equiv N\tilde{T}_2^N = \frac{1}{2}\left(R^N - \frac{Nv^-}{2}\right). \tag{10}$$

In case of entry, the incumbent obtains 0, whereas absent entry, it obtains $\underline{\Pi}$. Note that $\tilde{\Pi}_2^N < \Pi_2^N$: given that the new good has been launched in $t = 1$, in $t = 2$, the profit E obtains is lower than the profit the incumbent would obtain, because E is weaker than I in its bargaining with each retailer. Indeed, in case of breakdown in a given negotiation, I still obtains a positive profit from selling the product of quality q^-, whereas E has no outside option profit.

Consider now the the sale of the new product in $t = 1$. Assume first that all negotiations but one have failed with E. The disagreement payoff of E is 0, whereas the disagreement payoff of the retailer is $\frac{v^-}{2}$. The optimal fixed fee denoted $\tilde{T}_1^1$ is thus given by:

$$R^1 - \tilde{T}_1^1 - \frac{v^-}{2} = \tilde{T}_1^1 \Leftrightarrow \tilde{T}_1^1 = \frac{1}{2N}\left(R^1 - \frac{Nv^-}{2}\right). \tag{11}$$

It is immediate that $\tilde{T}_1^1$ is smaller than the tariff T_1^1 earned by an incumbent firm selling a new product, since the entrant has no status-quo in its bargaining with each retailer,

whereas each retailer has the same status-quo profit as if it were bargaining with an incumbent firm selling the new product.

This negotiation does not occur if $R^1 \leq \frac{v^-}{2}$. 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:

$$\frac{R^{\tilde{n}-1}}{\tilde{n}-1} \leq \frac{v^-}{2} < \frac{R^{\tilde{n}}}{\tilde{n}}. \tag{12}$$

Comparing eqs. (7) and (12), we have $\tilde{n} \leq \hat{n}$: the entrant needs access to fewer retailers than the incumbent to successfully launch the new product, for the sum of status-quo profits is lower in a negotiation involving the entrant, while the revenue to be shared in the negotiation is unchanged as compared to a negotiation involving an incumbent selling the new good. By recurrence, we determine the profit earned by E in $t = 1$ with $n \geq \tilde{n}$ retailers :

$$\tilde{\Pi}_1^n \equiv \frac{1}{n+1} \left(\sum_{i=\tilde{n}}^{n} R^i - \frac{n(n+1) - \tilde{n}(\tilde{n}-1)}{2} \frac{v^-}{2} \right). \tag{13}$$

As N firms bargain with E in equilibrium, E obtains $\tilde{\Pi}_1^N$. Note again that, because E has no outside option profit in its bargaining, we have $\tilde{\Pi}_1^N < \Pi_1^N$. Indeed, despite the fact that $\tilde{n} < \hat{n}$, the entrant has a lower status-quo than the incumbent in its first negotiation (0 v. $Nv^-/2$). Therefore, it gets a lower share of the joint profit in this first negotiation. This affects all subsequent negotiations and tends to reduce the profit of the entrant as compared to the profit of the incumbent. We now consider E's incentives to enter in $t = 1$, and we summarize our results in the following proposition:

Proposition 3. *If pay-to-stay fees are forbidden, due to slotting fees efficient innovations by the entrant are deterred for any innovation cost such that:*

$$F \in \left[\tilde{\Pi}_1^N + \tilde{\Pi}_2^N, R^N - \frac{Nv^-}{2} \right].$$

Due to the Arrow replacement effect, a new entrant always has higher incentives to launch a new product than an incumbent manufacturer.

Proof. See Appendix A.4. □

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Our proposition confirms that slotting fees may even have a deterrence effect on innovation by an entrant. It is easier, however, for the entrant than for an incumbent to launch a new product. Two forces are in balance to explain this second result.

On the one hand, as explained above, because E has a weak bargaining position with retailers compared to the incumbent, we have both $\tilde{\Pi}_1^N < \Pi_1^N$ and $\tilde{\Pi}_2^N < \Pi_2^N$.

On the other hand, absent the cost F, the entrant has an incentive to launch the new product as soon as it yields a positive profit. In contrast, I must ensure that it yields a larger profit than Nv^-, the profit it would earn with the well-known product of quality q^-. This corresponds to the Arrow replacement effect (Arrow, 1962), which reduces the net gain of launching a new product for the incumbent. This second effect always dominates.

Note that the upper bound $R^N - \frac{Nv^-}{2}$, which corresponds to the entrant profit absent any spillover in the first period, i.e. $2\tilde{\Pi}_2^N$, is larger than the upper bound in the incumbent case $R^N - Nv^-$. Again, this is because the replacement effect overwhelms the hold-up effect.

4.2 Pay-to-stay fees

We now assume that in period $t = 1$, there exists a preliminary stage in which the incumbent may offer an exclusive dealing agreement to each retailer in exchange for a lump-sum payment (*i.e.* offer a pay-to-stay fee) denoted ϕ. Without loss of generality, we assume that the exclusivity agreement prevails over $t = \{1, 2\}$. These agreements may be discriminatory. Each retailer that receives an exclusive dealing offer then chooses to accept or refuse the agreement. We adopt here the framework of assumptions of Segal and Whinston (2000). In particular, we assume that retailers can coordinate their acceptance or rejection decisions over their most preferred equilibrium.[22] After this preliminary stage, a new entrant selling a new product of quality $q^+ > q^-$ chooses to enter or not at cost $F \simeq 0$. We voluntarily examine the case in which entry would be inevitable absent pay-to-stay fees to better emphasize their exclusionary properties.

Assume first that $f > \tilde{n}$ retailers are free, i.e. they have refused the incumbent contract in the preliminary stage. Next, assume that E entered. Then, the f free retailers may bargain with E in periods $t = \{1, 2\}$. In this bargaining, each of the free retailers has a

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[22]In contrast, if retailers cannot coordinate their acceptance or refusal over the incumbent's offer, there exists for instance an equilibrium in which the incumbent can profitably deter entry by offering an infinitesimal pay-to-stay fee ϵ to each of N retailers (See Rasmusen et al. (1991)).

status-quo profit equal to $\frac{v^-}{2}$. According to the previous section, we know that E thus succeeds in its bargaining with all f retailers in equilibrium in $t = 1$. As $N - f$ retailers were selling the product of I, the spillover has not entirely played its role. In $t = 2$, there is no more spillover among the f free retailers: the joint profit on each of the f free outlets is $\frac{R^f}{f}$. In $t = 2$, I obtains a profit $(N - f)(\frac{v^-}{2} - \phi)$, each tied retailer earns $\frac{v^-}{2} + \phi$, and the profit of E is $\tilde{\Pi}_2^f$, given by equation (10). We denote $\tilde{\pi}_t^f$ the profit of a single retailer which deals with the entrant when f retailers sell the new product in period t. Here, each free retailer obtains $\tilde{\pi}_2^f = \frac{1}{2f}(R^f + \frac{Nv^-}{2})$.

Consider now period $t = 1$. Again, E succeeds in its bargaining with all f retailers in equilibrium. As among the f retailers, the spillover effect arises, the profit of the entrant in $t = 1$ is $\tilde{\Pi}_1^f$, defined by equation (13). In equilibrium, the profit of a free retailer is $\tilde{\pi}_1^f = \frac{R^f - \tilde{\Pi}_1^f}{f}$. The profits of I and the tied retailers are the same as in $t = 2$.

At the entry stage, E enters if and only if it expects a positive profit, *i.e.* if and only if $F < \tilde{\Pi}_1^f + \tilde{\Pi}_2^f$. In case of entry, the profit of I over the two periods is $(N - f)(v^- - \phi)$.

At the preliminary stage, I chooses either to accomodate or to blockade entry.

Accomodation. Assume first that I offers a pay-to-stay fee to $N - \tilde{n}$ or fewer retailers. In this case, regardless of the number of tied retailers, E enters and sells to all $f \geq \tilde{n}$ free retailers. In each period $t = \{1, 2\}$, the profit of each retailer that buys from E is necessarily larger than its status-quo profit, $\frac{v^-}{2}$. Then, each pay-to-stay fee would have to be larger than v^- for any exclusivity contract running over the two periods to be accepted by a retailer. However, I earns at most $(N - f)v^-$. I therefore cannot profitably lock in less than $N - \tilde{n}$ retailers. In case of accomodation, no pay-to-stay fee is offered to the retailers, and therefore E enters and sells its new product over all N markets from the first period. The profit of I is 0.

Entry Blockaded. Assume now that I offers a pay-to-stay fee to strictly more than $N - \tilde{n}$ retailers. In that case, if at least $N - \tilde{n} + 1$ retailers accept, entry is blockaded and I earns $\frac{Nv^-}{2} - k\phi$ in which $k \geq N - \tilde{n} + 1$ is the number of retailers that accepts the agreement. It is then optimal for I to offer pay-to-stay fees to exactly $N - \tilde{n} + 1$ retailers. Each retailer accepts a pay-to-stay fee, if its profit with I when all other retailers accept is at least equal to the profit obtained when all refuse the deal. This condition can be written as follows:

$$v^- + \phi \geq \tilde{\pi}_1^N + \tilde{\pi}_2^N. \tag{14}$$

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The incumbent chooses ϕ in order to bind the above constraint, and therefore:

$$\phi = \tilde{\pi}_1^N + \tilde{\pi}_2^N - \upsilon^-. \tag{15}$$

As the retailer's profit in each period is strictly increasing with respect to the quality of the new product, q^+, ϕ is strictly increasing with respect to q^+. The profit of the incumbent when entry is blockaded is thus $N\upsilon^- - (N - \tilde{n} + 1)\phi$, with ϕ defined in (15). Therefore, the incumbent obtains a larger profit by blockading than by accomodating entry if:

$$N\upsilon^- \geq (N - \tilde{n} + 1)\phi. \tag{16}$$

The above condition is therefore less likely to hold as q^+ increases, since ϕ strictly increases in q^+ and $\tilde{n}$ decreases in q^+.

Let us now analyze the effect of the spillover on condition (16), keeping qualities constant. To do so, denote ϕ' the pay-to-stay fee that the incumbent would have to pay to each retailer absent any spillover. In this case, the profit of a retailer would be the same in the two periods, and equal to $\tilde{\pi}_2^N$. Absent spillover, it is then immediate that $\tilde{n} = 1$, which means that the manufacturer needs to compensate every retailer for renouncing buying from E. Moreover, applying the same reasoning as in equation (14), we obtain $\phi' = 2\tilde{\pi}_2^N - \upsilon^-$. Absent spillovers, condition (16) thus becomes:

$$N\upsilon^- \geq N\phi'. \tag{17}$$

We analyze the difference between the left-hand sides of the two conditions (16) and (17) and find that exclusion by the incumbent is easier with spillover if and only if:

$$N(\phi - \phi') - (\tilde{n} - 1)\phi < 0.$$

We obtain the following proposition:

Proposition 4. *Spillovers have an ambiguous effect on exclusion through pay-to-stay fees. On the one hand, they increase the pay-to-stay fee amount that the incumbent must pay to secure one retailer. On the other hand, they may decrease the number of retailers that must be secured.*

If $\tilde{n} \geq N/3 + 1$, then deterring entry is easier with spillovers than without.

Proof. See Appendix A.5. □

The strategy of the incumbent corresponds to the "divide-and-conquer" strategy high-lighted in Segal and Whinston (2000). In our framework, however, the advantage of the incumbent results from the informative externality, which similarly ensures that the revenue on each market increases with the number of firms that sell the new product. Interestingly, in our model, buyer power is crucial for spillovers to induce such a divide-and-conquer strategy: if retailers had no bargaining power, either all or none of them would be offered a pay-to-stay fee. Besides, in our framework, it is possible to exclude the potential entrant, even if it bears no cost to launch the new product. Indeed, no retailer will accept to deal with the entrant unless it can offer more than the profit that the retailer would earn with the well-known product; this can only happen if at least $\tilde{n}$ retailers remain free.

5   On the magnitude of slotting fees

This section highlights comparative static results on the magnitude of slotting fees paid by the manufacturer with respect to the spillover intensity, retail concentration and the quality of the new product.

The magnitude of slotting fees is expressed as the relative loss of profits in the first period as compared to the second period. In what follows, the Slotting Fee Magnitude, denoted SFM, is thus defined as follows:

$$SFM \equiv 1 - \frac{\Pi_1^N}{\Pi_2^N}.$$

5.1   Spillover intensity and advertising strategies

Let us first consider a variation in spillover intensity. In our framework, this corresponds to a change in the distribution of market revenues from v^n to $\bar{v}^n$. We consider that the informative spillover decreases if $\forall n \in [1, N]$ $\bar{v}^n \geq v^n$ and $\exists n \in [1, N]$ such that $\bar{v}^n > v^n$.

When the informative spillover decreases (increases), information across markets through the sales in retailers' outlets has a smaller (larger) role to play in boosting 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 in 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 paid by the manufacturer for the new product introduction. It weakly softens (resp. reinforces) innovation deterrence.*

Proof. See Appendix A.6 □

Consider now that the manufacturer can affect the informative spillover intensity. It could do so for instance by launching an advertising campaign to inform consumers about its new product. The classic informative advertising model by Grossman and Shapiro (1984), which is introduced in section 2.2, is useful here to present our insights. Let us introduce a, the amount spent in informative advertising by the manufacturer. We now assume that the probability that a consumer is aware of the existence of the product on each market becomes $\xi(n, a)$, which is increasing in a. For a given n, a strong level of advertising increases the market revenue $v^n = \max_{p_i} \xi(n, a) x(p_i, q^+)$ and thus decreases the informative spillover. Each retailer would then contribute less to the diffusion of information about the product, and thus be able to extract lower slotting fees. The manufacturer then faces a trade-off between the ex-ante advertising cost 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 claims that "*Manufacturers that perform thorough market research and support new products with strong advertising campaign often do not pay allowance.*"[23] As in Desai (2000), we find that "*advertising and slotting allowance are partial substitutes of one another in the sense that the manufacturer can increase one in order to compensate for a reduction in the other.*"

To give an illustration of these results, we consider the following example. Assume that the representative consumer's utility on each market is $u(q, x_i) = q x_i - \frac{x_i^2}{2}$ if aware of the

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

product's existence and 0 otherwise. This leads to a linear demand function on each market $x_i(q^+, p_i) = q^+ - p_i$. Assume now that $\xi(n, a) = (\frac{n}{N})^{1-a}$, where $a \in [0, 1]$ represents the level of advertising. In the case $a = 1$, all potential consumers are aware of the product's existence through advertising, and therefore there is no informative spillover. Maximizing the representative consumer's utility with respect to x_i, we obtain the following expected demand function: $X(q^+, n, p_i) = \xi(n, a)(q^+ - p_i)$. Maximizing the profit on market i, we obtain $R^n = \frac{n\xi(n,a)(q^+)^2}{4}$.

Assume that $q^- = 1$, $q^+ = 1.3$ and $N = 8$. The resulting revenue with the well-known good on each market is $v^- = 1/4$, and the total profit earned by the manufacturer over the two periods with the well-known good is 2. The resulting second-period profit with the new good is $\Pi_2^N = 1.69$.

In Table 1, for each value of a corresponding to a level of advertising intensity, we give the value of $\hat{n}$ (the minimum number of retailers that must be reached for negotiations to succeed) and the equilibrium profits in the two periods. Absent slotting fees, the manufacturer's profit in each period would be equal to the second period profit. The last column gives the slotting fee magnitude.

[Table 1 about here.]

Following Corollary 4, in Table 1 the percentage of slotting fees paid in the first period by the manufacturer decreases with respect to a (advertising intensity). In this example, the total profit earned by the manufacturer over the two periods with the new product is 2.99 when $a = 0$ and 3.1 when $a = 0.5$. If the innovation cost is $F = 1$, the innovation is deterred in the former case. However, the manufacturer would be ready to pay up to 0.1 for an advertising campaign that lowers a from 0 to 0.5, and then it could innovate. This suggests that large manufacturers with powerful communication tools are likely to pay a retailer lower slotting fees when launching a new product than smaller manufacturers.

5.2 Retail concentration

In order to account for a size effect, we assume now that the manufacturer faces symmetric retailers, with each owning s outlets. To simplify the analysis, we assume that the number of outlets is $M = sN$, and therefore N corresponds here to the number of retailers. Allowing for the presence of larger retailers enables us to account for the effect of down-

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stream concentration on the sharing of industry revenue and innovation. Note that we have to modify Assumption 2, as the number of markets is now sN, and therefore we have: $v^- < v^{sN}$. Note also that an immediate consequence of the independence between the level of output and the spillover is that even if one retailer owns two outlets or more when n markets are open, the optimal revenue on each market is independent of the number of outlets it owns. We therefore avoid a size effect through quantities.

If $\hat{m}$ denotes the threshold number of oulets below which all negotiations fail, we show that the threshold number of open retailers below which all negotiations fail is $\hat{n} = \lfloor \frac{\hat{m}}{s} + 1 \rfloor$ if $\hat{m}$ is not a multiple of s, and $\hat{n} = \frac{\hat{m}}{s}$ otherwise.

We denote by $\Pi_t^{s,n}$ the profit of a manufacturer selling to n retailers, each owning s outlets in period t. By recurrence,[24] we obtain the following general formula when a manufacturer faces N retailers of size s (and $M = sN$ outlets):

$$\Pi_1^{s,N} = \frac{1}{N+1} \sum_{i=\hat{n}}^{N} R^{si} + \frac{\hat{n}(\hat{n}-1)}{N+1} \frac{sv^-}{2}. \tag{18}$$

We now compare this profit with the manufacturer's profit obtained with small retailers, that is:

$$\Pi_1^{1,sN} = \frac{1}{sN+1} \sum_{i=\hat{m}}^{sN} R^i + \frac{\hat{m}(\hat{m}-1)}{sN+1} \frac{v^-}{2}. \tag{19}$$

In order to determine the effect of buyer size on the manufacturer's profit, it is useful to first note that a retailer applies the average spillover amongst its own outlets. Indeed, the decision of a large retailer is binary: it bargains over all its outlets at the same time and thus cannot decide to sell the new product in only part of its outlets. As a consequence, the spillover effect applies uniformly over its outlets. Figure 2 is then useful to understand the effect of the buyer size on the bargaining between the retailers and the manufacturer.

[Figure 2 about here.]

In Figure 2, we first draw the two curves representing the revenue function considered by $N = 8$ retailers of size $s = 1$ in the first and second period. In $t = 2$, the revenue is the line of equation $m\frac{R^8}{8}$. As mentioned in Section 3.3, the area between the two curves represents the amount of slotting fees paid by the manufacturer in $t = 1$.

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[24]Details are provided in Appendix A.7.1.

Assume now that one retailer monopolizes the retail market, i.e. $N = 1$ and $s = 8$. Then in the above graph, the same line of equation $m\frac{R^8}{8}$ now represents the revenue function both in the first and second periods, and thus the area, and hence slotting fees disappear. Indeed, as there is no firm outside the group, the spillover plays no role in the bargaining. Therefore, full retail concentration benefits the manufacturer.

Consider now the case with $N = 4$ retailers of size $s = 2$. In Figure 2, we now draw the revenue function in this case. As this curve is above the revenue curve with $N = 8$ retailers of size $s = 1$ for all n, the area between the diagonal and the revenue curve that represents the amount of spillovers (see eq. (9)) shrinks, so the retailer's concentration always benefits the manufacturer.

Consider for instance the negotiations for outlets 5 and 6, that is, starting at point $\mathcal{P}$. When the manufacturer bargains with 2 independent outlets, it takes into account the marginal contribution of each outlet, that is $(R^6 - R^5)$. In contrast, when bargaining with a large retailer of size 2, it takes into account the total contribution over the two outlets, that is $(R^6 - R^4)$. Because the revenue curve is convex, the inframarginal contribution is lower than the marginal contribution and therefore the manufacturer must leave a larger share of the revenue to the small outlets. We obtain the following proposition:

Proposition 5. *A manufacturer pays no slotting fee in the case of full retail concentration. When the spillover is such that the cumulative revenue function is convex, the magnitude of slotting fees strictly decreases as the size of retail groups increases.*

Proof. See Appendix A.7.2. □

In contrast, when the revenue curve is not convex, the large-retailer curve is below the small-retailer curve for some values of n. This is for instance the case in Figure 3. Then, the spillover exerted by the group is locally stronger than that of the marginal small retailer. In that case, it is clear that the effect of retailing concentration on the manufacturer's profit is ambiguous. Slotting fees may now increase with retail concentration. Note however that sufficient retail concentration always lowers slotting fees as compared with no concentration at all. As mentioned in Proposition 5, the monopolization of the retail sector always implies zero slotting fees. We provide in Appendix A.7.2 the example corresponding to Figure 3.

[Figure 3 about here.]

5.3 Quality gap

We now analyze the impact of the quality gap $(q^+ - q^-)$ on the magnitude of slotting fees and the incentives to innovate. The magnitude of slotting fees can be written as:

$$SFM = 1 - \left[\frac{2}{N+1} \left(\frac{\sum_{i=\hat{n}}^{N} R^i}{R^N} \right) + \frac{\hat{n}(\hat{n}-1)}{N(N+1)} \frac{Nv^-}{R^N} \right].$$

An increase in the quality q^+ increases demand on any given market. It thus increases v^n and R^n, and hence decreases $\hat{n}$. If $\hat{n}$ is larger than 1, $\hat{n}$ and $\hat{n}(\hat{n}-1)$ decrease with q^+. In addition, as the gap $q^+ - q^-$ increases, the ratio $\frac{Nv^-}{R^N}$ decreases. Therefore, the second term in the brackets is strictly decreasing with respect to q^+. As for the first term in the brackets, the effect of q^+ is ambiguous, as both the numerator and denominator increase. Therefore, the total effect of the quality gap on the magnitude of slotting fees may depend on the specification of spillovers.

Using the same simple example as in the previous section, we summarize the effect of an increase of q^+ in Table 2, for $a = 0$, which corresponds to a case in which the spillover intensity is the strongest.

[Table 2 about here.]

From Table 2, an increase in the quality q^+ increases the magnitude of slotting fees. Despite this effect, the profit of the manufacturer clearly increases as the quality increases. As a consequence, if the cost associated with innovation is fixed, the incentives to innovate always increase with q^+. If, however, the cost associated with innovation is increasing with respect to the level of quality achieved, then the optimal quality choice is obtained by equalizing the marginal revenue of the manufacturer to its marginal cost, where the marginal revenue corresponds to the derivative of the manufacturer's profit with respect to q^+. One can then write this profit as a function of the second period profit of the manufacturer and the magnitude of slotting fees, that is:

$$\Pi_1^N + \Pi_2^N = (2 - SFM)\Pi_2^N = (2 - SFM)\frac{R^N}{2}.$$

Denoting $\partial_{q^+} R^N$ and $\partial_{q^+} SFM$ the corresponding variations of the revenue and the slotting

fee magnitude with q^+, we then derive the manufacturer's profit with respect to q^+:

$$\underbrace{\frac{2 - SFM}{2} \partial_{q^+} R^N}_{(1)} - \underbrace{\partial_{q^+} SFM \frac{R^N}{2}}_{(2)}.$$

We can then highlight two reasons why the manufacturer may have an incentive not to choose the optimal quality from the point of view of the industry when innovating. On top of a standard hold-up effect, the marginal benefit of increasing quality is lower in the presence of an informative spillover for two additional reasons. First, from the left-hand term (1), the manufacturer only earns a share $\frac{2 - SFM}{2}$ of the marginal revenue of quality investment, instead of 1 absent any informative spillover,[25] which reinforces the hold-up effect and pushes the manufacturer to under-invest. Second, from the right-hand term (2), assuming that the magnitude of slotting fees SFM is increasing with respect to q^+, it further decreases the marginal benefit of quality investment.

6   Conclusion

In this paper, we provide 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 offers an interesting twist as compared to the existing literature. Indeed, the literature that explains slotting fees through information issues related to the new product introduction generally enhances the efficiency effects. In contrast, the presence of an informative spillover based on information about the existence of the product to consumers deters efficient innovation and reduces industry profits and consumer surplus.

In terms of competition policy, our argument thus clearly adds to the list of harmful effects of slotting fees. Moreover, according to the EU report on Unfair Trade Practices, "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

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[25]If there were no hold-up, the manufacturer would obtain all the revenue in both periods, and therefore the first term would be $2\partial_{q^+} R^N$.

[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", 2016.

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.

Our additional results also have consequences in terms of competition policy. We first show that the informative spillover can facilitate the use of pay-to-stay fees by the incumbent to deter the entry of an innovative rival. Moreover, we show that less powerful manufacturers, that is manufacturers who cannot advertise their new products at a low cost, are likely to pay more slotting fees to retailers. Therefore, the innovation deterrence effect is more likely to harm small manufacturers.

Finally, if a large literature confirms that retail concentration increases buyer power, our model shows that slotting fees decrease with retail concentration under reasonable conditions. Indeed, when the size of retail groups increases, the number of outlets outside of each group, that is on which the informative spillover is exerted, decreases.

One further direction for research is to take into account competition at the retail level. In a framework in which consumers have the same valuation for quality and competition is soft enough, we believe our main results would hold.[27] Indeed, competition creates a substitutability among outlets that goes against the complementarity created by the informative spillover. However, in the introduction period, all other things being equal, the informative spillover still enables retailers to capture a rent from the manufacturer regardless of the retail market structure.[28]

References

Arrow, K.J., 1962. "Economic welfare and the allocation of resources for invention," in *The Rate and Direction of Inventive Activity: Economic and Social Factors*, Universities-National Bureau, 609-626.

Barry, T. and D.J. Howard, 1990. "A Review and Critique of the Hierarchy of Effects in Advertising," *International Journal of Advertising*, 9:2, 121-135.

Batigalli, P., Fumagalli, C. and M. Polo, 2007. "Buyer Power and Quality Improvement," *Research in Economics*, 61, 45-61.

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[27]In case of intense retail competition, the equilibrium of the bargaining game may be such that only a subset of retailers sell the new product. Moreover, if consumers are heterogeneous in their valuation for quality, a differentiation issue may arise. Taking into account these two dimensions may affect our results.

[28]The only exception is the full monopolization of the retail market.

Chambolle. C, Christin, C. and G. Meunier, 2015. "Optimal production channel for private labels: Too much or too little innovation?," *Journal of Economics & Management Strategy*, 25:2, 348-368.

Chipty, T. and Snyder, C.M., 1999. "The Role of firm size in bilateral bargaining: a study of the cable television industry," *Review of Economics and Statistics*, 81, 326-340.

Chen, Z. 2014. "Supplier Innovation in the Presence of Buyer Power," *Economic Papers*, Carleton University Department of Economics.

Chu, W. 1992. "Demand signaling and screening in channels of distribution," *Marketing Science* , 11:4, 324-47.

Desai, P. S. 2000. "Multiple Messages to Retain Retailers: Signaling New Product Demand," *Marketing Science*, 19:4, 381-389.

European Commission, 2010. "Guidelines on Vertical Restraints".

European Commission Report, 2016. "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.

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, 2003. "The Use of Slotting Allowances in the Retail Grocery Industry: Selected Case Studies in Five Product Categories," Washington, DC. Available at http://www.ftc.gov/opa/2003/11/slottingallowance.htm

Foros, O and H.J. Kind, 2008. "Slotting Allowances Harm Retail Competition," *Scandinavian Journal of Economics*, 110:2, 367-384.

Foros, O, H.J. Kind, and J. Y. Sand, 2009. "Slotting Allowances and Manufacturers' Retail Sales Effort," *Southern Economic Journal*, 76:1, 266282.

Grossman, G. and C. Shapiro, 1984. "Informative Advertising with differentiated products," *Review of Economic Studies*, 51, 63-81.

Hristakeva, S., 2016. "How Do Vertical Contracts Affect Product Availability? An Empirical Study of the Grocery Industry," Mimeo.

Inderst, R. and C. Wey, 2003. "Market Structure, Bargaining, and Technology choice in Bilaterally Oligopolistic Industries," *The RAND Journal of Economics*, 34:1, 1-19.

Inderst, R. and C. Wey, 2007. "Buyer Power and Supplier Incentives," *European Economic Review*, 51:3, 647-667.

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

Larivière Martin A. and V. Padmanabhan, 1997. "Slotting Allowances and New Product Introductions," *Marketing Science*, 16:2, 112-128.

Marx, L. M. and Shaffer, G., 2007. "Upfront Payments and Exclusion in Downstream Markets," *The RAND Journal of Economics*, 38:3, 823-843.

Marx, L. M. and Shaffer, G., 2010. "Slotting Allowances and Scarce Shelf Space," *Journal of Economics & Management Strategy*, 19, 575-603.

McKinsey, 2010. "A new way to measure word-of-mouth marketing," available at: http://www.mckinsey.com/business-functions/marketing-and-sales/our-insights/a-new-way-to-measure-word-of-mouth-marketing/

Montez, J., 2007. "Why Bake a Larger Pie When Getting a Smaller Slice?," *The RAND Journal of Economics*, 38:4, 948-966.

Morton, Jack, 2012. "New Realities 2012," available at: http://www.jackmorton.com/press-release/jack-morton-publishes-new-realities-2012-research/

Miklos-Thal,J., P. Rey, and T.Vergé, 2011. "Buyer Power and Intrabrand Coordination," *Journal of the European Economic Association* 9:4, 721-741.

Nielsen Global New Products Report, 2013. available at: http://www.nielsen.com/us/en/insights/reports/2013/nielsen-global-new-products-report–january-2013.html

Rasmusen, E.B., Ramseyer, J.M., Wiley, Jr., J.S., 1991. "Naked Exclusion," *The American Economic Review*, 81:5, 1137-1145.

Rey, P. and M. Whinston, 2013. "Does retailer power lead to exclusion?," *RAND Journal of Economics*, 44:1, 75-81.

Shaffer, G. 1991. "Slotting Allowances and Retail Price Maintenance: A Comparison of Facilitating Practices," *RAND Journal of Economics*, 22:1, 120-35.

Shaffer, G., 2005. "Slotting Allowances and Optimal Product Variety," *The B.E. Journal of Economic Analysis & Policy*. 5:1.

Segal, I.R., Whinston, M.D., 2000. "Naked Exclusion: Comment," *The American Economic Review*, 90:1, 296-309.

Smith, H. and J. Thanassoulis, 2012. "Upstream uncertainty and countervailing power," *International Journal of Industrial Organization*, 30, 483-495.

Stole, L.A. and Zwiebel, J., 1996. "Intra-firm bargaining under non-binding contracts,"

Review of Economic Studies, 63, 375-410.

Sullivan, M.W., 1997. "Slotting Allowances and the Market for New Products", *Journal of Law & Economics*, 40:2, 461-93.

Yehezkel, Y., 2014. "Motivating a Supplier to Test a Product Quality," *The Journal of Industrial Economics*, 62:2, 309-345.

A   Appendix

A.1   Assumption 1' and Assumption 1

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

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

Following equation (3), we can write:

$$
\begin{aligned}
v^n - v^{n-1} &= X(q^+, n, p_i^*(q^+, n)) p_i^*(q^+, n) - X(q^+, n-1, p_i^*(q^+, n-1)) p_i^*(q^+, n-1) \\
&= X(q^+, n, p_i^*(q^+, n)) p_i^*(q^+, n) - X(q^+, n, p_i^*(q^+, n-1)) p_i^*(q^+, n-1) \\
&\quad + [X(q^+, n, p_i^*(q^+, n-1)) - X(q^+, n-1, p_i^*(q^+, n-1))] p_i^*(q^+, n-1) \\
&> 0
\end{aligned}
$$

The first part is positive simply because $p^*(n)$ maximizes $X(q^+, n, p_i) p_i$. The second part is positive because of Assumption 1': since $\xi(n) > \xi(n-1)$, $X(q^+, n, p_i)$ is increasing with respect to n. Therefore Assumption 1' implies Assumption 1. This inequality $v^n > v^{n-1}$ implies that $\frac{R^n}{n} > \frac{R^{n-1}}{n-1}$, which can be rewritten as $R^i < i \frac{R^N}{N}$, $\forall i < N$.

A.2   Bargaining in period 1

If the producer 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:

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

and the producer obtains the equilibrium profit:

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

This profit is the status-quo profit of the producer in its bargaining with $\hat{n} + 1$ retailers. By recurrence, we show that the equilibrium profit of the producer when he bargains with all N retailers is:

$$\Pi_1^N = \frac{1}{N+1} \sum_{i=\hat{n}}^{N} R^i + \frac{\hat{n}(\hat{n}-1)}{N+1} \frac{v^-}{2}. \tag{20}$$

Assume that the above formula is true when U bargains with $n > \hat{n}$ retailers:

$$\Pi_1^n = \frac{1}{n+1} \sum_{i=\hat{n}}^{N} R^i + \frac{\hat{n}(\hat{n}-1)}{n+1} \frac{\upsilon^-}{2}. \tag{21}$$

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

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

The left-hand term is the difference between the profit the retailer obtains in case of success in the negotiation $\frac{R^{n+1}}{n+1} - T_1^{n+1}$ and its outside profit from the sale of the well-known product $\frac{\upsilon^-}{2}$. The right-hand term is the difference between the profit of the manufacturer if all negotiations succeed $(n+1)T_1^{n+1}$ and its outside option profit, i.e. the sum of the profit that it would obtain from the sale of the new product in n markets Π_1^n and the profit from the sale of the well-known product on the market $n+1$. We can simplify the above expression and 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 that:

$$\Pi_1^{n+1} = \frac{1}{n+2} \sum_{i=\hat{n}}^{n+1} R^i + \frac{\hat{n}(\hat{n}-1)}{n+2} \frac{\upsilon^-}{2}. \tag{22}$$

For all $\hat{n} \in \{1,...N\}$:

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

The profit of U strictly increases with the number of downstream firms it bargains with. Indeed, for all $n \in [1,N]$ we have:

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

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

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

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

The first difference is always strictly positive as $R^i < R^{n+1}$ for all $i \in \{\hat{n}, ..., n\}$. The second difference is also strictly positive as $\frac{R^{n+1}}{\hat{n}} > \frac{R^{\hat{n}}}{\hat{n}}$, and from (7) we know that $\frac{R^{\hat{n}}}{\hat{n}} > \upsilon^-$. As a consequence, U always bargains with N retailers when it launches the product. If U chooses to launch the new product, it is always more profitable to sell it in $t = 1$: it is straightforward that $N\frac{\upsilon^-}{2} + \Pi_1^N < \Pi_1^N + \Pi_2^N$.

A.3 Proof of Proposition 1

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

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

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

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

A.4 Proof of Proposition 3

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

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

If all negotiations but one have failed, the remaining negotiation is successful if and only if $\tilde{n} = 1$. In this case, the profit of the entrant (and hence the status-quo profit of the entrant in its negotiation with two firms) is $\tilde{T}_1^1$, given by equation (11). Otherwise the status-quo profit of the entrant in its negotiation with two firms is 0. Extending this reasoning to any $\tilde{n} > 1$, consider now that the supplier bargains with $\tilde{n}$ 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:

$$\frac{R^{\tilde{n}}}{\tilde{n}} - \tilde{T}_1^{\tilde{n}} - \frac{\upsilon^-}{2} = \tilde{n}\tilde{T}_1^{\tilde{n}}.$$

The resulting profit of the entrant is:

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

Consider now that the supplier bargains with $\tilde{n}+1$ retailers. Status-quo profits are given by:

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

The negotiation with each of the $\tilde{n}+1$ retailers gives:

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

which yields:

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

The resulting profit of the entrant is:

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

By recurrence, for any $n \in \{\tilde{n}, \cdots, N\}$, the profit of E is given by:

$$\tilde{\Pi}_1^n = \frac{1}{n+1}\left(\sum_{i=\tilde{n}}^{n} R^i - \frac{\upsilon^-}{2}\sum_{i=\tilde{n}}^{n} i\right) = \frac{1}{n+1}\left(\sum_{i=\tilde{n}}^{n} R^i - \frac{n(n+1)-\tilde{n}(\tilde{n}-1)}{2}\frac{\upsilon^-}{2}\right). \quad (23)$$

Since retailers equally share the remaining profit, we have:

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

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From equations (22) and (23), 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 the incumbent is always larger than that of the entrant. From equation (10) and Lemma 1, the difference $\tilde{\Pi}_2^N - \Pi_2^N = -\frac{N\upsilon^-}{4} < 0$. The difference between the net gains of launching the new product for the entrant and the incumbent is simply given by $[\tilde{\Pi}_1^N + \tilde{\Pi}_2^N] - [\Pi_1^N + \Pi_2^N - N\upsilon^-]$, 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 an entrant than for an incumbent.

A.5 Proof of Proposition 4

Assume that the fixed fee is $F = 0$ and that condition (17) is satisfied, that is, the incumbent is able to blockade entry without spillover. We then find a sufficient condition

to ensure that the incumbent is able to blockade entry in the presence of spillover.

Entry is blockaded without spillover if and only if:

$$Nv^- \geq N\phi' \iff Nv^- \geq N(2\tilde{\pi}_2^N - v^-) \iff v^- \geq \tilde{\pi}_2^N \iff v^- \geq \frac{1}{2}\frac{R^N}{N} + \frac{v^-}{4} \iff v^- \geq \frac{2}{3}\frac{R^N}{N}.$$

We thus consider that $\frac{R^N}{N} \in \left[v^-, \frac{3}{2}v^-\right]$, or alternatively $v^- \in \left[\frac{2}{3}\frac{R^N}{N}, \frac{R^N}{N}\right]$. Consider now the condition to ensure that entry is blockaded with spillover:

$$Nv^- \geq (N - \tilde{n} + 1)\phi.$$

This can be written:

$$
\begin{aligned}
(N - \tilde{n} + 1)\phi &= (N - \tilde{n} + 1)(\tilde{\pi}_1^N + \tilde{\pi}_2^N - v^-) \\
&= (N - \tilde{n} + 1)\left(\frac{R^N}{N} - \frac{1}{N(N+1)}\sum_{i=\tilde{n}}^{N} R^i + \frac{N(N+1) - \tilde{n}(\tilde{n}-1)}{N(N+1)}\frac{v^-}{4} + \frac{1}{2}\frac{R^N}{N} + \frac{v^-}{4} - v^-\right), \\
&= (N - \tilde{n} + 1)\left(\frac{3}{2}\frac{R^N}{N} - \frac{1}{N(N+1)}\sum_{i=\tilde{n}}^{N} R^i + \left(\frac{N(N+1) - \tilde{n}(\tilde{n}-1)}{N(N+1)} - 3\right)\frac{v^-}{4}\right), \\
&= (N - \tilde{n} + 1)\left(\frac{3}{2}\frac{R^N}{N} - \frac{1}{N(N+1)}\sum_{i=\tilde{n}}^{N} R^i - \frac{2N(N+1) + \tilde{n}(\tilde{n}-1)}{N(N+1)}\frac{v^-}{4}\right).
\end{aligned}
$$

We now determine an upper bound for $(N - \tilde{n} + 1)\phi$, using $v^- \geq \frac{2}{3}\frac{R^N}{N}$ and $R^i \geq i\frac{v^-}{2} \geq \frac{i}{3}\frac{R^N}{N}$.
We thus have:

$$
\begin{aligned}
\phi &\leq \frac{3}{2}\frac{R^N}{N} - \frac{1}{N(N+1)}\sum_{i=\tilde{n}}^{N} \frac{i}{3}\frac{R^N}{N} - \frac{2N(N+1) + \tilde{n}(\tilde{n}-1)}{N(N+1)}\frac{1}{4}\left(\frac{2}{3}\frac{R^N}{N}\right), \\
\phi &\leq \frac{R^N}{N}\left(\frac{3}{2} - \frac{N(N+1) - \tilde{n}(\tilde{n}-1)}{6N(N+1)} - \frac{2N(N+1) + \tilde{n}(\tilde{n}-1)}{6N(N+1)}\right) = \frac{R^N}{N}.
\end{aligned}
$$

A sufficient condition for entry to be blockaded with spillovers when it is without spillover is then given by:

$$N\frac{R^N}{N} \leq N\phi' \iff \frac{N}{3} + 1 \leq \tilde{n}.$$

A.6 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

the second period profit of the manufacturer does not depend on the spillover intensity, the variation in SFM is fully explained by the impact of the spillover intensity on the first period profit. Recall that the profit of the manufacturer in $t = 1$ 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 $\hat{n} = k-1$. Then, the new profit of the manufacturer is:

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

We compare this to its former profit, that is:

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

The difference between these two profits is given by:

$$\frac{1}{N+1} \left(\overline{R}^{k-1} - (k-1)\upsilon^- \right).$$

Because we now have $\frac{\overline{R}^{k-1}}{k-1} > \upsilon^-$, this term is positive.

- 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 $\frac{1}{N+1} \sum_{i=\hat{n}}^{N} \overline{R}^i > \frac{1}{N+1} \sum_{i=\hat{n}}^{N} R^i$.

A.7   Retailer size

A.7.1   Equilibrium profits

We denote by $\Pi_1^{s,n}$ the profit earned by a manufacturer selling through n retailers, each owning s outlets. In what follows, we have $v^- < v^{sN}$. For any negotiation with less than $\hat{n}$ retailers, all negotiations fail, which means that each retailer leaves half of its revenue to the manufacturer:

$$\Pi_1^{s,n} = n \times \frac{sv^-}{2} \quad \forall n < \hat{n}.$$

The profit of each retailer of size s is then $\frac{sv^-}{2}$.

Consider now the $\hat{n}^{\text{th}}$ negotiation, that is the first negotiation that ensures that all the $\hat{n}^{\text{th}}$ retailers sell the new product. The negotiation program is then:

$$\frac{R^{\hat{n}}}{\hat{n}} - T_1^{s,\hat{n}} - s\frac{v^-}{2} = \hat{n}T_1^{s,\hat{n}} - \hat{n}s\frac{v^-}{2},$$

which yields:

$$T_1^{s,\hat{n}} = \frac{1}{\hat{n}+1}\left(\frac{R^{s\hat{n}}}{\hat{n}} + \frac{\hat{n}-1}{\hat{n}+1}\frac{sv^-}{2}\right),$$

$$\Pi^{s,\hat{n}} = \hat{n}T_1^{s,\hat{n}} = \frac{R^{s\hat{n}}}{\hat{n}+1} + \frac{\hat{n}(\hat{n}-1)}{\hat{n}+1}\frac{sv^-}{2}.$$

Assume now that there exists $n \geq \hat{n}$ such that:

$$\Pi_1^{s,n} = \frac{1}{n+1}\sum_{i=\hat{n}}^{n} R^{si} + \frac{\hat{n}(\hat{n}-1)}{n+1}\frac{sv^-}{2}$$

Consider now the $(n+1)^{\text{th}}$ negotiation. The program is given by:

$$\frac{R^{s,n+1}}{n+1} - T_1^{s,n+1} - \frac{sv^-}{2} = (n+1)T_1^{s,n+1} - \Pi_1^{s,n} - \frac{sv^-}{2},$$

This yields:

$$(n+2)T_1^{s,n+1} = \frac{1}{n+1}\sum_{i=\hat{n}}^{n+1} R^{si} + \frac{\hat{n}(\hat{n}-1)}{n+1}\frac{sv^-}{2}$$

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

A.7.2   Proof of Proposition 5

First, it is straightforward that in the case of full monopolization of the retail sector, the manufacturer obtains $\Pi_1^{sN,1} = \frac{R^{sN}}{2}$ in $t = 1$. This profit is exactly the profit obtained by the manufacturer in $t = 2$, and therefore the manufacturer pays no spillover.

We now show that retail concentration always benefits the manufacturer when the revenue curve R^i is weakly convex.

Let us first assume that $\hat{m} = 1$. The difference between the profits of the manufacturer when it faces large versus small retailers, given respectively by (18) and (19), is of the same sign as the following expression:

$$\Delta'' = (sN + 1) \sum_{i=1}^{N} R^{si} - (N + 1) \sum_{i=1}^{sN} R^i.$$

We first show that the manufacturer always obtains a strictly higher profit when bargaining with the first group of size s rather than with the corresponding s independent outlets. For instance, assume that the manufacturer faces $6N$ outlets. We now compare the manfacturer's profit when it bargains with N retailers of size $s = 6$ or $6N$ retailers of size 1. The first negotiation with a group of size 6 brings a profit $\frac{1}{2}R^6$ to the manufacturer, whereas negotiating with the first 6 independent outlets brings a profit $\frac{1}{7}\sum_{i=1}^{6} R^i$. Rewriting the difference and using the relationship $R^i = \sum_{j=1}^{i}(R^j - R^{j-1}) + R^1$, we obtain:

$$7R^6 - 2\sum_{i=1}^{6} R^i = 5(R^6 - R^5) + 3(R^5 - R^4) + (R^4 - R^3) - (R^3 - R^2) - 3(R^2 - R^1) - 5(R^1 - 0)) \geq 0.$$

Therefore, if the function R^i is weakly convex in $i \ \forall i \in [1,5]$, we have $R^{i+1} - R^i \geq R^i - R^{i-1}$. It is immediate then, in the above expression and comparing the last term with the first, the second term with the next to last and the third with the fourth ...that it is always true. We can generalize this result for the first negotiation with a group of any size $s > 2$:

$$(s + 1)R^s - 2\sum_{i=1}^{s} R^i = \sum_{i=1}^{s}[2i - (s + 1)](R^i - R^{i-1}) > 0.$$

We then have that for any group of size s, the first negotiation with one group of size s generates a strictly higher profit for the manufacturer than negotiating with s separate retailers, as long as R^i is weakly convex in i.

We now consider further negotiations with groups of size s, and show this result for all values of s and N, by first expressing Δ'' as a function of revenue differences $R^m - R^{m-1}$ for all $m \in [1, sN]$. Δ'' can be written as follows:

$$
\begin{aligned}
\Delta'' &= (s-1)NR^{sN} - (N+1)\sum_{k=1}^{s-1} R^{sN-k} + (s-1)NR^{s(N-1)} - (N+1)\sum_{k=1}^{s-1} R^{s(N-1)-k} \\
&\quad + \cdots + (s-1)NR^s - (N+1)\sum_{k=1}^{s-1} R^{s-k}.
\end{aligned}
$$

From this, we first derive the coefficient for the term $(R^{sN} - R^{sN-1})$:

$$
\begin{aligned}
\Delta'' &= (s-1)N(R^{sN} - R^{sN-1}) + (s-1)NR^{sN-1} - (N+1)\sum_{k=1}^{s-1} R^{sN-k} \\
&\quad + (s-1)NR^{s(N-1)} - (N+1)\sum_{k=1}^{s-1} R^{s(N-1)-k} + \cdots + (s-1)NR^s - (N+1)\sum_{k=1}^{s-1} R^{s-k} \\
&= (s-1)N(R^{sN} - R^{sN-1}) + [(s-2)N - 1]R^{sN-1} - (N+1)\sum_{k=2}^{s-1} R^{sN-k} \\
&\quad + (s-1)NR^{s(N-1)} - (N+1)\sum_{k=1}^{s-1} R^{s(N-1)-k} + \cdots + (s-1)NR^s - (N+1)\sum_{k=1}^{s-1} R^{s-k}.
\end{aligned}
$$

Repeating the same reasoning, we obtain the coefficient for the term $(R^{sN-1} - R^{sN-2})$:

$$
\begin{aligned}
\Delta'' &= (s-1)N(R^{sN} - R^{sN-1}) + [(s-2)N - 1](R^{sN-1} - R^{sN-2}) + [(s-3)N - 2]R^{sN-2} \\
&\quad - (N+1)\sum_{k=3}^{s-1} R^{sN-k} + (s-1)NR^{s(N-1)} - (N+1)\sum_{k=1}^{s-1} R^{s(N-1)-k} \\
&\quad + \cdots + (s-1)NR^s - (N+1)\sum_{k=1}^{s-1} R^{s-k}.
\end{aligned}
$$

The same reasoning can be applied to Δ'' up to the $s(N-1)^{th}$ term, and we then obtain the following expression:

$$
\begin{aligned}
\Delta'' &= \sum_{k=1}^{s} [(s-k)N - (k-1)]\left(R^{sN-k+1} - R^{sN-k}\right) + (s-1)(N-1)R^{s(N-1)} \\
&\quad - (N+1)\sum_{k=1}^{s-1} R^{s(N-1)-k} + \cdots + (s-1)NR^s - (N+1)\sum_{k=1}^{s-1} R^{s-k}.
\end{aligned}
$$

We now determine the coefficient for the term $(R^{s(N-1)} - R^{s(N-1)-1})$:

$$\Delta'' = \sum_{k=1}^{s} [(s-k)N - (k-1)] \left(R^{sN-k+1} - R^{sN-k}\right) + (s-1)(N-1)(R^{s(N-1)} - R^{s(N-1)-1})$$

$$+ (s-1)(N-1)R^{s(N-1)-1} - (N+1)\sum_{k=1}^{s-1} R^{s(N-1)-k} + ... + (s-1)NR^s - (N+1)\sum_{k=1}^{s-1} R^{s-k}$$

$$\Delta'' = \sum_{k=1}^{s} [(s-k)N - (k-1)] \left(R^{sN-k+1} - R^{sN-k}\right) + (s-1)(N-1)(R^{s(N-1)} - R^{s(N-1)-1})$$

$$+ [(s-1)(N-1) - 2] R^{s(N-1)-1} - (N+1)\sum_{k=2}^{s-1} R^{s(N-1)-k} + \cdots + (s-1)NR^s - (N+1)\sum_{k=1}^{s-1} R^{s-k}.$$

We can then derive the general expression of Δ'' as a function of all differences $(R^{si-k+1} - R^{si-k})$:

$$\Delta'' = \sum_{i=1}^{N}\sum_{k=1}^{s} \underbrace{[(s-k)i - (N-i+1)(k-1)]}_{\beta_{i,k}} \left(R^{si-k+1} - R^{si-k}\right).$$

We show that for any $l \in [1, s]$ and $j \in [1, N]$, the sum of coefficients in front of all terms such that $k > l$ and $i \geq j$ is larger than the coefficient in front of the term such that $k = l$ and $i = j$:

$$\sum_{i=j+1}^{N}\sum_{k=1}^{s} \beta_{i,k} + \sum_{k=1}^{l-1} \beta_{j,k} \geq -\beta_{j,l}. \tag{24}$$

For a weakly convex revenue function, this condition is sufficient to ensure that $\Delta'' \geq 0$, that is, the manufacturer earns more when facing large retailers than when facing small retailers. This condition (24) boils down to:

$$\sum_{i=j+1}^{N}\sum_{k=1}^{s} \beta_{i,k} + \sum_{k=1}^{l} \beta_{j,k} \geq 0. \tag{25}$$

The first term of the left-hand side can be simplified as:

$$
\begin{aligned}
\sum_{i=j+1}^{N}\sum_{k=1}^{s}\beta_{i,k} &= \sum_{i=j+1}^{N}\sum_{k=1}^{s}[(s-k)i-(N-i+1)(k-1)] = \sum_{i=j+1}^{N}\sum_{k=1}^{s}[(s-1)i-(N+1)(k-1)] \\
&= \sum_{i=j+1}^{N}\left[s(s-1)i-(N+1)\left(\frac{s(s+1)}{2}-s\right)\right] = \sum_{i=j+1}^{N}\frac{s(s-1)}{2}(2i-(N+1)) \\
&= \frac{s(s-1)}{2}j(N-j).
\end{aligned}
$$

The second term of the left-hand side can be simplified as:

$$
\sum_{k=1}^{l}\beta_{j,k} = \sum_{k=1}^{l}[(s-k)j-(N-j+1)(k-1)] = l\left((s-1)j-\frac{(l-1)(N+1)}{2}\right).
$$

For all $l \in [1,s]$ and $j \in [1,N]$, condition (25) is satisfied.[29]

We now consider the general profit functions, taking into account that the first negotiations may not succeed. We have shown that whenever Φ^i is weakly convex:

$$
\Delta'' = (sN+1)\sum_{i=1}^{N}\Phi^{si} - (N+1)\sum_{i=1}^{sN}\Phi^i > 0. \tag{26}
$$

Let us now define the function Φ^i as follows:

$$
\begin{aligned}
\Phi^i &= R^i \text{ if } i \in [\hat{m}, sN], \\
&= iv^- \text{ otherwise.}
\end{aligned}
$$

The function Φ^i is weakly convex: it is strictly convex over the interval $[\hat{m}, sN]$ and linear over the interval $[1, \hat{m}-1]$. Retail concentration also increases the manufacturer's profit when $\hat{m} > 0$.

---

[29]The obvious exception is the case in which $l = 1$ and $j = N$: $\beta_{N,1}$ corresponds to the coefficient of the highest term, $R^{sN} - R^{sN-1}$, and therefore condition (24) makes no sense in this case.
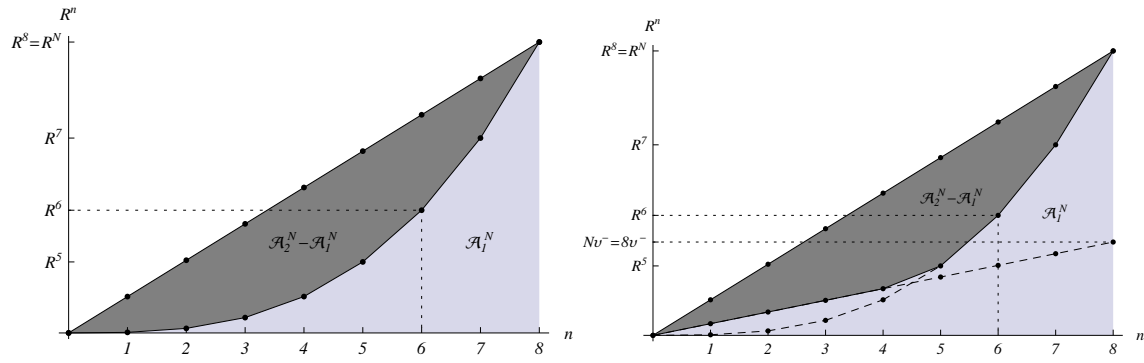
Figure 1: Graphic representation of the revenue curve with or without spillover for $N = 8$.
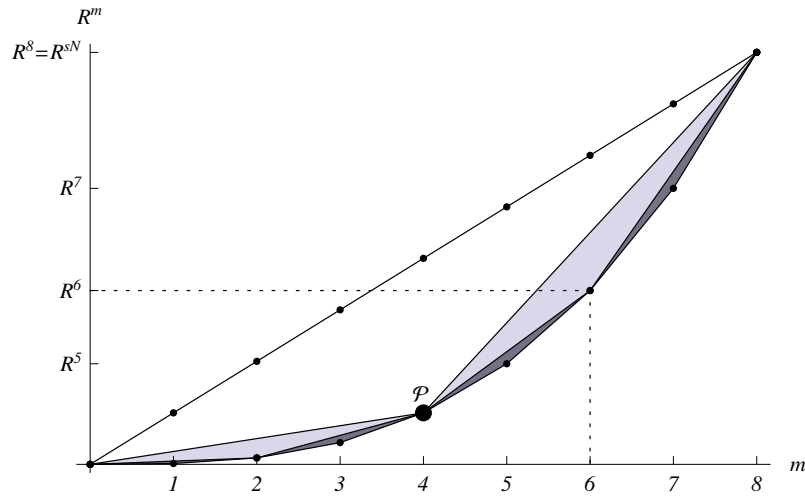Left: $\hat{n} = 1$; Right: $\hat{n} = 5$.

Figure 2: Revenue curves in period 1 for different retail structure (s, N). From top to bottom $(8, 1)$, $(4, 2)$, $(2, 4)$, $(1, 8)$.
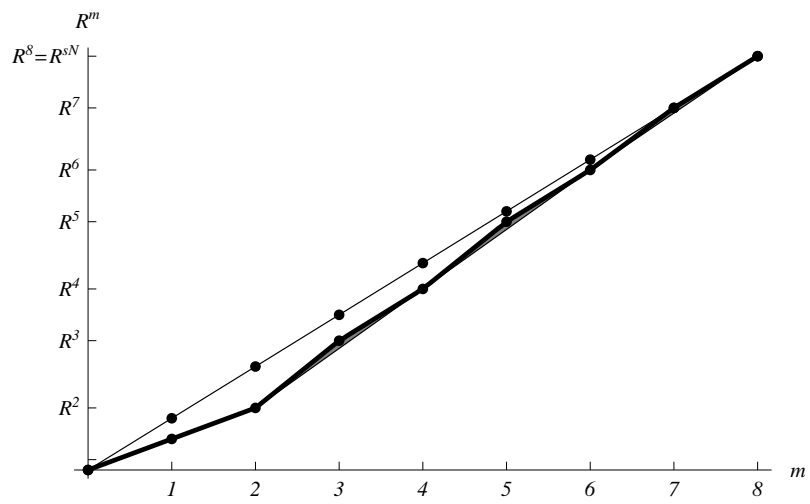
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Figure 3: Revenue curves in period 1 for different retail structures (s, N). From top to bottom $(8, 1)$, $(1, 8)$, $(4, 2)$.

a	$\hat{n}$	Π_1^N	SFM (%)
0	5	1.30	23.14
0.2	5	1.33	21.09
0.3	4	1.35	19.74
0.5	3	1.41	16.28
0.6	3	1.45	14.00
0.7	2	1.50	11.20
0.8	1	1.55	7.90
1	1	1.69	0

Table 1: Slotting fee magnitude and advertising.

q^+	$\hat{n}$	Π_1^N	Π_2^N	SFM (%)
1.1	7	1.058	1.21	12.5%
1.3	5	1.29	1.69	23.1%
1.5	4	1.65	2.25	26.6%
1.8	3	2.23	3.24	28.3%
2	2	2.81	4.00	28.8%
2.2	1	3.42	4.84	29.2%
2.4	1	4.08	5.76	29.2%

Table 2: Slotting fee magnitude and quality gap.