New Product Introduction and Slotting Fees *

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Abstract

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

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

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1 Introduction

Slotting fees are upfront payments from the manufacturer to the retailer, paid to secure a slot for a new product in retailers' shelves.[1] Their amount and frequency have rapidly grown since the mid-1980s. Outside of case studies conducted by the FTC (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, 50% to 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 practitioneers. Indeed, slotting fees may have anti-competitive 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, manufacturers 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 capture an extra rent for new product introduction.

[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.

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 already bought the new product. Several studies ackowledge 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 available the new product in a given market, a retailer offers, as a by-product, an informative advertising service to the manufacturer. 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, that is at introduction, it may deter the manufacturer's incentive to launch a new product.

We analyze the relationship between an upstream monopolist and several retailers each active on a separate market.

The manufacturer can always sell a well-known good to all retailers. It may also offer, provided it pays a fixed cost of innovation, a new good of better quality. We adopt a two-period game. In the first 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. In the second period, the manufacturer bargains with each retailer to sell the well-known good – absent innovation – or the new good – in case of innovation. In each period, we consider bargaining among each pair following the specification of Stole and Zwiebel (1996).[8] On the demand side, we introduce an "informative spillover": when the manufacturer launches a new product, selling through one outlet increases demand in all other

[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 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.

outlets in which the product is sold in the first period. If the new product was launched in the first period in all markets, then in the second period, the product is mature and the informative spillover no longer plays a role. This informative spillover builds on the literature on informative advertising following the seminal paper by Grossman and Shapiro (1984) as only consumers informed about the new product existence may have a positive demand for the good. Moreover, it also directly relates to a large literature which, following Telser (1960), hinges on the public good nature of retail services.[9]

In equilibrium, when the manufacturer launches a new product, we show that it successfully bargains with all retailers in both periods. However, comparing the bargaining between the manufacturer and each retailer in the two periods, the retailer is able to extract a slotting allowance from the manufacturer in the introduction period. Indeed, when bargaining over a new product, the manufacturer must compensate each retailer for the positive informative spillover it creates on all other markets. The presence of a spillover is thus a new source of buyer power. 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 highlight that an informative advertising campaign at introduction is likely to lower the amount of slotting fees paid to retailers. Therefore, slotting fees are less likely to deter innovation when the manufacturer is able to heavily advertise its new product at a low cost, as would do for instance a renowned brand manufacturer.

Further, we 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.

We then explore the case in which the new product can only be launched by an entrant, while the incumbent manufacturer cannot innovate. Although we find that, due to the Arrow replacement effect, innovation by an entrant is more likely than innovation by an incumbent, information spillovers may still deter innovation.

Finally, we show that our main results are unchanged when introducing retail competition within markets. In addition, although in our main model, firms are myopic with respect to their

[9]See Motta (2004) for a survey of this literature.

decision to innovate and in the bargaining process, we also explore the more complex case in which firms are forward-looking. We highlight that the amount of slotting fees is likely to be larger in that context.

Our work is first related to the industrial organization and marketing literature on slotting fees. A first strand of 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 to relax retail competition.[10] 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) explicitely differentiate slotting fees, defined as lump-sum payments not conditioned by an effective sale, from franchise fees, paid only if the product is effectively sold. By allowing for such three-part tariffs, they 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 contingent contract 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 rather emphasizes efficiency effects of slotting fees, more explicitely relates slotting fees to the additionnal costs associated to 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

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

slotting fees may be used to share the risk of launching a new product between manufacturer and retailer. Sullivan (1997) and 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 wholesale price that raises incentives for the manufacturer to promote its new product through demand-enhancing investments. Slotting fees therefore enable a better coordination of investment decision within the vertical chain.

To the best of our knowledge, Yehezkel (2014) is the only article that both takes into account informative peculiarities of new product 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 comprises 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 convey 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 manufacturer pay for this informative advertising service through slotting fees.

Moreover, while in a large strand of the literature slotting fees result from an intense competition among manufacturers to get access to a scarce shelf space, our results are still valid in a market structure which is more competitive at the retail than at the upstream level.

Finally, previous work in the industrial organization literature has studied the positive impact of buyer size on buyer power on the one hand (see *e.g.* Chipty and Snyder, 1999; Inderst and Wey, 2003, 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. We also derive some comparative static results when varying spillover intensity. We then explore the effect of retail concentration on slotting fees in Section 4. Section 5 analyzes the case of new product introduction by an entrant. Section 6 shows that our results hold when introducing competition among stores. In Section 7, we highlight that our main results are reinforced when firms are forward looking. Section 8 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 good well-known of quality q^- to all retailers. It may also offer a new (unknown) good of better quality $q^+ > q^-$. Due to a capacity constraint on its shelf space, a retailer can only sell one of these two goods. Production and retailing costs are normalized to 0.

First in subsection 2.1, we present a reduced form model by giving our assumptions on the market revenues for a well known as well as a new good. Then, in subsection 2.2 we wholly describe the microfoundations of these market revenues. This second part requires the introduction of numerous notations that will not be used again and can therefore be read separately from the rest of the paper. 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 and a well-known good. 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 $t \in \{1, 2\}$. We present these market revenues in turn for each period $t = \{1, 2\}$.

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

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

The assumption $\upsilon^0 = 0$ 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.[11]

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

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

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 $\upsilon^- < \upsilon^N$.*

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

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

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

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

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 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 υ^N for any $n' \in \{1, ..., N\}$ markets. As we show below, if a new product is launched in equilibrium, it is always sold on N retail markets in $t = 1$, which enables us to clearly consider $t = 1$ as an introduction period and $t = 2$ as a maturity period.

2.2 Microfoundations

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

Assume that on each market i, there is a mass of potential consumers, which we normalize to 1. A representative consumer earns utility $u(q,x)$ from consuming a quantity x of a good of quality q. We make standard assumptions on 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 new product existence. When a consumer is aware of a product 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 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.[12] This model is in the spirit of Grossmann and Shapiro (1984)'s seminal paper on informative advertising. In their paper the probability ξ is controlled by the manufacturer through advertising investments. In contrast, in our model, our probability is only a function of the number of open markets on which the new product is sold, n, in order to reflect the word-of-mouth communication process. It also reflects the impossibility for

[12]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: $u(\xi(n)q, x_i) - p_i x_i$.

a retailer to appropriate the informative retail service it provides to consumers. We make two key assumptions on $\xi(n)$.

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

When the new good is sold by n retailers, the demand on market i is $X(q^+, n, p_i) = \xi(n)x(q^+, p_i)$. 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 new product sold on the n open markets.*

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

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

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

Similarly, Assumption 2 derives from the following assumption:

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

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

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

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

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

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 therefore case is $\max\{\upsilon^n, \upsilon^{n'}\}$.

2.3 Timing of the game and bargaining framework

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

- 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 additionnal cost. If it does not innovate, it can only produce the well-known good of quality q^-.

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

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

In Stage 2, we consider a sequential bargaining protocol *à la* Stole and Zwiebel (1996).[16] 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

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

[15] Note that this is not a restriction. We could have alternatively repeated the same two-stage game in the two periods. However, as we consider that only one innovation can take place, if profitable, innovation always occurs in the first period.

[16] Stole and Zwiebel (1996) develop their analysis in the context of a firm bargaining over wages. Several papers, among which Montez (2007), Bedre-Defolie (2012), De Fontenay and Gans (2014) and Chambolle and Villas-Boas (2015), have later used this bargaining framework to analyze bargaining among vertically related firms.

manufacturer U. Besides, in case of failure of the negotiation between one retailer and U, the failing pair can never negotiate again, and all other pairs renegotiate their contracts from scratch. 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.[17] In our context, in which the success of a new product crucially depends on the number of retailers who accept to "launch" it, it is particularly relevant to adopt such a contingent contracting framework. Our bargaining protocol reflects that a retailer may take into account the number of other retailers who have accepted to launch the new product as an important determinant of its own contract.

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 $(\frac{1}{2},\frac{1}{2})$.[18] If the revenue to share on market i is υ, 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:[19]

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

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

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

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

[17] See Inderst and Wey, 2003 who show this equivalence.

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

[19] 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.

There is a discount factor of δ between the two periods. To simplify our analysis, we first assume that firms are myopic, namely $\delta = 0$. This assumption reflects the difficulties of firms to accurately anticipate the shelf-life of a new product. Indeed, it is always possible that a more attractive product is introduced in a future period, thus annihilating the benefits of the former innovation. In contrast, the new product may yield additionnal profits for several periods in a row. In section 7 we analyze the complex case in which firms are perfectly forward looking, namely $\delta = 1$, and provide solid insights that our results would then be reinforced.

3 Slotting allowance for a new product

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

3.1 Bargaining stage

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

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

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

Proof. Straightforward. $\square$

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

Assume that the new product was effectively sold in N markets in $t=1$[20], then, in $t=2$, regardless of the number of open markets n, the new product generates a revenue υ^N on each market $i \in \{1,...,n\}$ since the informative spillover has already played its role in $t=1$. Again all negotiations are independent of one another which implies that T_2^n is the same for all $n \in \{1,...N\}$. Still, an important difference remains compared to the case of a well-known product. In case of a breakdown in one pair's negotiation, the manufacturer is still able to bargain over the well-known product with the retailer and therefore i and U obtains respectively a disagreement payoff $d_i = \frac{\upsilon^-}{2}$ and $d_U = \frac{\upsilon^-}{2} + (N-1)T_2^N$. As by assumption $q^+ > q^-$, we have $R^N > N\upsilon^-$. Therefore, because there is extra surplus to share, any negotiation between the manufacturer and a retailer over the new product succeeds, and υ^N is shared according to equation (5). The optimal fixed fee is thus given by:

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

As the term $\frac{\upsilon^-}{2}$ cancels out, the equilibrium in $t=2$ is such that N retailers sell the new product and pay the same tariff 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 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 $d_i = d_U = \frac{\upsilon^-}{2}$: U can still bargain with the retailer to sell the well-known product. Equation (5) can be rewritten as follows:

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

It is immediate that this negotiation fails when $R^1 \leq \upsilon^-$, and succeeds otherwise. We generalize

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

the breakdown condition in the following lemma:

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

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

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

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

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

Proof. We give here a sketch of the proof. If the manufacturer bargains with $\hat{n}$ retailers, the negotiation is as follows:

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

and the manufacturer obtains the equilibrium profit:

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

This is the status-quo profit of the manufacturer when bargaining with $\hat{n}+1$ firms. By recurrence, the manufacturer bargains with N retailers in equilibrium and obtains a profit:

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

Details of the recurrence are provided in Appendix B.1. □

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

Proposition 1. *When launching a new product, the manufacturer obtains a smaller profit in 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. Assumption 1 implies that $\frac{R^i}{i} < \frac{R^N}{N}, \forall i$. Therefore:

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

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

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

□

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

In $t = 1$, for any number of open markets n, negotiations are symmetric as each retailer considers itself marginal in its negotiation with the manufacturer. For all $n \geq 2$, in case of a breakdown in the negotiation with one retailer, the profit realized on each remaining market is strictly lower than in case of success, as there is less spillover, i.e. the demand is lower when $n-1$ outlets sell the new product than when n do. 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.

For instance, assume $N = 2$ and the negotiation with retailer 1 already took place and succeeded. When U and retailer 2 bargain in $t = 1$, outside options are $d_U = \frac{\upsilon^1 + \upsilon^-}{2}$, as retailer 2 sells the well-known product and retailer 1 sells the new, and $d_2 = \frac{\upsilon^-}{2}$. In contrast, in $t = 2$, outside options are $d_U = \frac{\upsilon^2 + \upsilon^-}{2}$ and $d_2 = \frac{\upsilon^-}{2}$. 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 else 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 Nash in Nash bargaining setting *à la* Chipty and Snyder (1999), i.e. a bargaining without renegotiation, 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.[21]

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 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 in section 3.3 or retail concentration in section 4. 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 spillover (in $t = 1$) is below the revenue curve without spillover (in $t = 2$).

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

[21] 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 $T_i = \frac{v^n}{2}$.

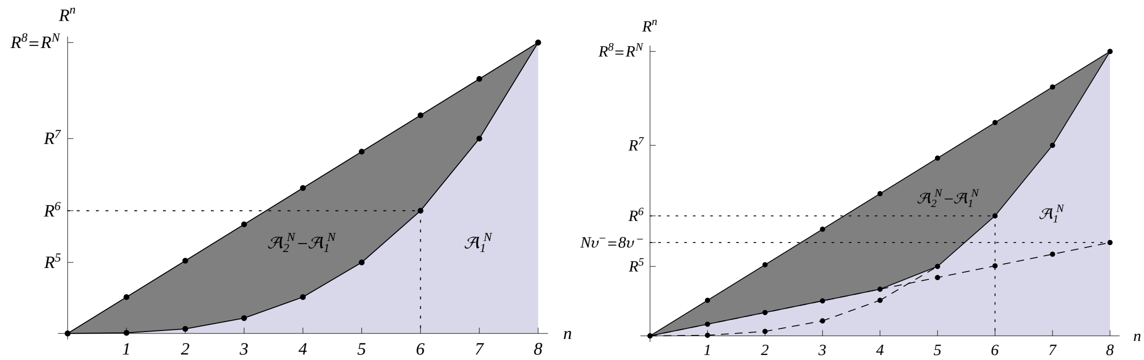

Figure 1: Graphic representation of the revenue curve with or without spillover for $N=8$. Left: $\hat{n}=1$; Right: $\hat{n}=5$.

revenue curve in period 2 is denoted $\mathscr{A}_2^N=\frac{NR^N}{2}=(N+1)\Pi_2^N-\frac{R^N}{2}$. We obtain:

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

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 $\mathscr{A}_2^N-\mathscr{A}_1^N>0$. The graphical demonstration also extends to any $\hat{n}>1$ (for instance, on the graph on the right in Figure 1, $\hat{n}=5$).

Let us now partly relax Assumption 1 by assuming that a new product only needs to be present in a large enough share (lower than 100%) of the market to reach all its potential consumers. For instance assume that the informative spillover entirely disappears once the manufacturer has reached $N-1$ markets in $t=1$, i.e. $\upsilon^{N-1}=\upsilon^N$. Though there is no extra-contribution of the marginal retailer when bargaining for a new product (as the spillover effect disappears), retailers still obtain slotting fees from the manufacturer. Indeed, because of the cumulative effect of the spillover, the status-quo profit of the manufacturer that results from negotiations with $N-1$ retailers is still lower in $t=1$ than in $t=2$. Therefore in equilibrium, the manufacturer still obtains a profit lower than $\frac{R^N}{2}$.[22] Our result is thus robust to such a variation in the spillover effect (the same reasoning applies whenever the spillover stops after $n\geq 2$ successfull negotiations).

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

3.2 Slotting fees and innovation deterrence

Consider now the decision of the manufacturer to innovate at the first stage in $t = 1$. Given that $\delta = 0$, the manufacturer chooses to innovate if and only if the net benefit it yields in $t = 1$, as compared to selling a well-known product, exceeds the cost of innovation, that is:

$$\Pi_1^N - \underline{\Pi} \geq F,$$

We thus obtain the following proposition:

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

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

Innovation deterrence always damages consumer surplus and welfare.

Proof. The lower bound is obtained by comparing the manufacturers' profit, with innovation, $\Pi_1^N - F$, and without, $\underline{\Pi}$. The upper bound derives from the comparison of the profit the manufacturer would obtain by selling a new product, with innovation but absent the spillover effect, $\frac{R^N}{2} - F$, and without innovation, $\underline{\Pi}$. □

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

As long as $q^+ > q^-$, when dealing with N retailers we always have $\Pi_1^N > \underline{\Pi}$. Therefore, absent innovation costs, it is always profitable for the manufacturer to introduce the new product when it can use the well-known 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 $\left[\Pi_1^N - \underline{\Pi}, \frac{R^N}{2} - \underline{\Pi}\right]$, the cost of innovation is too high compared to the profit of the manufacturer, and the innovation is deterred only because of the spillover.

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

The deterrence effect of slotting fees paid for the introduction of new products was pointed out by the FTC in its 2003 report on slotting allowances: "*roughly 10 percent of ice cream products fail to earn enough revenue in their first year to cover their slotting fees.*" 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 but also retailers. This also means that if it were possible, the retailer would commit itself to not using slotting fees before the manufacturer decides to innovate. Only when innovation occurs absent the regulation does the regulation decrease the retailer's profit.

3.3 Spillover Intensity and Advertising

We first define a variation in spillover intensity as follows:

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

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

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

Proof. See Appendix B.2 □

Consider now that the manufacturer can affect the informative spillover intensity. He 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 here useful to present our insights. Let a be the advertising expenditures by the manufacturer. We assume that the probability that a consumer is aware of the existence of the product on each market is a function $\xi(n,a)$ increasing in a. For a given n, a strong level of advertising increases the market revenue $\upsilon^n = \max_{p_i} \xi(n,a)x(p_i,q^+)$ and thus decreases the informative spillover. The manufacturer then faces a trade-off between the ex-ante advertising expenditures and the ex-post reduction in slotting fees. We obtain the following corollary:

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

This result is well illustrated by the findings of the Food Marketing Institute in 2003 which claims that "*Manufacturers that perform thorough market research and support new products with strong advertising campaign often do not pay allowance.*"[23] As 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.*"

4 Retail concentration

This section highlights how slotting fees paid by the manufacturer evolve with respect to retail concentration. In order to account for a size effect, we assume now that the manufacturer faces symmetric retailers, that each owns 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. We also assume that a large retailer bargains over all its outlets at the same time and thus cannot decide to sell the new product in only part of them.[24] Note that we have to modify Assumption 2 as the number of markets is now sN, and therefore we have: $\upsilon^- < \upsilon^{sN}$. As previously, we avoid a size effect

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

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

through quantities.[25]

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,[26] we obtain the following general formula when the manufacturer faces N retailers of size s (and $M = sN$ outlets):

$$\Pi_1^{s,N} = \frac{1}{N+1} \sum_{i=\hat{n}}^{N} R^{si} + \frac{\hat{n}(\hat{n}-1)}{N+1} \frac{s\upsilon^-}{2} \tag{10}$$

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

$$\Pi_1^{1,sN} = \frac{1}{sN+1} \sum_{i=\hat{m}}^{sN} R^{i} + \frac{\hat{m}(\hat{m}-1)}{sN+1} \frac{\upsilon^-}{2} \tag{11}$$

It is useful to first note that, because a large retailer bargains over all its outlets at the same time, it applies the average spillover amongst its own 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.

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 3.2 the area between the two curves represents the amount of slotting fees paid by the manufacturer in $t = 1$.

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 $t = 1$ and $t = 2$ and there are no slotting fees. Indeed, as there is no firm outside the group, the spillover plays no role in the bargaining. Therefore, the monopolization of the retail sector always implies zero slotting fees and therefore benefits the manufacturer.

Consider now the case with $N = 4$ retailers of size $s = 2$. In Figure 2, we now draw the revenue

[25] Following remark 1 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.

[26] Details are provided in Appendix C.1.

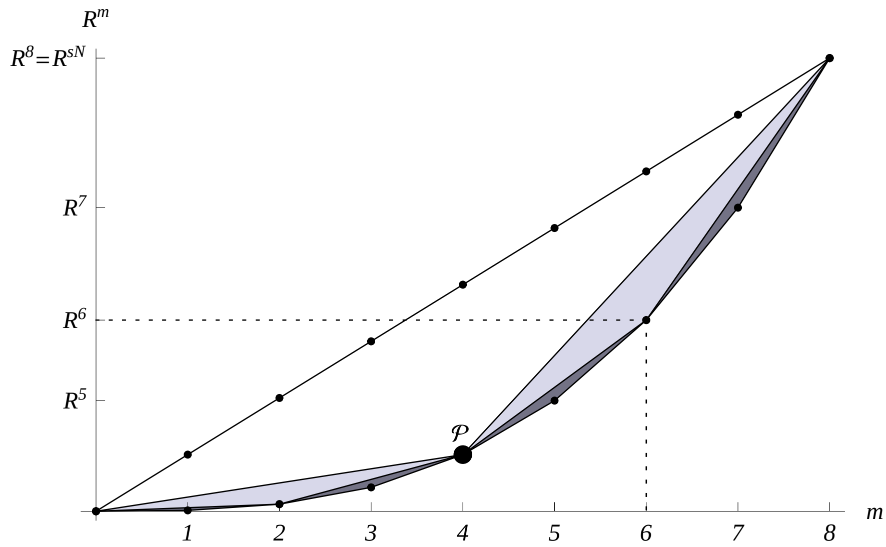

Figure 2: Revenue curves in period 1 for different retail structure (s,N). From top to bottom $(8,1)$, $(4,2)$, $(2,4)$, $(1,8)$.

function in that 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, retailer's concentration benefits again the manufacturer.

Consider for instance the negotiations for outlets 5 and 6, that is, starting at point $\mathscr{P}$. 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 of 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 3. *A manufacturer pays no slotting fee in 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 C.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

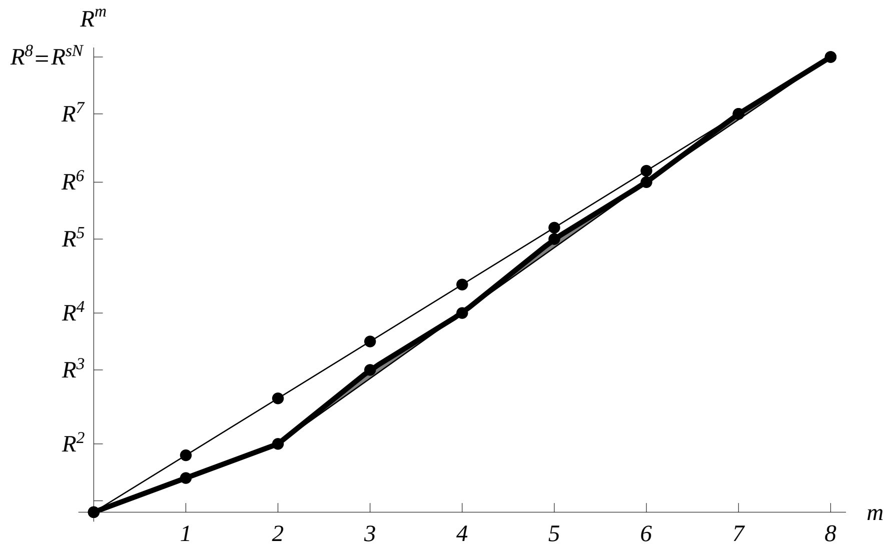

Figure 3: Revenue curves in period 1 for different retail structure (s,N). From top to bottom $(8,1)$, $(1,8)$, $(4,2)$.

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. Again, this result is in line with the FTC report (2003) on slotting allowances which relates that Walmart, the largest retail group in the U.S., is known not to charge slotting fees.

5 A new product is launched by an entrant

Assume now that the new product of quality q^+ is launched by a potential entrant, denoted E, in period $t=1$, while the incumbent manufacturer, denoted I, cannot innovate and therefore at best sells the well-known product. 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-know 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 :

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

and in equilibrium E obtains:

$$\tilde{\Pi}_2^N \equiv N\tilde{T}_2^N = \frac{1}{2}\left(R^N - \frac{N\upsilon^-}{2}\right) \tag{12}$$

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

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

$$R^1 - \tilde{T}_1^1 - \frac{\upsilon^-}{2} = \tilde{T}_1^1 \Leftrightarrow \tilde{T}_1^1 = \frac{1}{2N}\left(R^1 - \frac{N\upsilon^-}{2}\right). \tag{13}$$

This negotiation does not occur if $R^1 \leq \frac{\upsilon^-}{2}$. Therefore, as in the previous case, there exists a cut-off value $\tilde{n}$ that represents a minimum number of negotiations that must take place in order to succeed. Here, the cut-off value is defined by:

$$\frac{R^{\tilde{n}-1}}{\tilde{n}-1} \leq \frac{\upsilon^-}{2} < \frac{R^{\tilde{n}}}{\tilde{n}} \tag{14}$$

Comparing eqs (7) and (14), we have $\tilde{n} \leq \hat{n}$: the sum of status-quo profits is lower ($d_i + d_U = \frac{\upsilon^-}{2}$) in a negotiation involving the entrant, while the revenue to be shared is unchanged. By recurrence, we determine the profit earned by E in $t = 1$ with $n \geq \tilde{n}$ retailers :

$$\tilde{\Pi}_1^n \equiv \frac{1}{n+1}\left(\sum_{i=\tilde{n}}^{n} R^i - \frac{n(n+1) - \tilde{n}(\tilde{n}-1)}{2}\frac{\upsilon^-}{2}\right) \tag{15}$$

As N firms bargain with E in equilibrium, E obtains $\tilde{\Pi}_1^N < \Pi_1^N$. Indeed, despite the fact that $\tilde{n} < \hat{n}$, the entrant has a lower status-quo than the incumbent in its first negotiation (0 v. $N\upsilon^-/2$). Therefore, it gets a lower share of the joint profit in this first negotiation. This affects all subsequent negotiations. We now consider E's incentives to enter in $t = 1$ and summarize our results in the following proposition:

Proposition 4. *Due to slotting fees efficient innovations by an entrant are deterred for any inno-*

vation cost such that:

$$F \in \left[\tilde{\Pi}_1^N, \tilde{\Pi}_2^N\right]$$

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 D.1. □

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

Although $\tilde{\Pi}_1^N < \Pi_1^N$, absent the cost F, E has an incentive to launch the new product as soon as it yields a positive profit. In contrast, the incumbent firm must ensure that it yields a larger profit than $\underline{\Pi}$. This corresponds to the Arrow replacement effect (Arrow, 1962), which reduces the net gain of launching a new product for the incumbent.

The upper bound $\tilde{\Pi}_2^N = \frac{R^N}{2} - \frac{N\upsilon^-}{4}$, which corresponds to the profit of E absent any spillover, is larger than the upper bound when the incumbent innovates $\frac{R^N}{2} - \underline{\Pi}$ because, again, the replacement effect overwhelms the hold-up effect.

6 Retail Competition

We now test the robustness of our analysis when considering markets in which several firms compete and show that our results remain valid. Assume that there exist $i \in \{1,2,3,4\}$ outlets and $j \in \{1,2\}$ markets. We consider the same stage game as in section 2.3 and add a third stage in which outlets $i = 1,2$ (resp. $i = 3,4$) compete à la Cournot on market 1 (resp. market 2).

We here follow the specification presented in section 2.2. In the absence of spillover, the inverse demand function is $P_j(Q) = q^+ - X_j$, with $X_j = x_{ij} + x_{-ij}$ the total output sold on market j. With spillovers represented by $\xi(n)$, the inverse demand function becomes $P_j(Q) = q^+ - \frac{X_j}{\xi(n)}$ (which corresponds to the inverse function of $X_j = \xi(n)(q^+ - p_j)$). We use the following specification of the spillover: $\xi(n) = \frac{n}{N}$, with $N = 4$ in our case.[27] We also assume from now on that $q^+ = 1$ and that the total profit obtained with the old product is 0.

[27] For the sake of simplicity, the spillover an outlet generates is the same towards its direct rivals or outlets in the other markets.

No spillover ($t = 2$). Assume first that the upstream firm has innovated in $t = 1$. If there is only one firm i in market j, i maximizes $x_{ij}(1 - x_{ij})$, and thus sets $x_{ij} = 1/2$ which generates a revenue $1/4$. If two retailers are active in market j, each retailer i maximizes $x_{ij}(1 - (x_{ij} + x_{-ij}))$ and thus sets $x_{ij} = 1/3$ for all i and j. The revenue generated by each retailer is $1/9$ and the total revenue in market j is $2/9$.

Lemma 4. *In equilibrium, in $t = 2$, the supplier obtains a profit $\Pi_2^{2,2} = \frac{17}{54}$.*

Proof. See Appendix E.1. □

With spillovers (period $t = 1$). Assume that U chooses to innovate in $t = 1$. In Stage 3, output choices not only depend on the market structure, but also on the spillover.

Assume that all but one negotiation, say with 1, have failed. In this case, 1 is a monopoly on its market, and the spillover is $\xi(1) = 1/4$. Retailer 1 thus maximizes $x_1(1 - 4x_1)$ and sets $x_1 = 1/8$ and the revenue on market 1 (and for the whole industry) is $\frac{1}{8}\left(1 - 4\frac{1}{8}\right) = \frac{1}{16}$.

Applying the same reasoning for all market structures, we summarize the revenue at each outlet in the following table. Lines represent the number of open outlets in the market we consider, whereas columns represent the number of open outlets in the other market. This way, we characterize the revenue in an outlet for all possible market structures. For instance, $1/12$ is the revenue in outlet 1 when both outlets are open in market 1 and only one is open in market 2. In contrast, $3/16$ is the revenue in outlet 1 when only one outlet is open in market 1 and both outlets are open in market 2.

	0	1	2
1	1/16	1/8	3/16
2	1/18	1/12	1/9

Table 1: Revenue in each outlet depending on the market structure.

Lemma 5. *In equilibrium, in $t = 1$, the supplier obtains a profit $\Pi_1^{2,2} = 23/108$.*

Proof. See Appendix E.2 □

Comparing the profit of the upstream firm in $t = 1$ and $t = 2$, we obtain the following proposition:

Proposition 5. *Retailers still manage to extract a slotting fee from the manufacturer at product launching, despite the competitiveness of the market.*

Proof. The profit of the upstream firm is $17/54$ in the absence of spillovers ($t = 2$), and $23/108 < 17/54$ when spillovers exist ($t = 1$). $\square$

Therefore, we have shown that in a framework with relatively soft competition among stores, our main results hold. Our results are unchanged when running the same analysis for three firms competing on each markets.[28] When competition becomes more intense on each market, however, it may become optimal for the manufacturer to provoke a breakdown in bargaining with a subset of retailers in order to limit the opportunism effect (see Chambolle and Villas-Boas, 2015). Moreover, if consumers are heterogeneous in their valuation for quality, a differentiation issue could arise. However as long as innovation is drastic our results would remain unchanged. We leave the full analysis of these issues for further research.

7 Firms are not myopic

If we assume that $\delta = 1$, then in $t = 1$ firms are able to take into account in their bargaining the future net gain (or loss) in $t = 2$. Solving the dynamic negotiation game is complex and we were not able to fully characterize the equilibrium outcome. However, we determine the negotiation outcomes in two polar cases, namely (i) when all but one negotiation have failed and (ii) when all but one negotiation have succedeed, in $t = 1$. These two specific cases are sufficient to provide solid insights that if firms were no longer myopic, our results would be reinforced; the rent extracted by the retailers at product introduction would further increase.

Negotiation in $t = 1$ when only one firm succeeds. Starting from a situation in which all firms but one, say retailer 1, have failed in their negotiation in $t = 1$, the Nash programme is:

$$R^1 - T_1^1 + \Delta_2^1 = T_1^1 + \Delta_2^U$$

[28] Details about this case are available upon request.

in which Δ_2^1 and Δ_2^U are the respective net gains (or loss) of retailer 1 and the manufacturer in $t=2$ if their negotiation in $t=1$ succeeds rather than breaks. To determine Δ_2^1 and Δ_2^U:

- we know that if retailer 1 and the manufacturer have failed in $t=1$, then all firms have failed in $t=1$ and their second period profits are respectively $\Pi_2^N = \frac{1}{N+1}\sum_{i=1}^{N} R^i$ for the manufacturer and $\pi_2^N = \frac{\Pi_2^N}{N}$ for retailer 1.[29]

- we have to solve the bargaining stage in $t=2$ if retailer 1 and U have succeeded in $t=1$, while all other negotiations have failed.

We then obtain the following lemma:

Lemma 6. *If all but one negotiations have failed in period 1, we show that $\Delta_2^1 < \Delta_2^U$ which implies that the out-of-equilibrium profit of the manufacturer in that case is strictly lower than in the case in which firms are myopic.*

Proof. See Appendix F.1. □

If $\Delta_2^1 - \Delta_2^U < 0$ then the manufacturer has a higher gain from trade with retailer 1 and therefore earns a lower profit in $t=1$ when firms are forward looking rather than myopic. The economic insight is clear. In case of a breakdown between retailer 1 and the manufacturer in $t=1$, all the informative spillover remains to play a role in $t=2$ which weakens the manufacturer towards retailers in $t=2$. This is why the manufacturer has a higher gain from trade than the retailer in $t=1$.

As previously shown, to determine the equilibrium profit in the first period, we then would have to determine all the nested out-of-equilibrium manufacturer's profit in the first period in case all negotiations but two have failed, and then in case all negotiations but three have failed and so on. These cases are too complex to be solved. However, the manufacturer's profit when only one firm succeeds in $t=1$ is the status-quo profit in the bargaining in which all negotiation have failed but two. Therefore, we have another source of disadvantage for the manufacturer who has a lower first period status-quo profit as compared to the case of myopia.

[29] These expressions are profits obtained in equilibrium in $t=1$ when $\hat{n}=1$, see eq (8). In this section, we consider that $\hat{n}=1$ to simplify our expressions and focus only on the effect of firm's myopia.

Besides, given the economic insight presented above, we believe that in each out-of-equilibrium first period bargaining, we will have $\Delta_2^1 - \Delta_2^U < 0$ which will further increase the manufacturer's profit loss in the first period as compared to the case with myopia. To see this, we now examine the second polar case in which all firms but one have succeeded in their negotiation with the manufacturer in $t = 1$.

Negotiation in $t = 1$ when all but one firm have succeeded. Starting from a situation in which all firms but one, say retailer 1, have already succeeded in their negotiation in $t = 1$, the Nash programme is:

$$\frac{R^N}{N} - T_1 + \Delta_2^1 = NT_1 - SQ + \Delta_2^U$$

where SQ is the unknown status-quo profit of the manufacturer and Δ_2^1 and Δ_2^U are defined above. To determine Δ_2^1 and Δ_2^U:

- we know that if retailer 1 and the manufacturer also succeed in $t = 1$, then all firms have succeeded in $t = 1$ and their second period profits are respectively $\pi_2^N = \frac{\Pi}{N}$ and $\Pi_2^N = \underline{\Pi}$.
- we have to solve the bargaining stage in $t = 2$ if retailer 1 and U have failed in $t = 1$, while all other negotiations have succeeded.

We then obtain the following lemma:

Lemma 7. *If all but one negotiations have succeeded in period 1, we show that $\Delta_2^1 < \Delta_2^U$ which implies that, assuming that its status-quo profit is not higher than the status-quo in the case of myopia, the resulting equilibrium profit of the manufacturer is strictly lower than in the case of myopia.*

Proof. See Appendix F.2. □

From Lemma 6, it is indeed reasonable to believe that SQ is lower than the status-quo profit of the manufacturer in the case of myopia in which case, $SQ \leq \frac{1}{N}\sum_{i=1}^{N-1} R^i$.

8 Conclusion

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

Our main result constitutes an interesting twist as compared to the existing literature. Indeed, the literature that explains slotting fees by information issues related to the new product introduction mostly enhances efficiency effects. In contrast, the presence of an informative spillover that relies on the diffusion of information on 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 on 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".[30] In our model, it is not the retailer who performs the informative spillover but rather the consumers through word-of-mouth. As this service is only a by-product of the retailer’s activity, slotting fees could be here considered as an unfair trading practice.

Our additional results also have consequences in terms of competition policy. Indeed, we show that less powerful manufacturers, that is manufacturers who cannot advertise their new products at low costs, are likely to pay more slotting fees to retailers. Therefore, the innovation deterrence effect is more likely to harm small manufacturers.

Moreover, if a large literature rather confirms that retail concentration increases buyer power, we show in our model that slotting fees decrease with retail concentration under reasonable conditions. The main insight is that 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.

[30] 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.

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Appendix

A Assumption 1' and Assumption 1

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

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

Following equation (3), we can write:

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

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

B Proofs of Section 3

B.1 Proof of lemma 3

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

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

and the manufacturer obtains the equilibrium profit:

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

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

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

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

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

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 status-quo 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 succeeds $(n+1)T_1^{n+1}$and its status-quo profit 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:

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

By recurrence, we thus have shown that the equilibrium profit of the manufacturer when he bargains with all N retailers is the expression given in eq. (8), hence:

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

B.2 Proof of Corollary 4

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

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

Then, there are three cases:

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

- Second, if $\frac{\overline{R}^n}{n} > \frac{R^n}{n}$ for $n < \hat{n}$ and $\hat{n}$ decreases as a result of the decrease in spillover, the profit of the manufacturer increases. Indeed, assume that initially $\hat{n} = k$, and only R^{k-1} changes and is now equal to $\overline{R}^{k-1}$, so that the new threshold is $\overline{\hat{n}} = k-1$. 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 $\frac{\overline{R}^{k-1}}{k-1} > \upsilon^-$, 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 $\frac{1}{N+1}\sum_{i=\hat{n}}^{N} \overline{R}^i > \frac{1}{N+1}\sum_{i=\hat{n}}^{N} R^i$ whereas the second term is unchanged.

C Proofs of section 4

C.1 Equilibrium profits

We denote by $\Pi_t^{s,n}$ the profit earned in period t by a manufacturer selling through n retailers each owning s outlets. In what follows we have $\upsilon^- < \upsilon^{sN}$. In $t = 1$, 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:

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

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

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:

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

which yields:

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

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

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

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

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

This yields:

$$(n+2)T_1^{s,n+1} = \frac{1}{n+1}\sum_{i=\hat{n}}^{n+1} R^{si} + \frac{\hat{n}(\hat{n}-1)}{n+1}\frac{s\upsilon^-}{2}, \qquad \Pi_1^{s,n+1} = \frac{1}{n+2}\sum_{i=\hat{n}}^{n+1} R^{si} + \frac{\hat{n}(\hat{n}-1)}{n+2}\frac{s\upsilon^-}{2}.$$

Hence the expression of the profit given in eq. (10).

C.2 Proof of proposition 3

First, it is straightforward that in 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 profits of the manufacturer when it faces a large retailer vs. s small retailers, given respectively by (10) and (11), 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.

If $N = 1$, that is in the bargaining with the first group of $s > 2$ outlets, we obtain:

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

Therefore if the function R^i is weakly convex in $i\ \forall i \in [1,s]$, we have $R^{i+1} - R^i \geq R^i - R^{i-1}$. Assume then that s is uneven. In that case, the above expression can be rewritten:

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

If, now, s is even, then the above expression can be rewritten:

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

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 separated 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 $(R^{sN} - R^{sN-1})$:

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

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 $(R^{s(N-1)} - R^{s(N-1)-1})$:

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

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 $i = j$.

$$\sum_{i=j+1}^{N}\sum_{k=1}^{s} \beta_{i,k} + \sum_{k=1}^{l-1} \beta_{j,k} \geq -\beta_{j,l}. \tag{16}$$

For a weakly convex revenue function, condition (16) is sufficient to ensure that $\Delta \geq 0$, that is, the manufacturer earns more when facing large retailers than when facing small retailers. Condition (16) boils down to:

$$\underbrace{\sum_{i=j+1}^{N}\sum_{k=1}^{s} \beta_{i,k}}_{(i)} + \underbrace{\sum_{k=1}^{l} \beta_{j,k}}_{(ii)} \geq 0. \tag{17}$$

(i) can be simplified as:

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

(ii) can be simplified as:

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

For all $l \in [1,s]$ and $j \in [1,N]$, condition (17) is satisfied.[31]

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:

$$\Delta = (sN+1)\sum_{i=1}^{N}\Phi^{si}-(N+1)\sum_{i=1}^{sN}\Phi^i > 0 \tag{18}$$

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

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

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 $\hat{m} > 1$.

D Proofs of Section 5

D.1 Proof of Proposition 4

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

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

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 E (and hence the status-quo profit of E in its negotiation with two firms) is $\tilde{T}_1^1$ given by equation (13). Otherwise the status-quo profit of E in its negotiation with two firms

[31] 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 (16) makes no sense in this case.

is 0. Consider now that E bargains with $\tilde{n} > 1$ retailers. Status-quo profits are given by:

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

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

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

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

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

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

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

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

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

which yields:

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

Hence equation (15).

From equations (8) and (15), the difference $\tilde{\Pi}_1^N - \Pi_1^N$ is of the sign of the following expression:

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

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

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

This is strictly negative and therefore the profit of E is always lower than that of an incumbent innovator.

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

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

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

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

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

E Proof of Section 6

E.1 Proof of lemma 4

We denote $T_t^{1,2}$ the tariff in period t when one outlet is open in the market considered and two outlets are open in the other market. Assume that one negotiation has failed on each market. The outcome of the negotiation with each outlet is:

$$\frac{1}{4} - T_2^{1,1} = T_2^{1,1} \Leftrightarrow T_2^{1,1} = \frac{1}{8} = \Pi^{1,1}.$$

As in the monopoly case, negotiations on the two markets are independent of one another and we thus have $T_2^{1,1} = T_2^{1,2}$. Assume now that no negotiation has failed yet. Status quo profits are $d_U = \frac{1}{8}$ and $d_i = 0$. The outcome of each negotiation is:

$$\frac{1}{9} - T_2^{2,1} = 2T_2^{2,1} - \frac{1}{8} \Leftrightarrow 3T_2^{2,1} = \frac{1}{9} + \frac{1}{8} \Leftrightarrow T_2^{2,1} = \frac{17}{216}.$$

the profit of U in each market is thus $\frac{17}{108}$. As before, we have $T_2^{2,2} = T_2^{2,1}$. Despite the fact that the total revenue in the market is lower when two retailers are active than when only one is, the upstream firm prefers to bargain with both retailers, using the status quo it obtains when the market is a monopoly to extract a rent from the second retailer. We thus obtain $\Pi_2^{2,2} = \frac{17}{54}$.

E.2 Proof of lemma 5

Assume first that all negotiations but one have failed. Since status quo profits are $d_U = d_i = 0$, the revenue $1/16$ is equally shared, that is, $T_1^{1,0} = \frac{1}{32}$. Now, if both negotiations on a given market have failed, status-quo profits are $d_U = 1/32$ and $d_i = 0$. The revenue at each retailer is $1/18$. The bargaining program with each retailer is thus:

$$\frac{1}{18} - T_1^{2,0} = 2T_1^{2,0} - \frac{1}{32} \Leftrightarrow T_1^{2,0} = \frac{1}{3}\left(\frac{1}{18} + \frac{1}{32}\right) = \frac{25}{3 \times 288},$$

and the upstream profit is then $\Pi_1^{2,0} = \frac{25}{432}$. If, however, one negotiation has failed in each market then the revenue at each retailer is $1/8$. Status-quo profits are the same as in the previous case, and the bargaining program with each retailer is:

$$\frac{1}{8} - T_1^{1,1} = 2T_1^{1,1} - \frac{1}{32} \Leftrightarrow T_1^{1,1} = \frac{1}{3}\left(\frac{1}{8} + \frac{1}{32}\right) = \frac{5}{96}.$$

The upstream profit is then $\Pi_1^{1,1} = \frac{5}{48}$.

We now consider that only one negotiation has failed. In that case, there is a competitive market and a monopolistic market. Negotiations with the three firms are asymmetric, as they do not all have the same marginal contribution to the joint profit.

- In the negotiation with retailers on the competitive market, $d_U = 5/48$ (the profit it would earn if there were only one remaining active retailer in each market). The revenue at each retailer is $1/12$. The bargaining program is thus:

$$\frac{1}{12} - T_1^{2,1} = 2T_1^{2,1} + T_1^{1,2} - \frac{5}{48} \Leftrightarrow 3T_1^{2,1} + T_1^{1,2} = \frac{1}{12} + \frac{5}{48} = \frac{3}{16} \tag{19}$$

- In the negotiation with the monopolistic retailer, $d_U = 25/432$, the profit it would earn if there were only two remaining active retailers, both in the same market. The revenue of the retailer is $3/16$. The bargaining program is thus:

$$\frac{3}{16} - T_1^{1,2} = 2T_1^{2,1} + T_1^{1,2} - \frac{25}{432} \Leftrightarrow T_1^{1,2} + T_1^{2,1} = \frac{1}{2}\left(\frac{3}{16} + \frac{25}{432}\right) = \frac{53}{432}. \tag{20}$$

Solving the system of equations (19,20), we obtain that $T_1^{2,1} = \frac{7}{216}$, and $T_1^{1,2} = \frac{13}{144}$. The resulting upstream profit is $\Pi^{2,1} = \Pi^{1,2} = \frac{67}{432}$.
We can now consider the case in which U bargains with all firms. In each negotiation, $d_U = \frac{67}{432}$. The revenue in each retailer is $1/9$. The bargaining program is thus:

$$\frac{1}{9} - T_1^{2,2} = 4T_1^{2,2} - \frac{67}{432} \Leftrightarrow T_1^{2,2} = \frac{1}{5}\left(\frac{1}{9} + \frac{67}{432}\right) = \frac{23}{432},$$

which yields $\Pi_1^{2,2} = \frac{23}{108}$.

F Proof of Section 7

F.1 Proof of lemma 6

Recurrence for profits in the second period. Assume that, in $t = 2$, the manufacturer bargains with k firms with which the first-period negotiation failed, and l firms with which the first-period negotiation succeeded; we denote $\Pi_2(k,l)$ the equilibrium profit of the manufacturer in the second-period negotiation with these $k+l$ firms. We also denote $T_2(k,l)$ second-period tariff for retailers with whom the negotiation failed in $t=1$, and $T_2^1(k,l)$ the second-period tariff for retailers with who negotiation succeeded in $t=1$.

We show here by recurrence that the equilibrium tariffs and profit of the manufacturer when bargaining with retailer 1 and with $n-1$ retailers with which the first-period negotiation has failed are given by:

$$T_2^1(n-1,1) = \frac{1}{n(n+1)}\left(nR^n - \sum_{i=1}^{n-1} R^i\right), \tag{21}$$

$$T_2(n-1,1) = \frac{1}{n}\left(\frac{R^n}{n(n+1)} + \frac{1}{n-1}\sum_{i=2}^{n-1}\left(\frac{i-1}{i}+\frac{2}{n+1}\right)R^i + \frac{2R^1}{(n+1)(n-1)}\right), \tag{22}$$

$$\Pi_2(n-1,1) = \frac{(n^2+n-1)R^n}{n^2(n+1)} + \frac{R^1}{n(n+1)} + \frac{1}{n}\sum_{i=2}^{n-1}\left(\frac{i-1}{i}+\frac{1}{n+1}\right)R^i \tag{23}$$

Assume first that $n=2$, that is, the manufacturer bargains with retailer 1 with which the first-period negotiation has succeeded and retailer 2 with which it has failed.

- If the negotiation fails with retailer 1 and the manufacturer bargains only with retailer 2, the bargaining program is given by:

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

- If, however, the negotiation fails with retailer 2 and the manufacturer bargains only with retailer 1, the bargaining program is given by:

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

When bargaining with the two retailers, the bargaining program is thus given by the following equations:

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

We then obtain:

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

We obtain: $\Pi_2(1,1) = T_2^1(1,1) + T_2(1,1)$. Therefore, equations (21), (22) and (23) are satisfied for $n=2$.

Assume now that the above expressions are true for a given value of $n \geq 2$. We show that they are then true for $(n+1)$. The bargaining program is given by the following equations:

$$\frac{R^{n+1}}{n+1} - T_2^1(n,1) = T_2^1(n,1) + nT_2(n,1) - \Pi_2(n,0),$$
$$\frac{R^{n+1}}{n+1} - T_2(n,1) = T_2^1(n,1) + nT_2(n,1) - \Pi_2(n-1,1),$$

which we can write as follows:

$$2T_2^1(n,1) + nT_2(n,1) = \frac{R^{n+1}}{n+1} + \Pi_2(n,0), \tag{24}$$
$$T_2^1(n,1) + (n+1)T_2(n,1) = \frac{R^{n+1}}{n+1} + \Pi_2(n-1,1). \tag{25}$$

Summing these two equations, we obtain:

$$(n+2)T_2(n,1) = \frac{R^{n+1}}{n+1} + 2\Pi_2(n-1,1) - \Pi_2(n,0). \tag{26}$$

In order to determine this expression, we need an expression of $\Pi_2(n,0)$, that is the profit of the manufacturer when it deals with n firms with which the negotiation had failed in period $t=1$. Let us show, by recurrence, that it is equal to $\Pi_2(n,0) = \frac{1}{n+1}\sum_{i=2}^{n+1}\frac{(i-1)R^i}{i}$. Consider first a situation in which the manufacturer only deals with one firm with which the negotiation had failed in period 1. Then, the bargaining program is:

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

Assume now that this expression is true for $n-1$ retailers, that is, $\Pi_2(n-1,0) = \frac{1}{n}\sum_{i=2}^{n}\frac{(i-1)R^i}{i}$. Then, when negotiations with n retailers with which negotiation has failed in period 1, the bargaining program is:

$$\frac{R^{n+1}}{n+1} - T_2(n,0) = nT_2(n,0) - \frac{1}{n}\sum_{i=2}^{n}\frac{(i-1)R^i}{i} \Leftrightarrow (n+1)T_2^i = \frac{R^{n+1}}{n+1} + \frac{1}{n}\sum_{i=2}^{n}\frac{(i-1)R^i}{i}.$$

Therefore, the profit of the manufacturer is:

$$\Pi_2(n,0) = nT_2(n,0) = \frac{n}{n+1}\left(\frac{R^{n+1}}{n+1} + \frac{1}{n}\sum_{i=2}^{n}\frac{(i-1)R^i}{i}\right) = \frac{1}{n+1}\sum_{i=2}^{n+1}\frac{(i-1)R^i}{i}. \tag{27}$$

Now, using the expressions of $\Pi_2(n,0)$ given in equation (27) and $\Pi_2(n-1,1)$ given in equation (23), we can compute $T_2(n,1)$ with eq. (26):

$$\begin{aligned} T_2(n,1) &= \frac{1}{n+2}\left(\frac{R^{n+1}}{n+1} + 2\Pi_2(n-1,1) - \Pi_2(n,0)\right) \\ &= \frac{1}{n+1}\left(\frac{R^{n+1}}{(n+1)(n+2)} + \frac{2R^1}{n(n+2)} + \frac{1}{n}\sum_{i=2}^{n}\left(\frac{i-1}{i} + \frac{2}{n+2}\right)R^i\right). \end{aligned}$$

We then determine $T_2^1(n,1)$, using the following expression eq. (24):

$$T_2^1(n,1) = \frac{1}{2}\left(\frac{R^{n+1}}{n+1} + \Pi_2(n,0) - nT_2(n,1)\right) = \frac{1}{(n+1)(n+2)}\left[(n+1)R^{n+1} - \sum_{i=1}^{n}R^i\right].$$

The profit of the manufacturer is then $T_2^1(n,1) + nT_2(n,1)$, which yields:

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

In particular, this is true for $n = N-1$, and we therefore obtain the equilibrium profit of the manufacturer in period $t = 2$ when only one negotiation (over N) has succeeded in period $t = 1$:

$$\begin{aligned} \Pi_2(N-1,1) &= T_2^1(N-1,1) + (N-1)T_2(N-1,1), \\ &= \frac{(N^2+N-1)R^N}{N^2(N+1)} + \frac{R^1}{N(N+1)} + \frac{1}{N}\sum_{i=2}^{N-1}\left(\frac{i-1}{i} + \frac{1}{N+1}\right)R^i. \end{aligned}$$

Gains from trade with and without myopia. It is immediate that the retailer is better off in this case than when it is not myopic if $\Delta_2^U - \Delta_2^1 > 0$, with Δ_2^1 and Δ_2^U the respective net gains (orloss) of retailer 1 and the manufacturer in $t=2$ if their negotiation in $t=1$ succeeds rather than breaks, which we compute:

$$\Delta_2^1 = [(\frac{R^N}{N} - (\frac{R^N}{N+1} - \frac{1}{N(N+1)}\sum_{i=1}^{N-1} R^i)) - (\frac{R^N}{N} - \frac{1}{N(N+1)}\sum_{i=1}^{N} R^i))],$$
$$= \frac{1}{N(N+1)}\left(2\sum_{i}^{N-1} R^i - (N-1)R^N\right) = \frac{1}{N(N+1)}\sum_{i=1}^{N} R^i - \frac{R^N}{N+1} + \frac{1}{N(N+1)}\sum_{i=1}^{N-1} R^i,$$
$$\Delta_2^U = (\frac{(N^2+N-1)R^N}{N^2(N+1)} + \frac{R^1}{N(N+1)} + \frac{1}{N}\sum_{i=2}^{N-1}\left(\frac{i-1}{i} + \frac{1}{N+1}\right)R^i - \frac{1}{(N+1)}\sum_{i=1}^{N} R^i).$$

In what follows, we prove that $\Delta_2^1 < \Delta_2^U$:

$$\Delta_2^1 - \Delta_2^U = \frac{1}{N}\sum_{i=1}^{N} R^i - \frac{(2N^2+N-1)R^N}{N^2(N+1)} - \frac{1}{N}\sum_{i=2}^{N-1}\left(\frac{i-1}{i}\right)R^i,$$
$$= \frac{1}{N}\sum_{i=2}^{N-1}\left(1 - \left(\frac{i-1}{i}\right)\right)R^i + \frac{((N(N+1)-(2N^2+N-1))R^N}{N^2(N+1)} + \frac{R^1}{N},$$
$$= \frac{1}{N}\left[\sum_{i=1}^{N-1}\frac{R^i}{i} - \frac{(N-1)R^N}{N}\right] < 0.$$

If $\Delta_2^1 - \Delta_2^U < 0$ then the profit of U in $t=1$ is lower when firms are not myopic than when firms are myopic ($\frac{R_1}{2}$). The equilibrium profit of U is its status-quo profit in the negotiation with a second firm in the first period, etc. Therefore the lag accumulates and the equilibrium first period profit of the manufacturer is always lower when firms are not myopic.

F.2 Proof of lemma 7

The tariff in $t=2$ with a firm who has failed in $t=1$ when all other negotiations had succeeded is:

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

The tariff in $t=2$ with a firm that had succeeded in $t=1$:

$$T_2(1,N-1) = \frac{(5-2N)R^N + 2NR^{N-1}}{6N}.$$

Therefore, the profit of U in $t = 2$ is:

$$\Pi_2(1,N-1) = NT_2(1,N-1) + T_2^N(1,N-1) = \frac{NR^{N-1} + R^N(2N+1)}{6N}.$$

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

$$\frac{R^N}{N} - T_1 + \Delta_2^1 = NT_1 - SQ + \Delta_2^U$$

where Δ_2^1 and Δ_2^U are defined above. Again, U earns a lower profit (and retailers a larger profit) when frims are not myopic if $\Delta_2^1 - \Delta_2^U < 0$. In order to show that this is true, we show that $\Delta_2^U > 0$ and $\Delta_2^1 < 0$:

$$\Delta_2^1 = [(\frac{R^N}{2N} - (\frac{R^N}{N} - T_2(1,N-1)] = \frac{(4-N)R^N + NR^{N-1}}{3N} < 0,$$
$$\Delta_2^U = [\frac{R^N}{2} - \frac{NR^{N-1} + R^N(2N+1)}{6N}] = \frac{-NR^{N-1} + R^N(N-1)}{6N} > 0.$$

With $SQ = \frac{1}{N}\sum_{i=1}^{N-1} R^i$ it is immediate that the first period profit for the manufacturer is lower when firms are forward looking rather than when they are myopic.