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On the countervailing power of large retailers when shopping costs matter*

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Abstract

We consider a set-up with vertical contracting between a supplier and a retail industry where a large retailer competes with smaller retailers that carry a narrower range of products. Consumers are heterogeneous in their shopping costs; they will either be multistop shoppers or one-stop shoppers. The countervailing power of the large retailer is modeled as a threat of demand-side substitution. We show that retail prices are higher, and industry surplus and social welfare fall, when the large retailer possesses countervailing power. Increasing marginal wholesale prices discourages multistop shopping behavior of consumers, making demand substitution less attractive for the large retailer.

JEL Classification: D43, L13, L40, L81.

Keywords: countervailing power, buyer power, polarization of the retail industry, shopping costs.

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1 Introduction

The recent decades have seen the growing dominance of powerful big-box retailers, which attract consumers through one-stop shopping. Another important trend in the retail industry is the polarization of store size. Increasingly, mid-sized general merchandise retailers are squeezed out by big-box retailers and small speciality stores or hard-discount chains (Griffith and Krampf, 1997, or more recently, Igami, 2011). As a result, big-box retailers often dominate the local retail market, in which they mainly compete with much smaller stores (for example, speciality stores).

At the same time, big-box retailers' success allows them to obtain more favorable terms from their suppliers. Competition authorities worldwide have expressed concerns about the impact of this countervailing power on consumers: countervailing power is socially desirable if the lower prices paid by large retailers to their suppliers are passed on to consumers. While the question of whether countervailing power is desirable for reducing retail prices has been discussed by legal and economic scholars since the 1950s without reaching a firm conclusion, this paper shows instead that countervailing power raises retail prices and decreases social welfare. When a large retailer possesses countervailing power it is not necessarily the consumer who benefits! The analysis uses a model that captures the main ingredients of the modern retail industry: the polarization of store size at the retail level and consumer shopping costs.

To be more specific, we consider a situation where a supplier sells to a retail industry. To capture the polarization of the retail industry and consumer shopping costs, we use the retail competition model developed by Chen and Rey (2012): a large retailer attracts consumers through one-stop shopping, and competes with much smaller retailers that focus on narrower product lines. Consumers are heterogeneous in their shopping costs and will be either multistop shoppers or one-stop shoppers depending on their shopping costs. To allow the possibility of profit-sharing between the supplier and the large retailer, we use two-part tariffs for contracts between the supplier and the large retailer.[1] The countervailing power of the large retailer is modeled as a threat of demand-side substitution.[2]

[1] The analysis in two-part tariffs is not restrictive; more general contracts can be considered.

[2] This is in line with Katz (1987), in which the source of large retailer's countervailing power is modeled as a credible threat of securing an independent source of supply.

See also Ellison and Snyder (2010), who find evidence for the importance of supplier competition, The supplier faces a trade-off between maximizing joint profits and extracting surplus. We show that, in this setting, joint profits maximization calls for wholesale prices equal to marginal cost. The supplier sells at marginal cost to the large retailer and the small retailers. While the presence of small retailers generates competitive pressure, it allows the large retailer to distinguish consumers according to their shopping costs, and this is best achieved through wholesale prices which are set at marginal cost. By contrast, surplus extraction is effective when the supplier instead charges high wholesale prices. By inducing less intrabrand competition through higher wholesale prices to the small retailers, the supplier makes it less attractive for the large retailer to switch to the alternative sources of supply. The reason is that by increasing the wholesale price to small retailers, the supplier discourages multistop shopping behavior of some consumers. The screening strategy of the large retailer with respect to consumers becomes less effective and higher wholesale price to the smaller retailers can thus be optimal for the supplier to disadvantage the large retailer. At the same time, the screening strategy of the large retailer is best achieved through a higher wholesale price to the large retailer when the wholesale prices of the small retailers increase. The fixed fee paid to the supplier by the large retailer decreases as the countervailing power of the large retailer increases. When the large retailer possesses a large enough countervailing power, the supplier pays a slotting fee (negative fixed fee) to the large retailer. In the end, high wholesale prices appear as a surplus extraction device rather than joint profits maximization. Industry surplus falls, as does consumer surplus, which results in a lower social welfare when the large retailer possesses countervailing power. The lower prices paid by the large retailer to the supplier (through a lower fixed fee) are not passed on to consumers. Countervailing power of the large retailer instead leads to higher prices for consumers, which echoes concerns voiced by many antitrust authorities according to which countervailing power may not lead to lower retail prices (Federal Trade Commission, 2001, Part IV; European Commission, 2011).[3]

Since Galbraith (1952, 1954), who argues that by exercising countervailing power,

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for the ability of large buyers to extract discounts from suppliers. They use data on wholesale prices for antibiotics sold to the U.S. market (drugstores and hospitals).

[3]Similar analysis is also suggested by Caprice and Rey (2015) when large retailers join forces to negotiate with suppliers. They show that joint listing decisions can enhance the bargaining position of the retailing chains without affecting final prices or even leading to higher final prices.

See also Foros and Kind (2008) and Doyle and Han (2014) for various models leading to higher retail prices when buyer power applies.

large retailers are able to lower the prices they pay their suppliers and pass on these savings to their consumers, countervailing power's impact has been elaborately discussed.[4] Our paper is not the first to demonstrate that countervailing power of large retailers can lead to higher consumer prices. In this regard, the analysis by von Ungern-Sternberg (1996) and Dobson and Waterson (1997) is particularly relevant. They show that under certain conditions increased concentration at the retail level may lead to higher retail prices. However their models, while adequate for their purposes, do not capture the retail industry ingredients that we mention above, such as the polarization of store size. In their models, all retail firms are symmetric. Moreover, these authors assume that upstream firms use linear pricing, which makes their analysis irrelevant to many retail industries in which nonlinear pricing is prevalent, especially when suppliers contract large retailers.[5]

By contrast, Chen (2003), using a model which captures the polarization of store size and nonlinear pricing, shows that countervailing power possessed by a large retailer leads to a fall in retail prices for consumers. The fall in retail prices is achieved through a fall in the wholesale prices of small retailers, which is the result of a supplier trying to offset the reduction in profits caused by the rise in countervailing power of the large retailer.[6] To capture the polarization of store size, Chen (2003) assumes that the downstream market is characterized by a dominant retailer facing a competitive fringe. In reality however, the main evolution of the retail industry is not characterized by this kind of asymmetry. Rather, large retailers offer a wide range of products while small retailers offer a narrower line of products. Moreover, large retailers attract consumers through one-stop shopping. At the theoretical level, Chen's (2003) modeling approach does not take into account this main ingredient.[7] Since Chen and Rey (2012) propose a simple way

[4] Many researchers have investigated this topic in various models. For recent contributions, see Iozzi and Valletti (2014); Chen et al. (2016) and Gaudin (2017). Discussions are available in Snyder (2005) and Chen (2007).

[5] See Villas-Boas (2007), and Bonnet and Dubois (2010) for evidence of such contracts in vertical contracting.

[6] Mills (2013) finds similar results with another mechanism.

[7] Another difference should be mentioned. Unlike in Chen (2003), where the supplier and the large retailer share the joint profits from their transaction, in our model, countervailing power is modeled by demand-side substitution. We will discuss this point in Section 4. With Chen's (2003) modeling of the countervailing power, only wholesale prices of the small retailers are affected when countervailing power changes. However, we will show in our set-up that countervailing power still leads to higher retail prices. Moreover, retail prices are now increasing in the countervailing power of the large retailer.

to consider this phenomenon, we use their retail competition model. Then, we add to their framework a vertical contracting setup to study the impact of countervailing power. It is thus shown that by capturing this feature (consumers are either one-stop shoppers or multistop shoppers) countervailing power can lead to higher retail prices. In other words, it is the combination of both "seller power" and "countervailing power" which explains that the countervailing power of the large retailer reduces social welfare. The results from our analysis confirm the importance of the polarization of store size and the existence of shopping costs in the debates about countervailing power. When shopping costs matter small retailers do not compete fiercely with large retailers. Instead, as shown by Chen and Rey (2012), their existence may benefit the large retailers, as they may exert seller power by screening consumers. Moreover, the value the consumers give to the small retailers play a role in the screening strategy of the large retailers when they discriminate consumers with respect to their shopping costs. Higher wholesale prices for the small retailers can thus make the strategy for large retailers to switch to alternative sources of supply less attractive.

A small range of literature now exists that mixes vertical contracting and shopping costs (Caprice and von Schlippenbach, 2013; Johansen and Nilssen, 2016). Caprice and von Schlippenbach (2013) show that, when one-stop shopping behavior is considered, slotting fees may emerge as a result of a rent-shifting mechanism in a three-party negotiation framework, where a monopolistic retailer negotiates sequentially with two competing or independent suppliers about two-part tariff contracts. The wholesale price negotiated with the first supplier is distorted upwards, and the first supplier may pay a slotting fee, as long as its bargaining power vis-à-vis the retailer is not too large. One-stop shopping behavior involves complementarity between products. This allows the retailer and the first supplier to extract rent from the second supplier. Johansen and Nilssen (2016) study a merger game between retailing stores to look into the incentives of independent stores to form a big store when some consumers have preferences for one-stop shopping. They show that one-stop shopping behavior may lead to an improvement in the bargaining position of the merged entity vis-à-vis producers, through the creation of an inside option that small stores do not have. In the present paper, we are interested in the impact of shopping costs on intrabrand competition between the large retailer and the small retailers when the supplier negotiates contracts with retailers, while Caprice and von Schlippenbach (2013) and Johansen and Tore (2016) focus on the changes in interbrand competition due to these shopping costs. Our findings confirm that shopping costs are a key ingredient of the competition between retailers (intrabrand competition) when a supplier negotiates with retailers.

The paper contributes to the large literature on vertical contracting with both public and secret contracts. Hart and Tirole (1990) document the opportunism problem arising in secret vertical contracts. Retail prices fall and the supplier cannot get the monopoly profits. In secret contracts, threat of demand-side substitution alters only the sharing of industry profits and not the prices.[8] In public contracts, demand-side substitution threat results in a decrease in retail price (Caprice, 2006; Inderst and Wey, 2011; Inderst and Shaffer, 2011).[9] Wholesale prices decrease to impair the outside option of retailers.[10] In this paper, we exhibit a similar mechanism except that wholesale prices increase to impair the outside option of the large retailer due to the shopping behavior of consumers. Again, our analysis suggests that consumer shopping costs may change the framework of the negotiations between the suppliers and the retailers.

The rest of the paper is organized as follows. We first present the model and the subgame-perfect equilibrium when the large retailer does not possess countervailing power (Section 2), before showing how countervailing power may lead to higher retail prices as well as a fall of social welfare (Section 3). Section 4 considers alternative modelings of the countervailing power and discusses the robustness of our insights. Section 5 concludes.

[8] See also Rey and Tirole (2007) for a review of this literature.

We should mention that, while a supplier faces an opportunism problem when negotiating with competing retailers, such a problem would not arise in our setting. Remember, joint profits maximization (when the countervailing power of the large retailer is absent) calls for wholesale prices equal to marginal cost: the supplier sells at marginal cost to the large retailer and the small retailers to maximize industry profits.

[9] When contracts are secret and an efficient supplier competes against an inefficient fringe of rivals, Caprice (2006) shows that banning price discrimination (which restores the publicity of contracts) may cause per-unit prices to fall and welfare to increase. The dominant supplier takes advantage of a strategic bargaining effect: reducing the price per-unit makes the outside option of buying from the fringe less profitable, allowing the dominant supplier to extract more bargaining surplus through the fixed fee.

[10] A similar trade-off arises in Montez (2007), but in another context.

2 The Model

Description of the model

The relationships between a supplier, retailers and consumers are modeled as follows. There are two levels of market: the upstream and the downstream market. In the upstream market, a supplier sells its product B to a large retailer L and a competitive fringe S. In the downstream market, these retailers resell the product to consumers. We assume this retail market structure represents the polarization of store size that we mention in the introduction, according to which large chain stores compete against traditional, independent retailers (large-scale retail giants versus small speciality stores).

We assume that the contract between the supplier and the large retailer L takes the form of two-part tariffs. Let w_L and F_L, respectively be the wholesale price and the fixed fee which are paid to the supplier by the large retailer. The two-part tariff in this model is a simple way to approximate nonlinear contracts.[11] Further, contracts between the supplier and the competitive fringe S are linear tariffs. As small retailers are modeled as a competitive fringe, considering nonlinear contracts for small retailers does not add anything in terms of contracting efficiency.[12] Let w_S be the wholesale price paid to the supplier by small retailers.

We use the framework from Chen and Rey (2012) for the retail competition in our setup. General retailing supply and demand conditions are considered. L and S offer different varieties B_L and B_S for the good B. We call this market the competitive market. The good A, which corresponds to the monopoly market is provided only by the large retailer. We denote the consumer valuations and the constant unit retailing costs for A, B_L and B_S by u_A, u_L and u_S and c_A, c_L and c_S respectively (c_A represents the all-inclusive cost of retailing A). Small retailers supply B_S at cost ($p_S = c_S + w_S$), thus offering consumers a value $v_S - w_S$, where $v_S = u_S - c_S$. We assume that small retailers S are more efficient than L in this segment (otherwise, S would not sell anything, and multistop shopping would never arise): $v_S > v_L = u_L - c_L (> 0)$. For instance, S can include chained, cost cutting hard discounters ($c_S < c_L$), or specialist stores that offer more service ($u_S > u_L$). L, however, benefits from its broader range ($v_A = u_A - c_A > 0$),

[11]The analysis would not be affected if we considered more general contracts as $T_L(q_L)$, where q_L corresponds to the quantity ordered by the large retailer. The appendix is available upon request.

[12]Linear prices allow the supplier to extract all the surplus from the small retailers as small retailers compete fiercely.

and overall offers a higher value: $v_A > v_S$ which implies $v_{AL} = v_A + v_L > v_S$ for any $v_L \geq 0$. We allow for general distributions of the shopping cost s, which is characterized by a cumulative distribution function $F(.)$ and a density function $f(.)$. Intuitively, consumers with a high s favor one-stop shopping, whereas those with a lower s can take advantage of multi-stop shopping; the mix of multistop and one-stop shoppers is, however, endogenous and depends on L's prices, p_A and p_L.

We consider the following game (simultaneous public offers):

- At stage one, offers to retailers are made simultaneously and are assumed to be public. L either accepts or rejects.

- Then, at stage two, the large retailer L sets p_A and p_L, and retail prices of the small retailers are given by $p_S = c_S + w_S$.

We will introduce countervailing power of the large retailer in the next section, but first we solve the subgame perfect equilibrium of this game to have a benchmark case in which the large retailer does not possess countervailing power.

The benchmark case[13]

At stage two, let $r_{AL} = p_A - c_A + p_L - c_L - w_L$ denote L's total margin, thus offering the consumer value $v_{AL} - w_L - r_{AL}$ from purchasing A and B_L. One-stop shoppers prefer L to S, as long as $v_{AL} - w_L - r_{AL} \geq v_S - w_S$ and are indeed willing to patronize L, as long as $s \leq v_{AL} - w_L - r_{AL}$. Moreover, consumers favor multistop shopping if the additional cost of visiting S is lower than the extra value it offers: $s \leq v_S - w_S - (v_L - w_L - r_L)$, where $r_L = p_L - c_L - w_L$ denotes L's margin on B_L. Figure 1 provides a description of the buying decision of the consumers according to their shopping cost.

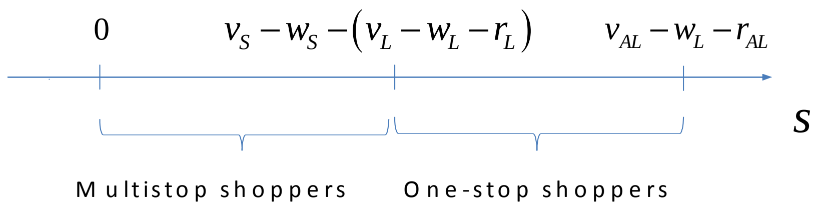

Figure 1: Shopping decision according to the shopping cost

[13] The large retailer does not possess countervailing power.

The total demand is given by $F(v_{AL}-w_L-r_{AL})$. L faces a demand $F(v_{AL}-w_L-r_{AL})-F(v_S-w_S-(v_L-w_L-r_L))$ for both products (from one-stop shoppers) and an additional demand $F(v_S-w_S-(v_L-w_L-r_L))$ for product A only (from multistop shoppers). Small retailers supply $F(v_S-w_S-(v_L-w_L-r_L))$ for product B. L's gross profit-maximization problem can be written as:

$$\begin{aligned}\max_{r_{AL},r_L} \pi_{AL} &= r_{AL}\left[F(v_{AL}-w_L-r_{AL})-F(v_S-w_S-(v_L-w_L-r_L))\right] \\ &\quad +r_A F(v_S-w_S-(v_L-w_L-r_L)) \\ &= r_{AL}F(v_{AL}-w_L-r_{AL})-r_L F(v_S-w_S-(v_L-w_L-r_L))\end{aligned}$$

where $r_A=p_A-c_A=r_{AL}-r_L$ denotes L's margin on A.

To characterize further the optimal retail pricing strategy, in what follows we assume that the inverse hazard rate, $h(.)=F(.)/f(.)$, is strictly increasing.[14] It results in optimal retail margins r_L^e and r_{AL}^e as follows.[15]

Loss leading arises and r_L^e is characterized by the first-order condition:

$$r_L^e=-\frac{F(v_S-w_S-(v_L-w_L-r_L^e))}{f(v_S-w_S-(v_L-w_L-r_L^e))}=-h(v_S-w_S-(v_L-w_L-r_L^e))<0.$$

Moreover, in the absence of any restriction on its total margin r_{AL} (i.e., $v_{AL}-w_L-r_{AL}\geq v_S-w_S$), L maximizes the first term $r_{AL}F(v_{AL}-w_L-r_{AL})$, which is the monopolistic gross profit that L could earn if S were not present. r_{AL}^e is characterized by the following first-order condition

$$r_{AL}^e=\frac{F(v_{AL}-w_L-r_{AL}^e)}{f(v_{AL}-w_L-r_{AL}^e)}=h(v_{AL}-w_L-r_{AL}^e)>0.$$

Let $r_A^m=h(v_A-r_A^m)$ denote the monopoly A's margin of L, yielding $\pi_A^m=r_A^m F(v_A-r_A^m)$.

We assume in the following analysis that $v_A-r_A^m\geq v_S$.[16]

Assumption 1: $v_A-r_A^m\geq v_S$, the comparative advantage of the large retailer due to its broader range is such that it is not constrained on its total margin.

[14] See Chen and Rey (2012).

[15] For the sake of exposition we ignore here non negativity price constraint.

[16] Assumption 1 that follows requires that $v_A\geq 2v_S$ for uniform shopping cost case. For details, see Appendix G.

The result is that there is no constraint on the total margin when $v_{AL} - r^m_{AL} \geq v_S$ for $v_L > 0$ with $r^m_{AL} = h\left(v_{AL} - r^m_{AL}\right)$, or when $v_{AL} - w_L - r^e_{AL} \geq v_S - w_S$ if $w_L \leq w_S$.

Comparative statics

Solving the above equations for margins as functions of, among other things, w_L and w_S: $r^e_{AL}\left(w_L, w_S\right)$ and $r^e_L\left(w_L, w_S\right)$, we get:

Lemma 1 *Assume* $w_L \leq w_S$*, we have* $\frac{\partial r^e_{AL}}{\partial w_L} \in (-1, 0)$, $\frac{\partial r^e_{AL}}{\partial w_S} = 0$, $\frac{\partial r^e_L}{\partial w_L} \in (-1, 0)$, $\frac{\partial r^e_L}{\partial w_S} \in (0, 1)$*. Moreover, we have* $\frac{\partial r^e_L}{\partial w_S} = -\frac{\partial r^e_L}{\partial w_L}$, $\frac{\partial^2 r^e_L}{\partial w_S \partial w_L} = -\frac{\partial^2 r^e_L}{\partial w_S^2}$ *and an increase in* w_L*, as well as an increase in* w_S *reduce the large retailer's profits:* $\frac{\partial \pi_{AL}\left(r^e_{AL}, r^e_L, w_L, w_S\right)}{\partial w_L} < 0$ *and* $\frac{\partial \pi_{AL}\left(r^e_{AL}, r^e_L, w_L, w_S\right)}{\partial w_S} < 0$.

Proof. See Appendix A. ■

Total margin is a decreasing function of the wholesale price at which the large retailer buys from the supplier and does not change with respect to w_S, because of assumption 1 (if $w_L \leq w_S$). L's margin on B_L, which is negative, is a decreasing function of w_L and an increasing function of w_S. So, the large retailer's profits are a decreasing function of the wholesale price at which it can purchase from the supplier, and its profits decrease as the input price of its rivals (small retailers) increases. The last effect is brought about by the screening strategy of the large retailer. Because of loss leading on B_L, the large retailer can extract more of A's value from multistop shoppers due to the presence of its rivals. When $v_S - w_S$ decreases, A's value extraction from multistop shoppers decreases (the surplus extraction is less effective). It results in an increase in w_S (which corresponds to $v_S - w_S$ smaller), which leads to a loss in L's profits. In other words, a decrease in small retailers' wholesale price boosts the sales of the small retailers and imposes a positive externality on the large retailer as the large retailer benefits from multistop shopping behavior of the consumers. As we will see this relation is important. When consumers face shopping costs, in case of a screening strategy of the large retailer, a decrease in the small retailers' wholesale price increases the profits of the large retailer. Furthermore, a new bargaining effect, which was absent from previous models of countervailing power, can arise. In the next section, we will see that an increase in the small retailers' wholesale price can decrease the profits that the large retailer obtains in the case of a disagreement with the efficient supplier, when we assume demand-side substitution for the large retailer as an outside option.

At stage one, the supplier sets contracts. In case the large retailer rejects the contract, L's associated profit is given by the monopoly profit on the product A, π_A^m (at the moment, there is no countervailing power).

The total profit of the supplier is written as:

$$\begin{aligned}&w_L\left[F\left(v_{AL}-w_L-r_{AL}^e\left(w_L\right)\right)-F\left(v_S-w_S-\left(v_L-w_L-r_L^e\left(w_L,w_S\right)\right)\right)\right]+F_L\\&+w_SF\left(v_S-w_S-\left(v_L-w_L-r_L^e\left(w_L,w_S\right)\right)\right)\end{aligned}$$

facing the constraint that the large retailer accepts the contract (w_L, F_L):

$$\pi_{AL}\left(r_{AL}^e\left(w_L\right),r_L^e\left(w_L,w_S\right),w_L,w_S\right)-F_L\geq\pi_A^m.$$

$F\left(v_{AL}-w_L-r_{AL}^e\left(w_L\right)\right)-F\left(v_S-w_S-\left(v_L-w_L-r_L^e\left(w_L,w_S\right)\right)\right)$ represents the demand from one-stop shoppers who buy the product at L, and the demand from multistop shoppers who buy at S is $F\left(v_S-w_S-\left(v_L-w_L-r_L^e\left(w_L,w_S\right)\right)\right)$.

The supplier will offer contracts such that the constraint holds with equality. We thus write the supplier's optimization problem as:

$$\begin{aligned}&\max_{w_L,w_S}\ w_L\left[F\left(v_{AL}-w_L-r_{AL}^e\left(w_L\right)\right)-F\left(v_S-w_S-\left(v_L-w_L-r_L^e\left(w_L,w_S\right)\right)\right)\right]\\&+\pi_{AL}\left(r_{AL}^e\left(w_L\right),r_L^e\left(w_L,w_S\right),w_L,w_S\right)+w_SF\left(v_S-w_S-\left(v_L-w_L-r_L^e\left(w_L,w_S\right)\right)\right).\end{aligned}$$

We omit the outside option of the large retailer π_A^m, because it does not depend on w_L and w_S.

The first-order conditions are (applying the envelope theorem and using the first-order conditions from stage two):

$$\begin{aligned}&-w_L\left(1+\frac{\partial r_{AL}^e}{\partial w_L}\right)f\left(v_{AL}-w_L-r_{AL}^e\right)\\&\qquad\qquad+\left(w_S-w_L\right)\left(1+\frac{\partial r_L^e}{\partial w_L}\right)f\left(v_S-w_S-\left(v_L-w_L-r_L^e\right)\right)=0\end{aligned}$$

$$-\left(w_S-w_L\right)\left(1-\frac{\partial r_L^e}{\partial w_S}\right)f\left(v_S-w_S-\left(v_L-w_L-r_L^e\right)\right)=0$$

Straightforward computations show that $w_L = w_S = 0$.[17]

Proposition 1 *(When the large retailer does not possess countervailing power) Joint profits maximization calls for wholesale prices equal to marginal cost. The supplier sells at marginal cost to the small retailers, as well as to the large retailer ($w_S = w_L = 0$); the fixed fee is given by $F_L = \pi_{AL}(0,0) - \pi_A^m$.*

Proof. See Appendix B. ∎

Because the outside option of the large retailer, given by the monopoly profits on A is independent from the contracts offered to the small retailers, the supplier maximizes industry surplus to capture the largest share of the surplus. Under assumption 1, the large retailer is not constrained in its total margin r_{AL}, it behaves like a monopoly on the bundle, the result is that $w_L = 0$. Moreover, as $\frac{\partial \pi_{AL}}{\partial w_S} < 0$ (lemma 1), industry surplus maximization results in $w_S = 0$. Intuitively, the benefits of loss leading, which come from A's value extraction are larger, when $v_S - w_S$ increases; for this reason, we obtain $w_S = 0$.

3 Effects of countervailing power

In this section, we study the effects of the countervailing power of the large retailer on consumer prices and social welfare. Some previous papers cited above find that a large retailer with countervailing power will use that power to obtain lower prices that it will pass on to consumers. In this section, by contrast, we show that introducing countervailing power leads to an increase in both wholesale prices (to the large retailer and to the small retailers) and consequently a decrease in consumer surplus, as well as a decrease in social welfare. The failure by the large retailer to bring its wholesale price down, however, does not mean that it pays more to the supplier. We will show that the fixed fee decreases when the countervailing power of the large retailer increases. Moreover, its wholesale price is lower than the wholesale price of the small retailers, however wholesale prices of both large and small retailers are higher compared to the benchmark case (without countervailing power).

[17] Second-order conditions are assumed to hold. Second-order conditions indeed hold for uniform shopping cost case, which is considered in Appendix G.

The countervailing power of the large retailer is measured by its capacity to obtain access an alternative supplier. The alternative supplier is modeled as a competitive fringe; let $\widetilde{c}$ be the manufacturing cost of the alternative supplier.[18] So, as $\widetilde{c}$ falls the countervailing power of the large retailer increases. We assume that the contracts of the small retailers are non contingent on the supplier-large retailer contract.[19]

Figure 2 below depicts the industry structure.

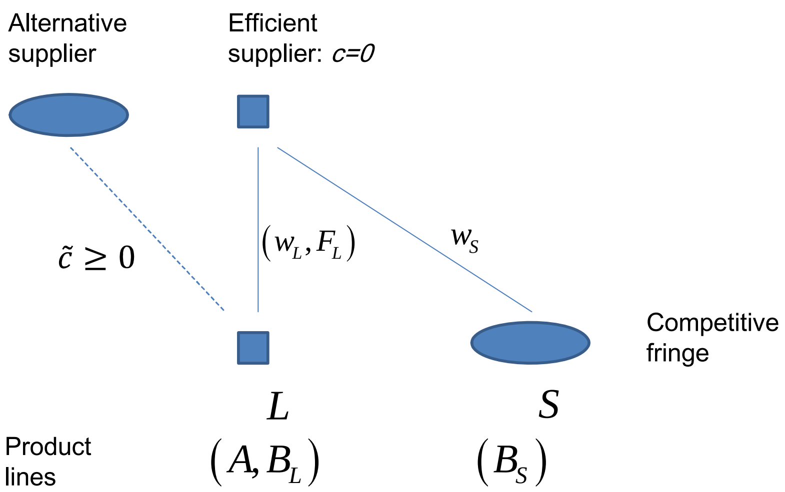

Figure 2: Industry structure in the case of countervailing power

In the case of refusal, let $\widetilde{r}_{AL} = h\left(v_{AL} - \widetilde{c} - \widetilde{r}_{AL}\right)$ be the total margin of L (in the absence of any restriction) and let $\widetilde{r}_L = h\left(v_S - w_S - \left(v_L - \widetilde{c} - \widetilde{r}_L\right)\right)$ be the margin of L on the good B_L yielding to $\widetilde{\pi}_{AL} = \widetilde{r}_{AL}F\left(v_{AL} - \widetilde{c} - \widetilde{r}_{AL}\right) - \widetilde{r}_L F\left(v_S - w_S - \left(v_L - \widetilde{c} - \widetilde{r}_L\right)\right)$ as an outside option. Under assumption 1 ($v_A - r_A^m \geq v_S$), the inequality $v_{AL} - \widetilde{c} - \widetilde{r}_{AL} \geq v_S$ is satisfied for $\widetilde{c} < v_L$ which results in the absence of any restriction on the total margin in case of refusal, as $v_{AL} - \widetilde{c} - \widetilde{r}_{AL} \geq v_S - w_S$.[20]

[18] See also, Caprice (2006); Inderst and Shaffer (2011).

[19] It is worth noting that a breakdown in contracts between the supplier and L is assumed to be observable but not verifiable (in court) and therefore cannot be contracted upon.

An alternative assumption would be to assume breakdown decision is a contractible contingency, i.e., that different prices between the supplier and small retailers can be proposed after a breakdown between the supplier and L. This point is discussed in Section 4. Similar discussion can be found in Caprice (2006).

[20] Consider instead, the less restrictive assumption ($v_{AL} - r_{AL}^m \geq v_S$) as assumption 1. As a result, the analysis will not change qualitatively. This change in assumption will require $v_{AL} \geq 2v_S$ instead of $v_A \geq 2v_S$ for uniform shopping cost case.

The following lemma helps to understand the bargaining effect we develop next.

Lemma 2 *The outside option of the large retailer, which is given by $\widetilde{\pi}_{AL}$, decreases in w_S.*

Proof. See Appendix C. ■

As the participation constraint of the large retailer holds with equality:

$$\pi_{AL}\left(r^e_{AL}\left(w_L\right), r^e_L\left(w_L, w_S\right), w_L, w_S\right) - F_L = \widetilde{\pi}_{AL}\left(w_S\right),$$

the resulting objective function of the supplier is given as:

$$\begin{aligned}
w_L & \left[F\left(v_{AL} - w_L - r^e_{AL}\left(w_L\right)\right) - F\left(v_S - w_S - \left(v_L - w_L - r^e_L\left(w_L, w_S\right)\right)\right)\right] \\
& \quad + w_S F\left(v_S - w_S - \left(v_L - w_L - r^e_L\left(w_L, w_S\right)\right)\right) \\
& \quad\quad + \pi_{AL}\left(r^e_{AL}\left(w_L\right), r^e_L\left(w_L, w_S\right), w_L, w_S\right) - \widetilde{\pi}_{AL}\left(w_S\right)
\end{aligned}$$

in which $\widetilde{\pi}_{AL}$ depends on w_S.

Differentiating the objective function with respect to w_L and w_S, we obtain the following first-order conditions (We apply the envelope theorem and use the first-order conditions from stage two to simplify the first-order conditions):

$$\begin{aligned}
& - w_L\left(1 + \frac{\partial r^e_{AL}}{\partial w_L}\right) f\left(v_{AL} - w_L - r^e_{AL}\right) \\
& \quad + \left(w_S - w_L\right)\left(1 + \frac{\partial r^e_L}{\partial w_L}\right) f\left(v_S - w_S - \left(v_L - w_L - r^e_L\right)\right) = 0
\end{aligned}$$

$$-\left(w_S - w_L\right)\left(1 - \frac{\partial r^e_L}{\partial w_S}\right) f\left(v_S - w_S - \left(v_L - w_L - r^e_L\right)\right) - \underbrace{\frac{\partial \widetilde{\pi}_{AL}\left(w_S\right)}{\partial w_S}}_{<0} = 0$$

Along the equilibrium path, the large retailer is not constrained in its total margin as long as $w_L < w_S$, which will be the case on equilibrium. Off-equilibrium, constraint on the total retail margin may arise, but the condition $\left(v_{AL} - r^m_{AL} \geq v_S\right)$ implies that $v_{AL} - \widetilde{c} - \widetilde{r}_{AL} \geq v_S$ is satisfied for a high enough countervailing power, in particular for $\widetilde{c} = 0$, resulting in $v_{AL} - \widetilde{c} - \widetilde{r}_{AL} \geq v_S - w_S$ for $\widetilde{c}$ small (the case in which there is no constraint on the total margin). When $\widetilde{c}$ is large, the analysis changes, but the wholesale price of the small retailers still increases when the large retailer possesses countervailing power, or remains unchanged compared to the benchmark case (without countervailing power).

The analysis can be found for uniform shopping cost in Appendix G.

Let w_L^* and w_S^* define the equilibrium wholesale prices which are the solutions of these first-order conditions.[21] The first-order condition with respect to w_L remains unchanged when compared to the benchmark case (without countervailing power), while the first-order condition with respect to w_S is higher than in the benchmark case. This is because the outside option only depends on w_S and depends on it negatively. By concavity of the objective function, we can conclude first that $w_S^* > 0$. Then, we can see that the second term of the first-order condition with respect to w_L is $-\frac{\partial \widetilde{\pi}_{AL}(w_S)}{\partial w_S}$ as $\frac{\partial r_L^e}{\partial w_L} = -\frac{\partial r_L^e}{\partial w_S}$ (See lemma 1) by using the first-order condition with respect to w_S. As $-\frac{\partial \widetilde{\pi}_{AL}(w_S)}{\partial w_S} > 0$, concavity of the objective function yields $w_L^* > 0$. $w_L^* < w_S^*$ comes from the first-order condition with respect to w_S because the term $-\frac{\partial \widetilde{\pi}_{AL}(w_S)}{\partial w_S}$ is positive.

Proposition 2 *Wholesale prices paid by retailers are higher when the large retailer possesses countervailing power; furthermore, we obtain* $0 < w_L^* < w_S^*$*. Countervailing power of the large retailer reduces the supplier's profits as well as the industry surplus. On the other hand, the profits of the large retailer increase with its countervailing power. Large enough countervailing power involves the payment of a slotting fee from the supplier to the large retailer.*

Proof. See Appendix D. ■

Due to the participation constraint of the large retailer, the equilibrium fixed fee equals $\pi_{AL}(w_L^*, w_S^*) - \widetilde{\pi}_{AL}(\widetilde{c}, w_S^*)$, we can show that it is decreasing in the countervailing power of the large retailer. A change in $\widetilde{c}$ has a direct effect on $\widetilde{\pi}_{AL}$, while it has an indirect effect on π_{AL}, which results in a decrease in the fixed fee when $\widetilde{c}$ decreases. Moreover, when $\widetilde{c} < w_L^*$, the fixed fee is negative because of $\widetilde{\pi}_{AL}(\widetilde{c}, w_S^*) > \pi_{AL}(w_L^*, w_S^*)$ (See lemma 1, $\frac{\partial \pi_{AL}}{\partial w_L} < 0$), which results in slotting fees paid from the supplier to the large retailer when the countervailing power of the large retailer is high. Moreover, the profits of the large retailer, which are given by $\widetilde{\pi}_{AL}(\widetilde{c}, w_S^*)$, increase when its countervailing power increases. In terms of policy implication, banning slotting fees decreases wholesale prices. When $\widetilde{c} < w_L^*$, a ban on slotting fees imposes a binding constraint. As the profits of the large retailer now are smaller, w_S^* is less distorted than if slotting fees were feasible.[22]

[21] Second-order conditions are assumed to hold.

[22] Furthermore, applying the analysis which follows, we can claim that banning slotting fees increases industry surplus, as well as consumer surplus. It results in the ban of slotting fees increasing social welfare.

Another result we have is that the wholesale price paid by the large retailer is smaller than the wholesale price of the small retailers. Investigating the upstream firm's profits, we breakdown the derivatives of the objective function with respect to the wholesale prices into two terms: industry profit and the outside option. A change in w_L has only a second-order effect on industry profit, while change in w_S has an additional effect on the outside option which is a first-order effect. Hence, it is optimal for the supplier to fix wholesale prices higher than zero and $w_L^* < w_S^*$.

Interestingly, in our model, countervailing power has effects which are different from those commonly envisioned. First, countervailing power causes an increase in the wholesale price paid by the small retailers. Thus, countervailing power results in a waterbed effect for small retailers, which is not seen in the benchmark case (without countervailing power).[23] This effect is brought about by the new mechanism of bargaining that we raise. Countervailing power of the large retailer creates incentives for the supplier to increase the wholesale price of small retailers to decrease the outside option of the large retailer. To understand the incentives of the supplier to do so, remember that the supplier's sales to the fringe retailers imposes a positive externality on the larger retailer; conversely, a reduction in the supplier's sales to the fringe retailers imposes a negative externality on the large retailer, by reducing screening opportunities. When the wholesale price of small retailers increases, multistop shopping behavior is less valuable for consumers which results in a decrease in screening opportunities of the large retailer. Hence, the outside option of the large retailer falls.

At the same time, as screening opportunities are reduced because small retailers are less attractive, we can see that the supplier has incentives to increase the wholesale price of the large retailer to offset the reduction in total profits, which is caused by the rise in the wholesale price paid by small retailers. Both wholesale prices are higher than in the benchmark case. Consequently, countervailing power is detrimental to the interests of the supplier and retailers as a whole, and causes a reduction in total profits.

Consumer surplus and welfare analysis

We now show that introducing countervailing power decreases the total quantity of goods in the competitive market (as well as in the monopoly market); the quantity sold

[23] Inderst and Valletti (2011) show that, when a large buyer is able to obtain lower input prices from a supplier, it is possible that other buyers will have to pay more for the same input as a result. The mechanism that we exhibit is different. See later.

by small retailers also decreases. The consumer surplus will decrease, as will the social welfare, as the industry surplus is lower when the large retailer possesses countervailing power.

We denote by $d_{AL} = v_{AL} - w_L - r^e_{AL}$ the consumer value of one-stop shopping. d_{AL} decreases as w_L increases.[24] We breakdown the consumer value of multistop shopping into the sum of two terms: the value of one-stop shopping and the additional value of multistop shopping. Let $d_{AS} = v_S - w_S - (v_L - w_L - r^e_L)$ denote the additional value of multistop shopping. d_{AS} decreases (increases) as w_S (w_L) increases as $\frac{\partial r^e_L}{\partial w_S} \in (0, 1)$ (as $\frac{\partial r^e_L}{\partial w_L} \in (-1, 0)$).[25] The consumer value of multistop shopping is given by $d_{AL} + d_{AS}$.

Suppose L possesses countervailing power, the consumer value of one-stop shopping decreases from $\overline{d}_{AL} = v_{AL} - r^e_{AL}(0)$ to $d^*_{AL} = v_{AL} - w^*_L - r^e_{AL}(w^*_L)$, as $w^*_L > 0$. Introducing countervailing power results in a discrete fall in consumer value from one-stop shopping; the total quantity in the competitive market (as well as the total quantity in the monopoly market) decreases. Similarly, going on the additional consumer value of multistop shopping, we find that d_{AS} decreases from $\overline{d}_{AS} = v_S - (v_L - r^e_L(0, 0))$ to $d^*_{AS} = v_S - w^*_S - (v_L - w^*_L - r^e_L(w^*_L, w^*_S))$ in the presence of countervailing power, as $0 < w^*_L < w^*_S$ and $\frac{\partial r^e_L}{\partial w_S} = -\frac{\partial r^e_L}{\partial wL}$ (See lemma 1). When L possesses countervailing power, the additional consumer value of multistop shopping falls and the quantity sold by small

[24] d_{AL} does not depend on w_S.
[25] See Lemma 1.

retailers decreases.[26]

The above construction of consumer value from multistop shopping ($d_{AL}+d_{AS}$) makes the analysis easier to explain. It becomes clear that all consumers enjoy at least the one-stop shopping value while the additional value from multistop shopping is enjoyed only by the multistop shoppers. Consumer surplus is given as:

$$\int_0^{d_{AL}} (d_{AL} - s)\, dF(s) + \int_0^{d_{AS}} (d_{AS} - s)\, dF(s)$$

where the first term represents the total value of one-stop shopping (one-stop shoppers and multistop shoppers), while the second term is the value of additional multistop shopping (multistop shoppers only). We first focus on the change of the total value of one-stop shopping (analysis of the change from the additional value of multistop shopping follows).

Suppose L possesses countervailing power, and let Δ_{AL} denote the loss in the total value of one-stop shopping in presence of countervailing power,

$$\Delta_{AL} = \int_{d_{AL}^*}^{\overline{d}_{AL}} (d_{AL}^* - s)\, dF(s) + \left(\overline{d}_{AL} - d_{AL}^*\right) F(d_{AL}^*).$$

We know that $d_{AL}^* < \overline{d}_{AL}$. Thus, consumers with a shopping cost exceeding d_{AL}^* do not

[26]Note that, we explicitly say that by introducing countervailing power, there is a discrete fall in one-stop shopping consumer value as well as in multistop shopping additional consumer value. It does not mean that d_{AL} and d_{AS} fall as countervailing power increases ($\widetilde{c}$ decreases). On the contrary, it is the opposite. The reason behind this is that decreasing the outside option of the large retailer becomes costlier as $\widetilde{c}$ falls. The result is that w_S^* increases when $\widetilde{c}$ increases, as does w_L^* (to offset the reduced attractiveness of small retailers). This can be seen in the comparative statics given below:

$$\begin{aligned} \frac{\partial d_{AL}^*}{\partial \widetilde{c}} &= -\underbrace{\frac{\partial w_L^*}{\partial \widetilde{c}}}_{\in(0,1)} - \underbrace{\frac{\partial r_{AL}^e}{\partial w_L}}_{\in(-1,0)} \underbrace{\frac{\partial w_L^*}{\partial \widetilde{c}}}_{\in(0,1)} < 0 \\ \frac{\partial d_{AS}^*}{\partial \widetilde{c}} &= -\frac{\partial w_S^*}{\partial \widetilde{c}} + \frac{\partial w_L^*}{\partial \widetilde{c}} + \frac{\partial r_L^e}{\partial w_S}\frac{\partial w_S^*}{\partial \widetilde{c}} + \frac{\partial r_L^e}{\partial w_L}\frac{\partial w_L^*}{\partial \widetilde{c}} = \underbrace{\left(\frac{\partial w_L^*}{\partial \widetilde{c}} - \frac{\partial w_S^*}{\partial \widetilde{c}}\right)}_{<0} \underbrace{\left(1 + \frac{\partial r_L^e}{\partial w_L}\right)}_{>0} < 0 \end{aligned}$$

because $\frac{\partial r_L^e}{\partial w_S} = -\frac{\partial r_L^e}{\partial w_L}$ and $0 < \frac{\partial w_L^*}{\partial \widetilde{c}} < \frac{\partial w_S^*}{\partial \widetilde{c}} < 1$ (See comparative statics on w_L^* and w_S^* in Appendix D).

Alternative modelings of the countervailing power of the large retailer lead to an increase in retail prices as countervailing power increases; see Subsection 4.2.

visit L and obtain zero, while in the case of no countervailing power they obtain $\overline{d}_{AL} - s$ as consumption value. The first term in Δ_{AL} represents this loss. Consumers with a shopping cost lower than d^*_{AL} shop within both regimes (with and without countervailing power). The second term is thus the difference in the values of one-stop shopping in the two regimes. All consumers (one-stop shoppers and multistop shoppers) face a loss in the value of one-stop shopping due to the countervailing power of the large retailer.

The presence of countervailing power of the large retailer also affects the additional value of multistop shopping ($d^*_{AS} < \overline{d}_{AS}$). Let us denote the loss in the total additional value of multistop shopping from the countervailing power as Δ_{AS}. It is given as:

$$\Delta_{AS} = \int_{d^*_{AS}}^{\overline{d}_{AS}} \left(\overline{d}_{AS} - s\right) dF\left(s\right) + \left(\overline{d}_{AS} - d^*_{AS}\right) F\left(d^*_{AS}\right).$$

Countervailing power discourages consumers with a shopping cost exceeding $d^*_{AS}\left(< \overline{d}_{AS}\right)$ from visiting S. These multistop shoppers will become one-stop shoppers instead of being multistop shoppers within the regime without countervailing power. This loss is given by the first term. The second term represents the loss of consumers with a shopping cost lower than d^*_{AS}. While they still patronize both retailers, they face a loss due to a decrease in the additional value of multistop shopping $\left(\overline{d}_{AS} - d^*_{AS}\right)$. All consumers who were multistop shoppers within the regime without countervailing power face a loss in the additional value of multistop shopping.

Overall, the countervailing power of the large retailer decreases the consumer surplus by $\Delta_{CS} = \Delta_{AL} + \Delta_{AS}$. We can also breakdown the change in the consumer surplus according to the four groups of consumers we distinguished: $s \in (0, d^*_{AS})$, $s \in \left(d^*_{AS}, \overline{d}_{AS}\right)$, $s \in \left(\overline{d}_{AS}, d^*_{AL}\right)$ and $s \in \left(d^*_{AL}, \overline{d}_{AL}\right)$.

We can write:

$$
\begin{aligned}
\Delta_{CS} \;=\; & \underbrace{\left[\left(\overline{d}_{AS}-d^*_{AS}\right)+\left(\overline{d}_{AL}-d^*_{AL}\right)\right]F\left(d^*_{AS}\right)}_{s\in\left(0,d^*_{AS}\right)} \\
& \underbrace{+\left(\overline{d}_{AL}-d^*_{AL}\right)\left[F\left(\overline{d}_{AS}\right)-F\left(d^*_{AS}\right)\right]+\int_{d^*_{AS}}^{\overline{d}_{AS}}\left(\overline{d}_{AS}-s\right)dF\left(s\right)}_{s\in\left(d^*_{AS},\overline{d}_{AS}\right)} \\
& +\underbrace{\left(\overline{d}_{AL}-d^*_{AL}\right)\left[F\left(d^*_{AL}\right)-F\left(\overline{d}_{AS}\right)\right]}_{s\in\left(\overline{d}_{AS},d^*_{AL}\right)}+\underbrace{\int_{d^*_{AL}}^{\overline{d}_{AL}}\left(\overline{d}_{AL}-s\right)dF\left(s\right)}_{s\in\left(d^*_{AL},\overline{d}_{AL}\right)}.
\end{aligned}
$$

The four regions are provided in Figure 3.

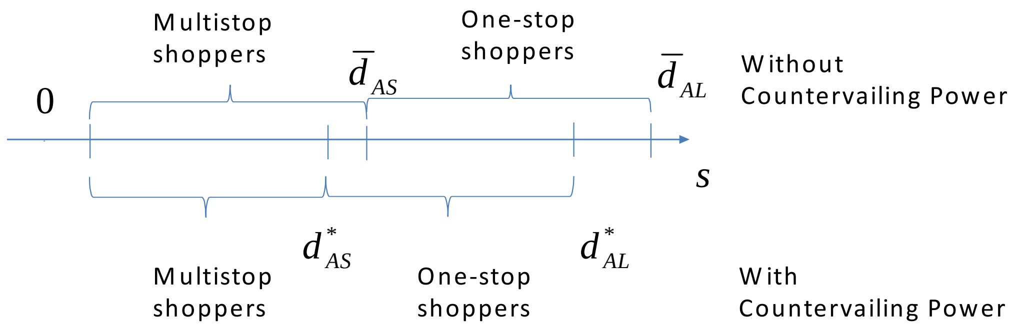

Figure 3: Changes in consumer values at the equilibrium

We can clearly see that when $s \in (0, d^*_{AS})$, multi-stop shoppers exist in both regimes (with and without countervailing power). This is reflected in the expression above for the region $s \in (0, d^*_{AS})$, where we have the difference in one-stop shopping value as well as the multistop shopping additional value. For the region $s \in (d^*_{AS}, \overline{d}_{AS})$, in the presence of countervailing power, one-stop shopping prevails, while consumers are multistop shoppers in the absence of countervailing power. Since consumer surplus for multistop shoppers has been split into two parts, we see the difference in one-stop shopping value for the consumers within both regimes along with a term that represents the additional surplus multistop shoppers obtain in absence of countervailing power. In the region $s \in (\overline{d}_{AS}, d^*_{AL})$, in both regimes we have one-stop shoppers and this is represented as the difference in one-stop shopping value. Finally, for $s \in \left(d^*_{AL}, \overline{d}_{AL}\right)$, one-stop shoppers exist only in the absence of countervailing power. The discussion above is summarized in the following proposition.

Proposition 3 *Countervailing power of the large retailer decreases the quantity sold by small retailers as well as the total quantity in the competitive market (Good B). Total quantity in the monopoly market also decreases (Good A). Consequently, countervailing power of the large retailer decreases consumer surplus.*

Proof. See Appendix E ■

Finally, the countervailing power of the large retailer decreases the social welfare (industry surplus decreases, as well as consumer surplus). The loss in social welfare is equal to

$$\Delta_W = \int_{d_{AS}^*}^{\bar{d}_{AS}} (v_S - v_L - s)\, dF(s) + \int_{d_{AL}^*}^{\bar{d}_{AL}} (v_{AL} - s)\, dF(s)$$

in which the first term corresponds to the fall in the demand from multistop shoppers who now become one-stop shoppers instead of being multistop shoppers and enjoyed $(v_S - v_L - s)$ as additional surplus, and the second term is the fall in the demand from one-stop shoppers who now do not buy.

Corollary 1 *Countervailing power of the large retailer decreases social welfare.*

As noted in the introduction, policy debates suggest that countervailing power is socially desirable if lower prices paid by large retailers to their suppliers are passed on to consumers. By showing that countervailing power can hurt consumers and social welfare, our analysis sheds new light on these debates and can help to qualify the conditions under which lower prices paid by large retailers to their suppliers are not passed on to consumers. We note in our analysis, that the large retailer exerts its market power in various ways: countervailing power (demand-side substitution) and seller power (the large retailer offers a wide range of products while small retailers focus on narrower product lines). It is the combination of both "countervailing power" and "seller power" which explains that the countervailing power of the large retailer reduces the social welfare.

Another policy implication follows: as wholesale prices are less distorted under a ban on slotting fees, we can claim that banning slotting fees increases social welfare.

4 Robustness and discussion

In this section, we first show in Subsection 4.1 that our analysis extends when the comparative advantage of the large retailer is smaller (namely, $v_S > v_{AL} - r_{AL}^m$, but still $v_{AL} > v_S$). Then, we discuss the assumptions about the contracts and stress that our insights do not depend on the modeling of the countervailing power of the large retailer (Subsection 4.2).

4.1 Smaller comparative advantage of the large retailer

In this subsection, we now assume that L's comparative advantage is smaller: $v_S > v_{AL} - r_{AL}^m$.[27] As a result, L will face a restriction on its total margin r_{AL} in order to keep attracting one-stop shoppers.

At stage two, consider w_L and w_S, which are offered by the supplier at stage one, we assume that $v_S - w_S > v_{AL} - w_L - r_{AL}^e$ with $r_{AL}^e = h\left(v_{AL} - w_L - r_{AL}^e\right)$. Instead of r_{AL}^e, L should, as a result, improve its offer to attract one-stop shoppers. It is then optimal for L to match the value offered by the competitive fringe of small retailers: $v_{AL} - w_L - r_{AL} = v_S - w_S$ or $r_{AL} = v_{AL} - w_L - (v_S - w_S)$ $(< r_{AL}^e)$, which gives L's gross profit, by replacing r_{AL}, equal to:

$$\pi_{AL} = \left[v_{AL} - w_L - (v_S - w_S)\right] F\left(v_S - w_S\right) - r_L^e F\left(v_S - w_S - \left(v_L - w_L - r_L^e\right)\right)$$

with $r_L^e = -h\left(v_S - w_S - \left(v_L - w_L - r_L^e\right)\right)$. The margin of the good B_L is unchanged. The fringe of small retailers exerts an effective competition for one-stop shoppers, but screening strategy is still best achieved by pricing B_L below cost at $r_L^e (< 0)$.

Note, we get:

$$\left.\frac{\partial \pi_{AL}}{\partial r_{AL}}\right|_{r_{AL} = v_{AL} - w_L - (v_S - w_S)} = \left. F\left(v_{AL} - w_L - r_{AL}\right) - r_{AL} f\left(v_{AL} - w_L - r_{AL}\right)\right|_{r_{AL} = v_{AL} - w_L - (v_S - w_S)}$$

which is positive by concavity of the objective function of the large retailer.

At stage one, the supplier sets contracts.

[27] For uniform shopping cost case, $v_S > v_{AL} - r_{AL}^m$ yields $v_{AL} < 2v_S$, see Appendix G.

We first consider the case where the large retailer has no countervailing power. The profit-maximization problem of the supplier can be written as

$$\begin{aligned}&\max_{w_L,w_S}\ w_L\left[F\left(v_S-w_S\right)-F\left(v_S-w_S-\left(v_L-w_L-r_L^e\right)\right)\right]+F_L\\&+w_SF\left(v_S-w_S-\left(v_L-w_L-r_L^e\right)\right)\end{aligned}$$

where the fixed fee is given by $F_L=\pi_{AL}\left(r_L^e\left(w_L,w_S\right),w_L,w_S\right)-\pi_A^m$.

First-order conditions (applying the envelope theorem on $\pi_{AL}\left(.\right)$ and using $r_L^e=-h\left(v_S-w_S-\left(v_L-w_L-r_L^e\right)\right)$) are

$$\left(w_S-w_L\right)\left(1+\frac{\partial r_L^e}{\partial w_L}\right)f\left(v_S-w_S-\left(v_L-w_L-r_L^e\right)\right)=0$$

$$\begin{aligned}&-\left(w_S-w_L\right)\left(1-\frac{\partial r_L^e}{\partial w_S}\right)f\left(v_S-w_S-\left(v_L-w_L-r_L^e\right)\right)\\&\quad-w_Lf\left(v_S-w_S\right)-\left(v_{AL}-w_L-\left(v_S-w_S\right)\right)f\left(v_S-w_S\right)+F\left(v_S-w_S\right)=0\end{aligned}$$

Let w_L^{**} and w_S^{**} be the solutions of the above equations. Straightforward computations lead to $w_S^{**}=w_L^{**}$ and $w_S^{**}=-\left(v_{AL}-v_S\right)+h\left(v_S-w_S^{**}\right)>0$ as

$$\left.\frac{\partial\pi_{AL}}{\partial r_{AL}}\right|_{r_{AL}=v_{AL}-w_L-\left(v_S-w_S\right)}=-\left(v_{AL}-w_L-\left(v_S-w_S\right)\right)f\left(v_S-w_S\right)+F\left(v_S-w_S\right)>0.$$

Instead of having $w_S=w_L=0$, as in the case of non countervailing power, equilibrium wholesale prices are higher to reduce the competitive pressure from small retailers on the total margin of the large retailer.

Subsequently, we introduce countervailing power of the large retailer. The profit-maximization problem of the supplier changes as the large retailer can now substitute the supplier in the case of a refusal. Instead of having π_A^m, in the case of a refusal, let $\widetilde{\pi}_{AL}\left(.\right)$ define the new outside option of the large retailer which is a function of $\widetilde{r}_{AL}\left(\widetilde{c},w_S\right)$, $\widetilde{r}_L\left(\widetilde{c},w_S\right)$, $\widetilde{c}$ and w_S. Writing the profit-maximization problem of the supplier, the first-order condition with respect to w_L is unchanged but the first-order condition with respect to w_S now becomes:

$$- (w_S - w_L)\left(1 - \frac{\partial r_L^e}{\partial w_S}\right) f\left(v_S - w_S - (v_L - w_L - r_L^e)\right)$$
$$- w_L f(v_S - w_S) - (v_{AL} - w_L - (v_S - w_S)) f(v_S - w_S) + F(v_S - w_S) - \frac{\partial \widetilde{\pi}_{AL}}{\partial w_S} = 0.$$

Without ambiguity, the impact of the countervailing power depends on the sign of $\frac{\partial \widetilde{\pi}_{AL}}{\partial w_S}$. If $\frac{\partial \widetilde{\pi}_{AL}}{\partial w_S} < 0$, wholesale prices will be higher, and the opposite will arise if $\frac{\partial \widetilde{\pi}_{AL}}{\partial w_S} > 0$. In the following, we provide a sufficient condition to get higher wholesale prices in case of countervailing power.

Proposition 4 *Assuming* $v_S > v_{AL} - r_{AL}^m > v_S - w_S^{**}$*, with* $w_S^{**} = -(v_{AL} - v_S) + h(v_S - w_S^{**}) > 0$*, a high enough countervailing power leads to higher wholesale prices.*

Proof. See Appendix F. ■

Assume $v_{AL} - r_{AL}^m > v_S - w_S^{**}$, and let $\widehat{\widetilde{c}} = v_S - w_S^{**} - \left(v_{AL} - \widetilde{r}_{AL}\left(\widehat{\widetilde{c}}\right)\right)$ with $\widetilde{r}_{AL}\left(\widehat{\widetilde{c}}\right) = h\left(v_{AL} - \widehat{\widetilde{c}} - \widetilde{r}_{AL}\left(\widehat{\widetilde{c}}\right)\right)$ define a threshold on $\widetilde{c}$; we have on the interval $\widetilde{c} \in \left(0, \widehat{\widetilde{c}}\right)$ that the large retailer is non-constrained on its total margin in the case of a refusal when the wholesale price of small retailers equals w_S^{**}.[28] Previous analysis (see lemma 1) shows that $\frac{\partial \widetilde{\pi}_{AL}}{\partial w_S} < 0$ in this case. Consequently, without ambiguity, a high enough countervailing power which is characterized by $\widetilde{c} \in \left(0, \widehat{\widetilde{c}}\right)$ leads to higher wholesale prices.[29]

Other results follow directly. A high enough countervailing power of the large retailer reduces the supplier's profits as well as the industry surplus. On the other hand, the profits of the large retailer increase in its countervailing power and the supplier pays a slotting fee to the large retailer (as $\widehat{\widetilde{c}} < w_L^{**}$ to get $v_{AL} - \widetilde{c} - \widetilde{r}_{AL}(\widetilde{c}) > v_S - w_S^{**}$ and $\frac{\partial \pi_{AL}}{\partial w_L} < 0$). Introducing high enough countervailing power decreases consumer surplus and consequently decreases social welfare as industry surplus is lower too.[30]

[28] Considering the uniform shopping cost case, $\widehat{\widetilde{c}}$ corresponds to $\frac{v_A - v_L}{2}$. See Appendix G.

[29] In Appendix G, the analysis of uniform shopping costs helps to illustrate this result.

[30] Note that by introducing countervailing power with $\widetilde{c} \in \left(0, \widehat{\widetilde{c}}\right)$, wholesale prices are higher compared to the case in which the large retailer has no countervailing power but wholesale prices are still equal at the equilibrium $(w_L = w_S)$. For more, see Appendix F.

As a result, in case $\widetilde{c} \in \left(0, \widehat{\widetilde{c}}\right)$ (large countervailing power), the total demand decreases

4.2 Discussion and alternative modeling of the countervailing power

The above framework aims at capturing how the countervailing power can lead to higher retail prices. The modeling choice of the countervailing power, namely, that the supplier is constrained in contracting with the large retailer by the threat of demand-side substitution, is in line with the literature. It also fits well as large retailers often have the ability to turn to other sources of supply if they dislike the supplier's terms.

Alternative modeling of the countervailing power has also been used in the literature. For example, the outcome of the negotiation between the supplier and the large retailer can be determined through the Nash's axiomatic approach. Following the approach developed in Chen (2003), we suppose that the contract between the supplier and the large retailer satisfies the following two properties:[31]

(i) the contract (w_L, F_L) is efficient in the sense that the surplus (joint profits) from *this transaction* is maximized, otherwise the large retailer would want to renegotiate;

(ii) the surplus from this contract is divided according to the sharing rule γ, where $\gamma \in (0, 1)$ denotes the large retailer's share of the joint profits. An increase in the amount of the countervailing power possessed by the large retailer implies a larger share γ.

In this setting, negotiations are sequential: the supplier is able to commit to the contracts with the small retailers, following which, negotiations between the supplier and the large retailer take place according to the above approach. We show that our insights, that is countervailing power can lead to higher retail prices and can decrease social welfare- carry over with this modeling of negotiations.[32]

(which is given by $F(v_S - w_S)$), but the quantity sold by small retailers does not change $(F(v_S - w_S - (v_L - w_L - r_L^e)))$. The demand of multistop shoppers is unchanged; only the demand of one-stop shoppers falls. Let $w_L^{**,C} = w_S^{**,C}$ define the equilibrium wholesale prices (which solve the first-order conditions) in case $\widetilde{c} \in \left(0, \widehat{\widetilde{c}}\right)$), we have $w_L^{**,C} = w_S^{**,C} > w_L^{**} = w_S^{**} > 0$. The loss in social welfare, which is equal to $\Delta_W = \int_{v_S - w_S^{**,C}}^{v_S - w_S^{**}} (v_S - s)\, dF(s)$, now corresponds to the fall in demand from one-stop shoppers who do not buy, in the case of countervailing power.

[31] Discussions of this approach can be found in Christou and Papadopoulos (2015), and Matsushima and Yoshida (2016).

[32] In the approach developed by Chen (2003), contracts between the supplier and the large retailer are assumed to be efficient, so that only the wholesale price paid by the small retailers (and the fixed fee between the supplier and the large retailer) varies in the countervailing power of the large retailer.

Alternatively, one can think of the outcome of the negotiation between the supplier and the large retailer given as a random proposal of take-it-or-leave-it offers before the negotiation takes place (See

We thus suppose that the sequence of contract negotiations is a two-stage sequence: at stage zero, the supplier makes a take-it-or-leave-it offer to each of the small retailers (w_S); at stage one, the contract between the supplier and the large retailer (w_L, F_L) is determined through the negotiation explained above. Then, stage two is unchanged.[33]

The analysis has been developed for $v_{AL} - r^m_{AL} > v_S$: the large retailer is not constrained on its total margin.[34]

Solving backwards, retail margins of the large retailer at stage two are unchanged. At stage one, the supplier and the large retailer negotiate a contract (w_L, F_L). The joint profits Π_J from the transaction between the supplier and the large retailer can be written:

$$\Pi_J = w_L \left[F\left(v_{AL} - w_L - r^e_{AL}\right) - F\left(v_S - w_S - \left(v_L - w_L - r^e_L\right)\right)\right] + \pi_{AL}\left(r^e_{AL}, r^e_L\right) - \pi^m_A$$

where $\pi_{AL}\left(r^e_{AL}, r^e_L\right) = r^e_{AL} F\left(v_{AL} - w_L - r^e_{AL}\right) - r^e_L F\left(v_S - w_S - \left(v_L - w_L - r^e_L\right)\right)$ and $\pi^m_A = r^m_A F\left(v_A - r^m_A\right)$ where $r^m_A = h\left(v_A - r^m_A\right)$. Differentiating Π_J with respect to w_L and apply the envelope theorem, then w_L satisfies:

$$-w_L \left[\left(1 + \frac{\partial r^e_{AL}}{\partial w_L}\right) f\left(v_{AL} - w_L - r^e_{AL}\right) + \left(1 + \frac{\partial r^e_L}{\partial w_L}\right) f\left(v_S - w_S - \left(v_L - w_L - r^e_L\right)\right)\right] = 0$$

by using $r^e_{AL} = h\left(v_{AL} - w_L - r^e_{AL}\right)$ and $r^e_L = -h\left(v_S - w_S - \left(v_L - w_L - r^e_L\right)\right)$. The first-order condition reveals that $w_L = 0$. Following the sharing rule suggested by Chen,

Chemla, 2003 for an example of this approach in use; or more recently, see Münster and Reisinger, 2015). With probability γ, the large retailer proposes (w_L, F_L), while with probability $(1-\gamma)$ the supplier proposes (w_L, F_L). That is, where $\gamma = 1$, the large retailer has full bargaining power, while where $\gamma = 0$ the supplier has full bargaining power. Offers to the small retailers are still made by the supplier, and, simultaneously, with the negotiation between the supplier and the large retailer. We still assume that contracts, in particular contracts with the small retailers cannot be conditional on any action chosen later in the game (acceptance or refusal decision on the offers in the negotiation between the supplier and the large retailer). We can show that, conditional on who makes the proposal, now has an impact on the wholesale price negotiated between the supplier and the large retailer. w_L maximizes the industry surplus, regardless of who makes the proposal, but varies in w_S. As w_S changes according to who makes the proposal in the negotiation between the supplier and the large retailer, w_L varies in w_S. Furthermore, as in Chen's approach, retail prices will increase in γ.

We thank Patrick Rey for suggesting this extension. Details can be found in Appendix H.

[33] Still, contracts to the small retailers are not contingent to the success of negotiation between the supplier and the large retailer.

[34] With $v_S > v_{AL} - r^m_{AL}$, we can show that the results still hold as long as the comparative advantage of the large retailer $(v_{AL} - v_S)$ is not too small. The proof is available upon request.

$F_L = (1-\gamma)\,\Pi_J$. At stage zero, the supplier chooses the contract offered to the small retailers. In so doing, it wants to maximize the total profits it earns from the sales to both the small retailers and the large retailer:

$$w_S F\left(v_S - w_S - \left(v_L - r_L^e\right)\right) + (1-\gamma)\,\Pi_J.$$

$\Pi_J = \pi_{AL}\left(r_{AL}^e\left(0, w_S\right), r_L^e\left(0, w_S\right), 0, w_S\right) - \pi_A^m$ corresponds to the gross profits of the large retailer written at $w_L = 0$ minus the monopoly profit on the good A. If we differentiate the objective of the supplier with respect to w_S and apply the envelope theorem, then w_S satisfies:

$$w_S\left(-1 + \frac{\partial r_L^e}{\partial w_S}\right) f\left(v_S - w_S - \left(v_L - r_L^e\right)\right) + \gamma F\left(v_S - w_S - \left(v_L - r_L^e\right)\right) = 0.$$

Let w_S^* denote the solution of the first-order condition. Comparative statics reveals that

$$\frac{\partial w_S^*}{\partial \gamma} = -\frac{F\left(v_S - w_S^* - \left(v_L - r_L^e\right)\right)}{\partial^2 \Pi_J / \partial w_S^2}$$

which is positive. An increase in the countervailing power of the large retailer increases the wholesale price paid by the small retailers.

The countervailing power of the large retailer does not affect the value of one-stop shopping as w_L, which is equal to the marginal cost of production (zero), does not change with respect to γ. w_L maximizes the joint profits from the transaction between the large retailer and the supplier and, because of the double marginalization problem, we get $w_L = 0$. So, the mechanism through which the countervailing power of the large retailer brings up the wholesale price paid by the small retailers is quite similar. Consider the change in the quantities sold in the retail market. When w_S increases, the sales to the small retailers decrease, which imposes a negative externality on the large retailer due to reduced screening opportunities. When γ is larger, the supplier internalizes less of the profits of the large retailer and so is more willing to impose a negative externality on the large retailer by selling less through the small retailers. Therefore, the increase in w_S is the result of the supplier trying to offset the reduction in profits caused by the rise in the countervailing power γ.

Hence, we obtain here that an increase in the countervailing power of the large retailer leads to an increase in the retail prices ($p_S = w_S$). Consequently, consumer surplus decreases. The present analysis in terms of consumer surplus is slightly easier compared to the previous analysis as the value of one-stop shopping does not change in this setting of negotiations.

Let $\overline{d}_{AS} = v_S - (v_L - r_L^e(0,0))$ with $r_L^e(0,0) = -h(v_S - (v_L - r_L^e(0,0)))$ denote the additional value of multistop shopping for $\gamma = 0$ as a benchmark and $d_{AS}^* = v_S - w_S^* - (v_L - r_L^e(0, w_S^*))$ with $r_L^e(0, w_S^*) = -h(v_S - (v_L - r_L^e(0, w_S^*)))$ as the value for $\gamma > 0$. Adding countervailing power leads to a decrease in the additional value of multistop shopping from $\overline{d}_{AS}$ to d_{AS}^*. The consumer surplus decreases by:

$$\Delta_{CS} = \left(\overline{d}_{AS} - d_{AS}^*\right) F\left(d_{AS}^*\right) + \int_{d_{AS}^*}^{\overline{d}_{AS}} \left(\overline{d}_{AS} - s\right) dF(s)$$

in which the first term corresponds to the decrease in consumer surplus of multi-stop shoppers who now face a higher price when shopping at smaller retailers, and the second term is the loss of consumers who now become one-stop shoppers due to the countervailing power of the large retailer. Furthermore, since industry surplus is maximized for $w_S = 0$, industry surplus decreases when we add countervailing power, as does social welfare, which decreases by:

$$\Delta_W = \int_{d_{AS}^*}^{\overline{d}_{AS}} (v_S - v_L - s)\, dF(s).$$

The question of which of model of countervailing power is more relevant (in terms of plausible assumptions and/or of predicted outcomes), is likely to vary across products or industries. In the first approach, both wholesale prices change according to the countervailing power of the large retailer, while in the second approach the wholesale price of the small retailers increases only. However, in both cases adding countervailing power of the large retailer decreases the social welfare.

It is worth noting that results hinge critically on the assumption that the breakdown in negotiation between the supplier, and the large retailer cannot be contracted upon, because of non-verifiability in court. Assume instead that the breakdown in negotiation is contractible (as do Inderst and Wey (2003), for example), the industry surplus maximization and the sharing of the industry surplus will be disentangled and the countervailing power of the large retailer will not affect retail prices along the equilibrium path. The same distinction arises between Caprice (2006) and Inderst and Shaffer (2011), who adopt the same assumption as we do in this paper, and Inderst and Shaffer (2010), who only focus on the industry surplus maximization. In practice, Möller (2007) noted that contingent contracts are rare and hard to enforce.[35]

5 Conclusion

A recurring theme in the retail industry is that large retailers offer a wide range of products and are thus able to capture large market shares through one-stop shopping. Their dominance in the retailing markets confers upon buyer power vis-à-vis the suppliers as well, which allows them to obtain more favorable trade terms than other retailers.

In this article, we demonstrate that countervailing power possessed by a large retailer can lead to a rise in retail prices for consumers as well as a decrease in social welfare. The fixed fee paid by the large retailer to the supplier decreases, but wholesale prices increase. While joint profits maximization calls for wholesale prices equal to marginal cost of production, high wholesale prices are a supplier's strategy to extract surplus from the large retailer. Such a response by the supplier to the countervailing power of the large retailer increases retail prices and decreases social welfare.

Thus, the countervailing power of large retailers may not lead to lower retail prices. The analysis provides a theoretical foundation for concerns voiced by many antitrust authorities: cost savings which only benefit the large retailers will not suffice; cost savings need to be passed on to consumers. While the question of whether countervailing power is socially desirable has been discussed by legal and economic scholars since the 1950s without reaching a firm conclusion, this article claims that countervailing power decreases social welfare. Our analysis which combines seller power and buyer power captures the main ingredients of the modern retail industry: polarization of the retail industry and shopping costs. In our model, a large retailer, which attracts consumers through one-stop shopping, competes with smaller retailers.

In many countries, retailers' pricing strategies are ruled by the same general compe-

[35] See also Milliou and Petrakis (2007) for an interesting discussion on this point.

tition laws as those of producers. However, during the 1990s, several countries adopted regulations to prevent retailers from engaging in loss-leading against smaller rivals, to the detriment of consumers.[36] At the same time, OECD (2007) argues that rules against loss-leading are likely to protect inefficient competitors and harm consumers. In our analysis, the large retailer sells below the marginal wholesale price. Preventing the large retailer from selling below the marginal wholesale price would shift the retail equilibrium. The first effect would be a price-raising effect as screening opportunities of the large retailer change. The effect of the countervailing power of the large retailer is, then far from being clear. However, assume the countervailing power of the large retailer benefits consumers, we would obtain that, preventing the large retailer from selling below the marginal wholesale price harms consumers if the first price-raising effect is larger. Another crucial point in banning loss-leading is the definition of the price threshold. If the price threshold is the unit wholesale price including the fixed fee, the large retailer does not sell below cost in any case. For example, assume the large retailer has high countervailing power, then the supplier pays slotting fees to the large retailer, which suggests that the large retailer does not sell below the unit wholesale price including fixed fee. Because the large retailer's pricing strategies are not binding in the case of high countervailing power, prohibiting selling at a loss may simply restrain the large retailer in the case of weak countervailing power, which leads to higher retail prices in this case. Even if this issue is important, we make the choice not to deal with it in this article, but to leave it for future investigations.

The countervailing power of large retailers also has an impact on suppliers' investment incentives.[37] When retailers enhance their buying power, suppliers adjust their investments according to the new bargaining position of their buyers. The concern frequently expressed in policy circles is that suppliers respond to growing buyer power by under-investing in innovation and production. Our above analysis argues that high wholesale prices may help to extract surplus from the large retailer, which may tend to reduce suppliers' investment incentives. Low wholesale prices would not favor the

[36] As noted by Chen and Rey (2013), below-cost resale is banned in Belgium, France, Ireland, Luxembourg, Portugal and Spain, whereas it is generally allowed in the Netherlands and the United Kingdom. In the United States, 22 states are equipped with general sales-below-costs laws, and 16 additional states prohibit below-cost sales on motor fuel.

For a contribution to this topic, see for example Allain and Chambolle (2011).

[37] See Inderst and Wey (2011) and Caprice and Rey (2015) for contributions to this issue.

surplus extraction from the large retailer, decreasing the supplier's incentives to invest. However, the impact of the supplier's investments with respect to the conditions of retail screening is less clear. Supplier's investments may have effects on the consumer value of the good at the large retailer as well as at the small retailers. The screening opportunities at the retail level may change, as may the seller power of the large retailer. We leave the analysis of the impact of the countervailing power on suppliers' investment incentives, consumer surplus and social welfare, when shopping costs matter to future researches.

References

Allain, M.-L. and C. Chambolle (2011), "Anticompetitive effects of resale-below-cost laws," *International Journal of Industrial Organization*, 29(4): 373-385;

Bonnet, C., and P. Dubois (2010), "Inference on vertical contracts between manufacturers and retailers allowing for nonlinear pricing and resale price maintenance," *RAND Journal of Economics*, 41(1): 139-164;

Caprice, S. (2006), "Multilateral Vertical Contracting with an Alternative Supply: The Welfare Effects of a Ban on Price Discrimination," *Review of Industrial Organization*, 28(1): 63-80;

Caprice, S., and P. Rey (2015), "Buyer power from joint listing decision," *Economic Journal*, 125: 1677-1704;

Caprice, S., and V. von Schlippenbach (2013), "One-Stop Shopping as a Cause of Slotting Fees: A Rent-Shifting Mechanism," *Journal of Economics and Management Strategy*, 22(3): 468-487;

Chemla, G. (2003), "Downstream Competition, Foreclosure, and Vertical Integration," *Journal of Economics and Management Strategy*, 12(2): 261–289;

Chen, Z. (2003), "Dominant retailers and the countervailing-power hypothesis," *RAND Journal of Economics,* 34(4), 612-625;

Chen, Z. (2007), "Buyer power: Economic theory and antitrust policy," Zerbe R. O. and J. B. Kirkwood (Eds), *Research in Law and Economics*, 22:17-40;

Chen, Z., Ding, H., and Z. Liu (2016), "Downstream Competition and the Effects of Buyer Power," *Review of Industrial Organization*, 49(1): 1-23;

Chen, Z., and P. Rey (2012), "Loss leading as an exploitative practice," *American Economic Review*, 102(7): 3462-3482;

Christou, C., and K.G. Papadopoulos (2015), "The countervailing power hypothesis in the dominant firm-competitive fringe model," *Economics Letters*, 126: 110-113;

Dobson, P. W,.and M. Waterson (1997), "Countervailing power and consumer prices," *Economic Journal,* 107: 418-430;

Doyle, C. and M. Han (2014), "Cartelization through buyer groups," *Review of Industrial Organization,* 44: 255-275;

Ellison, S. and C. Snyder (2010), "Countervailing power in wholesale pharmaceuticals," *Journal of Industrial Economics*, 58(1): 32-53;

European Commission (2011), "Guidelines on the applicability of Article 101 of the Treaty on the Functioning of the European Union to horizontal cooperation agreements," 2011/C 11/01, available at:

http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52011XC0114(04)&from=EN;

Federal Trade Commission (2001), "Report on the Federal Trade Commission workshop on slotting allowances and other marketing practices in the grocery industry," available at:

https://www.ftc.gov/sites/default/files/documents/reports/report-federal-trade-commission-workshop-slotting-allowances-and-other-marketing-practices-grocery/slottingallowancesreportfinal_0.pdf;

Foros, O. and H. Kind (2008), "Do slotting allowances harm retail competition?," *Scandinavian Journal of Economics,* 110(2): 367-384;

Galbraith, J. K. (1952), "American capitalism: The concept of countervailing power," Boston: Houghton Mifflin;

Galbraith, J. K. (1954), "Countervailing power," *American Economic Review*, 44: 1-6;

Gaudin G. (2017), "Vertical bargaining and retail competition. What drives countervailing power?," available at:

https://papers.ssrn.com/sol3/papers2.cfm?abstract_id=2655726;

Griffith, D.A., and R.F. Krampf (1997), "Emerging trends in U.S. retailing," *Long Range Planning: International Journal of Strategic Management*, 30: 847-852;

Igami, M. (2011), "Does big drive out small?," *Review of Industrial Organization*, 38(3): 1-21;

Inderst, R., and G. Shaffer (2010), "Market-share contracts as facilitating practices," *RAND Journal of Economics*, 41(4): 709-729;

Inderst, R., and G. Shaffer (2011), "Wholesale Price Determination under the threat of Demand-Side Substitution," Working Paper University of Frankfurt, University of Rochester;

Inderst, R. and T. Valletti (2011), "Buyer power and the waterbed effect," *Journal of Industrial Economics*, 59: 1-20;

Inderst, R., and C. Wey (2003), "Bargaining, Mergers, and Technology Choice in Bilaterally Oligopolistic Industries," *RAND Journal of Economics*, 34(1): 1-19;

Inderst, R., and C. Wey (2011), "Countervailing power and dynamic efficiency," *Journal of the European Economic Association*, 9(4): 702-720;

Iozzi, A., and T. Valletti (2014), "Vertical bargaining and countervailing power," *American Economic Journal: Microeconomics*, 6(3), 106-35;

Johansen, B. O., and T. Nilssen (2016), "The Economics of Retailing Formats: Competition versus Bargaining," *Journal of Industrial Economics*, 64(1): 109-134;

Katz, M. L. (1987), "The welfare effects of third-degree price discrimination in intermediate good markets," *American Economic Review*, 77(1):154-167;

Matsushima, N., and S. Yoshida (2016), "the countervailing power hypothesis when dominant retailers function as sales promoters," Osaka University, Discussion Paper N° 981;

Milliou, C., and E. Petrakis (2007), "Upstream horizontal mergers, vertical contracts, and bargaining," *International Journal of Industrial Organization*, 25(5): 963-987;

Mills, D. (2013), "Countervailing power and chain stores," *Review of Industrial Organization*, 42(3): 281-295;

Möller, M. (2007), "The timing of contracting with externalities," *Journal of Economic Theory*, 133(1): 484-503;

Münster, J., and M. Reisinger (2015), "Sequencing bilateral negotiations with externalities," mimeo;

Rey P., and J. Tirole (2007), "A primer on foreclosure," Handbook of Industrial Organization, Edited by M. Armstrong and R. Porter, 3: 2145-2220;

Snyder C. (2005), "Countervailing power," contribution to the New Palgrave Dictionary;

Vieira-Montez, J. (2007), "Downstream Concentration and Producer's Capacity Choice: Why Bake a Larger Pie when Getting a Smaller Slice," *RAND Journal of Economics*, 38(4): 948-966;

Villas-Boas, S. B. (2007), "Vertical Relationships between Manufacturers and Retailers: Inference with Limited Data," *Review of Economic Studies*, 74(2): 625-652;

von Ungern-Sternberg, T. (1996), "Countervailing power revisited," *International Journal of Industrial Organization*, 14(4):507-520.

Appendix

A Proof of lemma 1

Recall first-order conditions:

$$\begin{aligned}
r_{AL}^e &= \frac{F\left(v_{AL}-w_L-r_{AL}^e\right)}{f\left(v_{AL}-w_L-r_{AL}^e\right)}=h\left(v_{AL}-w_L-r_{AL}^e\right), \\
r_L^e &= -\frac{F\left(v_S-w_S-\left(v_L-w_L-r_L^e\right)\right)}{f\left(v_S-w_S-\left(v_L-w_L-r_L^e\right)\right)}=-h\left(v_S-w_S-\left(v_L-w_L-r_L^e\right)\right) \text{ with } h\left(.\right)=\frac{F\left(.\right)}{f\left(.\right)}.
\end{aligned}$$

Comparative statics on the first-order conditions reveal that:

$$\begin{aligned}
\frac{\partial r_{AL}^e}{\partial w_L} &= -\frac{h'\left(v_{AL}-w_L-r_{AL}^e\right)}{1+h'\left(v_{AL}-w_L-r_{AL}^e\right)} \in (-1,0) \text{ with } h'\left(.\right)>0, \\
\frac{\partial r_{AL}^e}{\partial w_S} &= 0, \\
\frac{\partial r_L^e}{\partial w_L} &= -\frac{h'\left(v_S-w_S-\left(v_L-w_L-r_L^e\right)\right)}{1+h'\left(v_S-w_S-\left(v_L-w_L-r_L^e\right)\right)} \in (-1,0) \text{ with } h'\left(.\right)>0, \text{ and} \\
\frac{\partial r_L^e}{\partial w_S} &= \frac{h'\left(v_S-w_S-\left(v_L-w_L-r_L^e\right)\right)}{1+h'\left(v_S-w_S-\left(v_L-w_L-r_L^e\right)\right)} \in (0,1) \text{ with } h'\left(.\right)>0,
\end{aligned}$$

which also implies $\frac{\partial r_L^e}{\partial w_S}=-\frac{\partial r_L^e}{\partial w_L}$. Moreover, using previous expressions, we have $\frac{\partial^2 r_L^e}{\partial w_S \partial w_L}=-\frac{\partial^2 r_L^e}{\partial w_S^2}$ (this equality will be useful in comparative statics later).

Differentiate π_{AL} with respect to w_L and apply the envelope theorem:

$$\frac{\partial \pi_{AL}}{\partial w_L}=-r_{AL}^e f\left(v_{AL}-w_L-r_{AL}^e\right)-r_L^e f\left(v_S-w_S-\left(v_L-w_L-r_L^e\right)\right).$$

Then, by using first-order conditions, we write

$$\frac{\partial \pi_{AL}}{\partial w_L}=-\left[F\left(v_{AL}-w_L-r_{AL}^e\right)-F\left(v_S-w_S-\left(v_L-w_L-r_L^e\right)\right)\right]$$

which is negative as $\left[F\left(v_{AL}-w_L-r_{AL}^e\right)-F\left(v_S-w_S-\left(v_L-w_L-r_L^e\right)\right)\right]>0$ (one-stop shoppers' demand).

We do the same with respect to w_S:

$$\frac{\partial \pi_{AL}}{\partial w_S} = r_L^e f\left(v_S - w_S - \left(v_L - w_L - r_L^e\right)\right) = -F\left(v_S - w_S - \left(v_L - w_L - r_L^e\right)\right)$$

which is negative as $F\left(v_S - w_S - \left(v_L - w_L - r_L^e\right)\right) > 0$ (multistop shoppers' demand). Q.E.D.

B Proof of proposition 1

Differentiate the objective function of the supplier with respect to w_L and w_S, and apply the envelope theorem (as the objective function of the supplier is a function of π_{AL}). We can simplify by using the first-order conditions on r_{AL}^e and r_L^e (with $r_{AL}^e = h\left(v_{AL} - w_L - r_{AL}^e\right)$ and $r_L^e = -h\left(v_S - w_S - \left(v_L - w_L - r_L^e\right)\right)$), so we have:

$$\begin{aligned}
&- w_L \left[\left(1 + \frac{\partial r_{AL}^e}{\partial w_L}\right) f\left(v_{AL} - w_L - r_{AL}^e\right)\right] \\
&\qquad + \left(w_S - w_L\right)\left[\left(1 + \frac{\partial r_L^e}{\partial w_L}\right) f\left(v_S - w_S - \left(v_L - w_L - r_L^e\right)\right)\right] = 0,
\end{aligned}$$

$$-\left(w_S - w_L\right)\left[\left(1 - \frac{\partial r_L^e}{\partial w_S}\right) f\left(v_S - w_S - \left(v_L - w_L - r_L^e\right)\right)\right] = 0.$$

Using the first-order condition on w_S, we can write $w_S = w_L$. Recognizing that the first-order condition on w_L is also a function of the first-order condition on w_S (as $\frac{\partial r_L^e}{\partial w_L} = -\frac{\partial r_L^e}{\partial w_S}$, see lemma 1), we get $w_L = 0$. The result is $w_L = w_S = 0$, and the fixed fee follows from the participation constraint of the large retailer $F_L = \pi_{AL}\left(r_{AL}^e\left(0\right), r_L^e\left(0,0\right), 0, 0\right) - \pi_A^m$. Q.E.D.

C Proof of lemma 2

Under assumption 1, $v_A - r_A^m \geq v_S$, we get $v_{AL} - \widetilde{c} - \widetilde{r}_{AL} \geq v_S$ which implies $v_{AL} - \widetilde{c} - \widetilde{r}_{AL} > v_S - w_S$ for any $w_S \geq 0$ (the large retailer is not constrained on its total margin $\widetilde{r}_{AL}$ in the case of a refusal). We can apply lemma 1 and $\frac{\partial \widetilde{\pi}_{AL}}{\partial w_S} < 0$. Q.E.D.

D Proof of proposition 2

With countervailing power, first-order conditions are written as:

$$- w_L \left[\left(1 + \frac{\partial r_{AL}^e}{\partial w_L} \right) f\left(v_{AL} - w_L - r_{AL}^e\left(w_L \right) \right) \right]$$
$$+ \left(w_S - w_L \right) \left[\left(1 + \frac{\partial r_L^e}{\partial w_L} \right) f\left(v_S - w_S - \left(v_L - w_L - r_L^e\left(w_L, w_S \right) \right) \right) \right] = 0$$

$$- \left(w_S - w_L \right) \left[\left(1 - \frac{\partial r_L^e}{\partial w_S} \right) f\left(v_S - w_S - \left(v_L - w_L - r_L^e \right) \right) \right] - \frac{\partial \widetilde{\pi}_{AL}\left(w_S \right)}{\partial w_S} = 0.$$

Compared to the case without countervailing power, the first is unchanged while a new term appears in the second. Remember $\frac{\partial \widetilde{\pi}_{AL}(w_S)}{\partial w_S} < 0$ (See lemma 2), we have $w_S > w_L$ (as $\frac{\partial r_L^e}{\partial w_S} \in (0,1)$, see lemma 1).

Using the first-order condition on w_S (with $\frac{\partial r_L^e}{\partial w_L} = -\frac{\partial r_L^e}{\partial w_S}$, see lemma 1), we can write the first-order condition on w_L as follows

$$-w_L \left[\left(1 + \frac{\partial r_{AL}^e}{\partial w_L} \right) f\left(v_{AL} - w_L - r_{AL}^e\left(w_L \right) \right) \right] - \frac{\partial \widetilde{\pi}_{AL}\left(w_S \right)}{\partial w_S} = 0.$$

Using $\frac{\partial \widetilde{\pi}_{AL}(w_S)}{\partial w_S} < 0$ and $\frac{\partial r_{AL}^e}{\partial w_L} \in (-1, 0)$ (see lemma 1), we have $w_L > 0$. Consequently, at equilibrium $w_S^* > w_L^* > 0$; the large retailer obtains a wholesale price smaller than the wholesale price of the small retailers and the fixed fee, from the participation constraint is written as: $F_L = \pi_{AL}\left(w_L, w_S \right) - \widetilde{\pi}_{AL}\left(w_S \right)$. Recognize that $\widetilde{\pi}_{AL}\left(w_S \right)|_{\widetilde{c}=0} = \pi_{AL}\left(0, w_S \right)$ and remember that $\frac{\partial \pi_{AL}(w_L, w_S)}{\partial w_L} < 0$, the sign of F_L is negative at $\widetilde{c} = 0$. By continuity, there exists $\widehat{\widetilde{c}}$, such that the sign of F_L remains negative for $\widetilde{c} < \widehat{\widetilde{c}}$., which means that the supplier pays a slotting fee for countervailing power which is very large.

Comparative statics with respect to $\widetilde{c}$.

For first-order conditions, we have:

$$\underbrace{-w_L\left[\left(1+\frac{\partial r_{AL}^e}{\partial w_L}\right)f\left(v_{AL}-w_L-r_{AL}^e\left(w_L\right)\right)\right]}_{A}$$
$$+\underbrace{\left(w_S-w_L\right)\left[\left(1+\frac{\partial r_L^e}{\partial w_L}\right)f\left(v_S-w_S-\left(v_L-w_L-r_L^e\left(w_L,w_S\right)\right)\right)\right]}_{-B}=0$$

$$\underbrace{-\left(w_S-w_L\right)\left[\left(1-\frac{\partial r_L^e}{\partial w_S}\right)f\left(v_S-w_S-\left(v_L-w_L-r_L^e\right)\right)\right]}_{B}-\underbrace{\frac{\partial\widetilde{\pi}_{AL}\left(w_S\right)}{\partial w_S}}_{C}=0.$$

For the sake of exposition, let $FOC_{w_L}=0$ and $FOC_{w_S}=0$ denote the first-order conditions, so we can write:

$$\begin{aligned} FOC_{w_L} &= A-B=0, \\ FOC_{w_S} &= B-C=0. \end{aligned}$$

To start with comparative statics with respect to $\widetilde{c}$, we introduce more comparative statics to help us:

- $\partial A/\partial w_L<0$, which is assumed to hold to satisfy the second-order condition for the case of no screening; moreover, we recognize that $\partial A/\partial w_S=0$;
- $\partial B/\partial w_S<0$, which is assumed to hold to satisfy the second-order condition for the case without countervailing power; moreover, by using $\frac{\partial^2 r_L^e}{\partial w_S\partial w_L}=-\frac{\partial^2 r_L^e}{\partial w_S^2}$ (see lemma 1), we recognize that $\partial B/\partial w_S=-\partial B/\partial w_L$, which is positive;
- lastly, $\frac{\partial C}{\partial\widetilde{c}}=\frac{\partial^2\widetilde{\pi}_{AL}}{\partial w_S\partial\widetilde{c}}=-\frac{\partial^2\widetilde{\pi}_{AL}}{\partial w_S\partial w_S}=-\frac{\partial C}{\partial w_S}<0$.

Subsequently, recognizing that $\widetilde{c}$ does not appear in A and B, from $FOC_{w_L}=0$, we can write that w_L is a function of w_S. Comparative statics on the $FOC_{w_L}\left(w_L\left(w_S\right),w_S\right)=0$ reveals that:

$$\frac{\partial FOC_{w_L}}{\partial w_L}\frac{\partial w_L}{\partial w_S}+\frac{\partial FOC_{w_L}}{\partial w_S}=0.$$

Using $FOC_{w_L} = A - B = 0$, we can write:

$$\frac{\partial w_L}{\partial w_S} = \frac{\partial B/\partial w_L}{\partial B/\partial w_L - \partial A/\partial w_L} \in (0,1)$$

with $\partial B/\partial w_L = -\partial B/\partial w_S > 0$ and $-\partial A/\partial w_L > 0$.

With w_L as a function of w_S and w_S as a function of $\widetilde{c}$, we can write:

$$FOC_{w_S}\left(w_L\left(w_S\left(\widetilde{c}\right)\right), w_S\left(\widetilde{c}\right), \widetilde{c}\right) = 0.$$

Comparative statics on FOC_{w_S} reveal that:

$$\frac{\partial FOC_{w_S}}{\partial w_L}\frac{\partial w_L}{\partial w_S}\frac{\partial w_S}{\partial \widetilde{c}} + \frac{\partial FOC_{w_S}}{\partial w_S}\frac{\partial w_S}{\partial \widetilde{c}} + \frac{\partial FOC_{w_S}}{\partial \widetilde{c}} = 0$$

which leads to:

$$\frac{\partial w_S}{\partial \widetilde{c}} = -\frac{\frac{\partial FOC_{w_S}}{\partial \widetilde{c}}}{\frac{\partial FOC_{w_S}}{\partial w_S} + \frac{\partial FOC_{w_S}}{\partial w_L}\frac{\partial w_L}{\partial w_S}}.$$

Using $FOC_{w_S} = B - C = 0$, we can write:

$$\frac{\partial w_S}{\partial \widetilde{c}} = \frac{\partial C/\partial w_S}{\partial C/\partial w_S - \frac{\partial B}{\partial w_S}\left(1 - \frac{\partial w_L}{\partial w_S}\right)} \in (0,1)$$

with $\partial C/\partial w_S = -\partial C/\partial \widetilde{c} > 0$ and $-\frac{\partial B}{\partial w_S}\left(1 - \frac{\partial w_L}{\partial w_S}\right) > 0$ (as $\frac{\partial B}{\partial w_S} < 0$ and $\frac{\partial w_L}{\partial w_S} \in (0,1)$).

Industry surplus: The industry surplus in terms of wholesale prices can be written as:

$$\begin{aligned}\Pi^I &= w_L(F(v_{AL} - w_L - r_{AL}^e) - F(v_S - w_S - (v_L - w_L - r_L^e))) \\ &\quad + w_S F(v_S - w_S - (v_L - w_L - r_L^e)) + r_{AL}^e F(v_{AL} - w_L - r_{AL}^e) \\ &\quad - r_L^e F(v_S - w_S - (v_L - w_L - r_L^e)).\end{aligned}$$

Looking at the change in industry surplus with respect to the wholesale prices:

$$\frac{\partial \Pi^I}{\partial w_S} = -(w_S - w_L) f(v_S - w_S - (v_L - w_L - r_L^e))(1 - \frac{\partial r_L^e}{\partial w_S}) < 0$$

$$\frac{\partial \Pi^I}{\partial w_L} = -w_L \left[\left(1+\frac{\partial r^e_{AL}}{\partial w_L}\right) f\left(v_{AL}-w_L-r^e_{AL}\right)\right]$$
$$(w_S-w_L)\left[\left(1+\frac{\partial r^e_L}{\partial w_L}\right) f\left(v_S-w_S-(v_L-w_L-r^e_L)\right)\right]$$

We can see from the above that industry surplus is maximized at $w_S = w_L = 0$ and any other configuration of the wholesale prices results in a reduction in industry surplus.

Supplier profits: We know that the supplier, by using two- part tariffs, is the residual claimant to the industry surplus after satisfying the large retailer's participation constraint. The supplier's profit is denoted as Π_S and can be brokendown as the difference between the industry profit and the outside option of the large retailer. The supplier's profit without countervailing power is given as:

$$\Pi_S(0,0) = \Pi^I(0,0) - \pi^m_A$$

The supplier's profit with countervailing power is given as:

$$\Pi_S(w^*_L, w^*_S) = \Pi^I(w^*_L, w^*_S) - \widetilde{\pi}_{AL}(w^*_S)$$

Taking the difference between the two, we have:

$$\Pi_S(0,0) - \Pi_S(w^*_L, w^*_S) = \underbrace{\Pi^I(0,0) - \Pi^I(w^*_L, w^*_S)}_{>0} - \underbrace{(\pi^M_A - \widetilde{\pi}_{AL}(w^*_S))}_{<0} > 0$$

The first term is obtained from the previous result that industry profit is maximized at $w_S = w_L = 0$, while the second term is negative, because for countervailing power being present, we have $\widetilde{\pi}_{AL}(w^*_S)) > \pi^M_A$, otherwise the retailer would prefer to obtain monopoly profits on the good A.

Further, as countervailing power increases ($\widetilde{c}$ falls), we see that wholesale prices fall. This results in industry profits rising along with a rise in the outside option of the large retailer.

Retail profits: By introducing credible countervailing power, the large retailer obtains higher profits since $\widetilde{\pi}_{AL}(w^*_S) > \pi^m_A$. Further,we know that in the presence of credible countervailing the wholesale prices are characterized as $w^*_S > w^*_L > 0$. As countervailing power increases, the outside option increases because the equilibrium wholesale price w_S^* satisfies $1 > \dfrac{\partial w_S^*}{\partial \widetilde{c}} > 0$.

Slotting fees: The fixed fee, from the participation constraint is given as $F_L = \pi_{AL}(w_L, w_S) - \widetilde{\pi}_{AL}(w_S)$. Notice that $\widetilde{\pi}_{AL}(w_S)|_{\widetilde{c}=0} = \pi_{AL}(0, w_S)$ and remember that $\frac{\partial \pi_{AL}(w_L,w_S)}{\partial w_L} < 0$. Since $w_L^* > 0$ in presence of countervailing power, we have $F_L^* < 0$ as $\pi_{AL}(w_L^*, w_S^*) < \widetilde{\pi}_{AL}(w_S^*)$ for $w_L^* > 0$. By continuity, there exists $\widehat{\widetilde{c}}$, such that the sign of F_L remains negative for $\widetilde{c} < \widehat{\widetilde{c}}$, which means that the supplier pays a slotting fee for countervailing power which is very large. Q.E.D.

E Proof of proposition 3

We need to show that the associated consumer value from one-stop shopping $d_{AL} = v_{AL} - w_L - r_{AL}^e(w_L)$ as well as the additional value of multistop shopping $d_{AS} = v_S - w_S - (v_L - w_L - r_L^e(w_L, w_S))$ are lower in the presence of countervailing power.

We know that without countervailing power $w_S = w_L = 0$, the associated values are given as:

$$\begin{aligned}\overline{d}_{AL} &= v_{AL} - r_{AL}^e(0)\\ \overline{d}_{AS} &= v_S - (v_L - r_L^e(0,0))\end{aligned}$$

In presence of countervailing power the wholesale prices are characterized as $w_S^* > w_L^* > 0$:

$$\begin{aligned}d_{AL}^* &= v_{AL} - w_L^* - r_{AL}^e(w_L^*)\\ d_{AS}^* &= v_S - w_S^* - (v_L - w_L^* - r_L^e(w_L^*, w_S^*))\end{aligned}$$

We know that d_{AL} is a function of w_L only and taking the derivative with respect to w_L, we get:

$$\frac{\partial d_{AL}}{\partial w_L} = -1 - \frac{\partial r_{AL}^e}{\partial w_L} < 0$$

where we know $\dfrac{\partial r_{AL}^e}{\partial w_L} \in (-1, 0)$. So we get the result that in the presence of countervailing power, the consumer value of one-stop shopping and hence the total demand are lower.

We continue with the additional value of multistop shopping, which is given as

$d_{AS} = v_S - w_S - (v_L - w_L - r_L^e(w_L, w_S))$. We know that in the presence of countervailing power $w_S^* > w_L^* > 0$, the change in r_L^e is given as the total differential:

$$dr_L^e(w_L, w_S) = \frac{\partial r_L^e(w_L, w_S)}{\partial w_L}\Delta w_L + \frac{\partial r_L^e(w_L, w_S)}{\partial w_S}\Delta w_S \tag{1}$$

$$= \underbrace{\frac{\partial r_L^e(w_L, w_S)}{\partial w_L}}_{<0}\underbrace{(\Delta w_L - \Delta w_S)}_{<0}. \tag{2}$$

The first term in the second equation comes from $\frac{\partial r_L^e(w_S, w_L)}{\partial w_L} = -\frac{\partial r_L^e(w_S, w_L)}{\partial w_S}$ and the second term comes from the fact that $w_S^* > w_L^* > 0$ and $\Delta w_i = w_i^* - 0$ for $i \in \{L, S\}$. Here we see that in the presence of countervailing power there is an increase in $r_L^e(w_S, w_L)$, because we know that $r_L^e(w_L^*, w_S^*) > r_L^e(0, 0)$. This result along with $w_S^* > w_L^* > 0$ gives us:

$$d_{AS}(0, 0) - d_{AS}(w_L^*, w_S^*) = (w_S^* - w_L^*) + r_L^e(w_L^*, w_S^*) - r_L^e(0, 0) > 0$$

This gives us the result that in the presence of countervailing power, there is a jump downwards in the additional value of multistop shopping. Q.E.D.

F Proof of proposition 4

Assume $v_{AL} - r_{AL}^m > v_S - w_S^{**}$, and let $\widehat{\widetilde{c}} = v_S - w_S^{**} - \left(v_{AL} - \widetilde{r}_{AL}\left(\widehat{\widetilde{c}}\right)\right)$ with $\widetilde{r}_{AL}\left(\widehat{\widetilde{c}}\right) = h\left(v_{AL} - \widehat{\widetilde{c}} - \widetilde{r}_{AL}\left(\widehat{\widetilde{c}}\right)\right)$ define a threshold on $\widetilde{c}$. For $\widetilde{c} \in \left(0, \widehat{\widetilde{c}}\right)$, we get $v_{AL} - \widetilde{c} - \widetilde{r}_{AL}(\widetilde{c}) > v_S - w_S^{**}$, which means that the large retailer is not constrained on its total margin $\widetilde{r}_{AL}(\widetilde{c})$ in the case of refusal. $\widetilde{r}_{AL}(\widetilde{c})$ is written as $\widetilde{r}_{AL}\left(\widehat{\widetilde{c}}\right) = h\left(v_{AL} - \widehat{\widetilde{c}} - \widetilde{r}_{AL}\left(\widehat{\widetilde{c}}\right)\right)$, which corresponds to the interior solution. Lemma 1 applies and $\frac{\partial \widetilde{\pi}_{AL}}{\partial w_S} < 0$.

Let $w_L^{**,C}$, $w_S^{**,C}$ define the equilibrium wholesale prices for $\widetilde{c} \in \left(0, \widehat{\widetilde{c}}\right)$, $w_L^{**,C}$ and $w_S^{**,C}$ solve the following first-order conditions:

$$(w_S - w_L)\left(1 + \frac{\partial r_L^e}{\partial w_L}\right) f\left(v_S - w_S - (v_L - w_L - r_L^e)\right) = 0$$

$$- (w_S - w_L)\left(1 - \frac{\partial r_L^e}{\partial w_S}\right) f\left(v_S - w_S - (v_L - w_L - r_L^e)\right)$$
$$- w_L f(v_S - w_S) - (v_{AL} - w_L - (v_S - w_S)) f(v_S - w_S) + F(v_S - w_S) - \frac{\partial \widetilde{\pi}_{AL}}{\partial w_S} = 0$$

in which $\frac{\partial \widetilde{\pi}_{AL}}{\partial w_S} = -F\left(v_S - w_S - (v_L - \widetilde{c} - \widetilde{r}_L)\right) < 0$. Straightforward computations show that $w_L^{**,C} = w_S^{**,C}$ and $w_L^{**,C} = w_S^{**,C} > w_L^{**} = w_S^{**}$ by concavity of the objective function as $\frac{\partial \widetilde{\pi}_{AL}}{\partial w_S} < 0$.

Note, countervailing power only impacts the total demand (loss in demand $F(v_S - w_S^{**}) - F\left(v_S - w_S^{**,C}\right)$) while the demand of multistop shoppers does not change as wholesale prices are still equal at the equilibrium $w_L^{**,C} = w_S^{**,C}$ (see the expression of the demand of multistop shoppers which is given by $F\left(v_S - w_S - (v_L - w_L - r_L^e)\right) = F\left(v_S - (v_L - r_L^e)\right)$ with

$$r_L^e = -h\left(v_S - w_S - (v_L - w_L - r_L^e)\right) = -h\left(v_S - (v_L - r_L^e)\right)). \qquad \text{Q.E.D.}$$

G An example: uniform shopping costs

$(v_A > v_S > v_L > 0)$

To illustrate our results, we suppose that shopping cost is uniformly distributed: $F(s) = s$. The monopoly profit on the good A is $r_A(v_A - r_A)$, which results in retail margin $r_A^m = \frac{v_A}{2}$ and profits $\pi_A^m = \frac{v_A^2}{4}$. Thus, as long as $v_A - r_A^m \geq v_S$ (Assumption 1), which corresponds to $\mathbf{v}_A > \mathbf{2v}_S$, L's retail margins are given by:

$$r_{AL}^e = \frac{v_{AL} - w_L}{2} \text{ and } r_L^e = -\frac{v_S - w_S - (v_L - w_L)}{2}.$$

In this way, L obtains:

$$\pi_{AL} - F_L = \frac{(v_{AL} - w_L)^2}{4} + \frac{(v_S - w_S - (v_L - w_L))^2}{4} - F_L.$$

Without countervailing power, the supplier sets:

$$w_S = w_L = 0 \text{ and } F_L = \pi_{AL} - \pi_A^m = \frac{v_{AL}^2}{4} + \frac{(v_S - v_L)^2}{4} - \frac{v_A^2}{4}.$$

With countervailing power, the outside option of the large retailer is given by (instead of π_A^m):

$$\widetilde{\pi}_{AL} = \frac{(v_{AL} - \widetilde{c})^2}{4} + \frac{(v_S - w_S - (v_L - \widetilde{c}))^2}{4},$$

after replacing retail margins, $\widetilde{r}_{AL} = \frac{v_{AL} - \widetilde{c}}{2}$ and $\widetilde{r}_L = -\frac{v_S - w_S - (v_L - \widetilde{c})}{2}$. The participation constraint of the large retailer becomes:

$$\pi_{AL} - F_L \geq \widetilde{\pi}_{AL}.$$

Solving the first-order conditions of the supplier, we obtain:

$$w_S^* = 2w_L^* \text{ and } w_L^* = \frac{v_S - (v_L - \widetilde{c})}{3}.$$

The supplier pays slotting fees for $w_L^* > \widetilde{c}$ which corresponds to $\widetilde{c} < \frac{v_S - v_L}{2}$ (when $v_L < \frac{v_S}{3}$, we obtain slotting fees for any $\widetilde{c} < v_L$).

When instead $\mathbf{2v}_S > \mathbf{v}_A$, L maintains the subsidy r_L^e but may charge only $r_{AL} = v_{AL} - w_L - (v_S - w_S)$ to one-stop shoppers if $v_{AL} - w_L - r_{AL}^e < v_S - w_S$ with $r_{AL}^e = \frac{v_{AL} - w_L}{2}$.

If $\mathbf{v}_{AL} > \mathbf{2v}_S$, which corresponds to $v_{AL} - w_L - r_{AL}^e > v_S - w_S$ as long as $w_L < w_S$, the large retailer is not constrained in its total retail margin along the equilibrium path. Without countervailing power, the results do not change: $w_S = w_L = 0$ and $F_L = \pi_{AL} - \pi_A^m$. With countervailing power, the results may change if $v_{AL} - \widetilde{c} - \widetilde{r}_{AL} < v_S - w_S$ with $\widetilde{r}_{AL} = \frac{v_{AL} - \widetilde{c}}{2}$. If $v_{AL} - \widetilde{c} - \widetilde{r}_{AL} < v_S - w_S$, L should charge $r_{AL} = v_{AL} - \widetilde{c} - (v_S - w_S)$ to attract one-stop shoppers (in the case of refusal); its outside option becomes:

$$\widetilde{\pi}_{AL} = [v_{AL} - \widetilde{c} - (v_S - w_S)](v_S - w_S) + \frac{(v_S - w_S - (v_L - \widetilde{c}))^2}{4}$$

instead of $\frac{(v_{AL} - \widetilde{c})^2}{4} + \frac{(v_S - w_S - (v_L - \widetilde{c}))^2}{4}$.

First, note that for $\widetilde{c} = 0$, $v_{AL} - \widetilde{c} - \widetilde{r}_{AL} = \frac{v_{AL}}{2} > v_S - w_S$ for any $w_S \geq 0$ because $v_{AL} > 2v_S$. The result is that, in $\widetilde{c} = 0$, equilibrium wholesale prices are given by:

$$w_S^* = 2w_L^* \text{ and } w_L^* = \frac{v_S - (v_L - \widetilde{c})}{3} \text{ (from the above case).}$$

In $\widetilde{c} = v_L$, $v_{AL} - \widetilde{c} - \widetilde{r}_{AL} = \frac{v_A}{2} > v_S - w_S$ for $w_S > v_S - \frac{v_A}{2} > 0$. Consequently, for $w_S = 0$, the large retailer is constrained in its total retail margin, off-equilibrium (in the case of refusal). Then, assume that $w_S = w_S^* = \frac{2}{3}\left[v_S - (v_L - \widetilde{c})\right]$ (the solution from the above case), we can check that $v_{AL} - \widetilde{c} - \widetilde{r}_{AL} > v_S - w_S^*$ as long as $v_A > \frac{2}{3}v_S$, which is true by assumption as $v_A > v_S$ (the inequality $v_A > \frac{2}{3}v_S$ is obtained for $\widetilde{c} = v_L$). The result is that $w_S^* = \frac{2}{3}\left[v_S - (v_L - \widetilde{c})\right]$ is a local solution. Then, we study the conditions under which this local solution is a global solution too. Off-equilibrium, considering $\left.\frac{\partial \widetilde{\pi}_{AL}}{\partial w_S}\right|_{w_S=0}$ in the constrained case, we have:

$$\left.\frac{\partial \widetilde{\pi}_{AL}}{\partial w_S}\right|_{w_S=0} = -v_A - \frac{1}{2}\left(v_L - \widetilde{c}\right) + \frac{3}{2}v_S.$$

We can check that this derivative is negative for any $\widetilde{c} < v_L$ if $v_A > \frac{3}{2}v_S$. The result is that we obtain $\left.\frac{\partial \widetilde{\pi}_{AL}}{\partial w_S}\right|_{w_S=0} < 0$ if $v_A > \frac{3}{2}v_S$, $\left.\frac{\partial \widetilde{\pi}_{AL}}{\partial w_S}\right|_{w_S=0} < 0$, for any $\widetilde{c} < v_L$, and $w_S^* = \frac{2}{3}\left[v_S - (v_L - \widetilde{c})\right]$ is a global solution (no change from the above case). For $v_A < \frac{3}{2}v_S$, $\left.\frac{\partial \widetilde{\pi}_{AL}}{\partial w_S}\right|_{w_S=0}$ becomes positive when $\widetilde{c}$ is very large. Two local solutions should be considered:

$$w_S = w_L = 0 \text{ and } w_S^* = 2w_L^* \text{ with } w_L^* = \frac{v_S - (v_L - \widetilde{c})}{3}.$$

A sufficient condition is to compare the profits of the supplier for $\widetilde{c} = v_L$. Calculations show that when $\frac{3v_S}{2} > v_A > \frac{\sqrt{2}}{\sqrt{3}}\left(\sqrt{6}-1\right)v_S$, $w_S^* = 2w_L^*$ with $w_L^* = \frac{v_S - (v_L - \widetilde{c})}{3}$ is a global solution for any $\widetilde{c} < v_L$. Lastly, if $v_S < v_A < \frac{\sqrt{2}}{\sqrt{3}}\left(\sqrt{6}-1\right)v_S$, $w_S = w_L = 0$ becomes a global solution when $\widetilde{c}$ is very large. Comparing the profits of the supplier in the two local solutions, we find that, for $\widetilde{c} > 3v_A + v_L - 4v_S + \sqrt{6}\left(v_A - v_S\right)$, $w_S = w_L = 0$ is a global solution.

To sum up,

if $v_A > \frac{\sqrt{2}}{\sqrt{3}}\left(\sqrt{6}-1\right)v_S$, $w_S^* = 2w_L^*$ with $w_L^* = \frac{v_S - (v_L - \widetilde{c})}{3}$;

if $v_A < \frac{\sqrt{2}}{\sqrt{3}}\left(\sqrt{6}-1\right)v_S$, we obtain $w_S^* = 2w_L^*$ with $w_L^* = \frac{v_S - (v_L - \widetilde{c})}{3}$ when $0 < \widetilde{c} < 3v_A + v_L - 4v_S + \sqrt{6}\left(v_A - v_S\right)$, and, $w_S = w_L = 0$ when $\widetilde{c} > 3v_A + v_L - 4v_S + \sqrt{6}\left(v_A - v_S\right)$.

As long as the comparative advantage of the large retailer is large enough ($v_A > \frac{\sqrt{2}}{\sqrt{3}}\left(\sqrt{6}-1\right)v_S$), any countervailing power of the large retailer leads to higher wholesale prices for any $\widetilde{c} < v_L$. When the comparative advantage is smaller, only large enough countervailing power ($\widetilde{c} < 3v_A + v_L - 4v_S + \sqrt{6}\left(v_A - v_S\right)$) leads to higher wholesale prices; by contrast, small countervailing power ($\widetilde{c} > 3v_A + v_L - 4v_S + \sqrt{6}\,(v_A - v_S)$) does not change the equilibrium wholesale prices: $w_S = w_L = 0$. Note, however that fixed fees change as $\widetilde{c}$ varies.

If $\mathbf{v}_{AL} < \mathbf{2v}_S$, the constraint on the total retail margin may apply along the equilibrium path and off-equilibrium (in the case of countervailing power). Without countervailing power, the participation constraint of the large retailer is written as $\pi_{AL} - F_L \geq \pi_A^m$ with:

$$\pi_{AL} = [v_{AL} - w_L - (v_S - w_S)]\,(v_S - w_S) + \frac{(v_S - w_S - (v_L - w_L))^2}{4}$$

as the large retailer is constrained on its total retail margin ($r_{AL} = v_{AL} - w_L - (v_S - w_S)$ to attract one-stop shoppers). The optimization problem of the supplier leads to:

$$w_S^{**} = w_L^{**} = v_S - \frac{v_{AL}}{2}.$$

Introducing countervailing power does not change the constraint on the total retail margin along the equilibrium path. Off-equilibrium, the constraint on the total retail margin will depend on $\widetilde{c}$: it is binding if $v_{AL} - \widetilde{c} - \widetilde{r}_{AL} < v_S - w_S$ or it is not binding if $v_{AL} - \widetilde{c} - \widetilde{r}_{AL} \geq v_S - w_S$, with $\widetilde{r}_{AL} = \frac{v_{AL} - \widetilde{c}}{2}$.

Note, $v_{AL} - \widetilde{c} - \widetilde{r}_{AL} \geq v_S - w_S^{**}$ when $\widetilde{c}$ is small, and in particular for $\widetilde{c} = 0$ $\left(\widetilde{c} \leq \frac{v_A - v_L}{2}\right)$; the result is that the large retailer is not constrained on its total retail margin in the case of refusal and $\left.\frac{\partial \widetilde{\pi}_{AL}}{\partial w_S}\right|_{w_S = w_S^{**}} = -\frac{v_S - w_S^{**} - (v_L - \widetilde{c})}{2} < 0$ (see lemma 1). By concavity of the objective function, we find that wholesale prices are higher when countervailing power is introduced as we have shown in the main text for $\widetilde{c}$ which is close to zero. Let w_S^{***} and w_L^{***} define equilibrium wholesale prices in the case of countervailing power, we find that

$$w_S^{***} = w_L^{***} = v_S - \frac{2}{5}v_{AL} - \frac{1}{5}(v_L - \widetilde{c}) > w_S^{**} = w_L^{**} = v_S - \frac{v_{AL}}{2} \qquad \text{if } \widetilde{c} \text{ is close to zero.}$$

If $\widetilde{c}$ is larger, two regimes should be considered:

$$\text{regime 1:} \quad w_S^{***} = w_L^{***} = v_S - \frac{2}{5} v_{AL} - \frac{1}{5}(v_L - \widetilde{c}) > w_S^{**} = w_L^{**},$$

(see previously) and,

$$\text{regime 2:} \quad w_S^{***} = w_L^{***} = v_S - (v_L + \widetilde{c}) < w_S^{**} = w_L^{**}.$$

The second regime is obtained by considering that L is constrained along the equilibrium path and off-equilibrium ($v_{AL} - \widetilde{c} - \widetilde{r}_{AL} < v_S - w_S$, with $\widetilde{r}_{AL} = \frac{v_{AL} - \widetilde{c}}{2}$). In this regime, $\left.\frac{\partial \widetilde{\pi}_{AL}}{\partial w_S}\right|_{w_S = w_S^{**}} > 0$ with uniform shopping cost, which leads to lower wholesale prices in the case of countervailing power. The threshold value in $\widetilde{c}$ is obtained by comparing the maximized profits of the supplier in the two regimes which are

$$\begin{aligned}
\text{regime 1:} \quad & w_L\left[(v_S - w_S) - (v_S - w_S - (v_L - w_L - r_L^e))\right] + w_S\left(v_S - w_S - (v_L - w_L - r_L^e)\right) \\
& + \pi_{AL} - \left[\widetilde{r}_{AL}\left(v_{AL} - \widetilde{c} - \widetilde{r}_{AL}\right) - \widetilde{r}_L\left(v_S - w_S - (v_L - w_L - r_L^e)\right)\right] \\
\text{regime 2:} \quad & w_L\left[(v_S - w_S) - (v_S - w_S - (v_L - w_L - r_L^e))\right] + w_S\left(v_S - w_S - (v_L - w_L - r_L^e)\right) \\
& + \pi_{AL} - \left[\left(v_{AL} - \widetilde{c} - (v_S - w_S)\right)(v_S - w_S) - \widetilde{r}_L\left(v_S - w_S - (v_L - w_L - r_L^e)\right)\right]
\end{aligned}$$

with $\pi_{AL} = \left[v_{AL} - w_L - (v_S - w_S)\right](v_S - w_S) + \frac{(v_S - w_S - (v_L - w_L))^2}{4}$ and replacing $w_S = w_L = v_S - \frac{2}{5} v_{AL} - \frac{1}{5}(v_L - \widetilde{c})$ in regime 1 and $w_S = w_L = v_S - (v_L + \widetilde{c})$ in regime 2.

Calculations show that regime 1 leads to higher profits if $\widetilde{c} \leq \frac{v_A - v_L}{3}$ and the supplier is better off in regime 2 if $\widetilde{c} > \frac{v_A - v_L}{3}$. To sum up, introducing countervailing power leads to higher wholesale prices if $\widetilde{c} \leq \frac{v_A - v_L}{3}$ and the opposite occurs if $\widetilde{c} > \frac{v_A - v_L}{3}$:

$$\begin{aligned}
w_S^{***} &= w_L^{***} = v_S - \frac{2}{5} v_{AL} - \frac{1}{5}(v_L - \widetilde{c}) > w_S^{**} = w_L^{**} = v_S - \frac{v_{AL}}{2} \\
\text{if } \widetilde{c} &\leq \frac{v_A - v_L}{3}, \\
w_S^{***} &= w_L^{***} = v_S - (v_L + \widetilde{c}) < w_S^{**} = w_L^{**} = v_S - \frac{v_{AL}}{2} \\
\text{if } \widetilde{c} &> \frac{v_A - v_L}{3}. \qquad \text{Q.E.D.}
\end{aligned}$$

H Alternative modeling of the countervailing power of the large retailer

In this Appendix, we assume, before stage one, that there is a random take-it-or-leave-it proposal between the supplier and the large retailer. Bargaining power is modeled as the probability of making the offer (w_L, F_L): the large retailer proposes with probability γ, while the supplier proposes with probability $(1-\gamma)$. That is, if $\gamma = 1$, the large retailer has full bargaining power, while if $\gamma = 0$ the supplier has full bargaining power. Simultaneously, the supplier makes offers to the small retailers. We still assume that contracts to the small retailers cannot be conditional on any action chosen later in the game, such as acceptance or rejection decision of the offers in the negotiation between the supplier and the large retailer. The second stage is unchanged.

In the following, we assume that $v_{AL} - r^m_{AL} \geq v_S$.

With probability $(1-\gamma)$, the supplier proposes (w_L, F_L) to the large retailer and, simultaneously, w_S to the small retailers. The large retailer accepts or rejects the offer of the supplier. The solution is given as in the benchmark case (without countervailing power): $w_L = w_S = 0$ and $F_L = \pi_{AL}(0,0) - \pi^m_A$.

With probability γ, the large retailer proposes (w_L, F_L) to the supplier and, simultaneously, the supplier proposes w_S to the small retailers. The supplier accepts or rejects the offer of the large retailer.

The large retailer chooses (w_L, F_L) to maximize its profits given as $\pi_{AL}(r^e_{AL}, r^e_L, w_L, w_S) - F_L$ with F_L satisfying:

$$\begin{aligned} &w_L \left[F\left(v_{AL} - w_L - r^e_{AL}\right) - F\left(v_S - w_S - \left(v_L - w_L - r^e_L\right)\right)\right] \\ &\qquad\qquad + w_S F\left(v_S - w_S - \left(v_L - w_L - r^e_L\right)\right) + F_L \geq w_S F\left(v_S - w_S\right). \end{aligned}$$

The participation constraint of the supplier holds with equality, which leads to:

$$\begin{aligned} \max_{w_L}\ & w_L \left[F\left(v_{AL} - w_L - r^e_{AL}\right) - F\left(v_S - w_S - \left(v_L - w_L - r^e_L\right)\right)\right] \\ & + w_S F\left(v_S - w_S - \left(v_L - w_L - r^e_L\right)\right) + \pi_{AL}\left(r^e_{AL}, r^e_L, w_L, w_S\right) - w_S F\left(v_S - w_S\right). \end{aligned}$$

Let $w_L^{BR}(w_S)$ denote the best response of the large retailer for which w_S is given;

$w_L^{BR}(w_S)$ maximizes the industry surplus and satisfies the following first-order condition:

$$(w_S - w_L)\left(1+\frac{\partial r_L^e}{\partial w_L}\right) f\left(v_S - w_S - \left(v_L - w_L - r_L^e\right)\right) \\ - w_L\left(1+\frac{\partial r_{AL}^e}{\partial w_L}\right) f\left(v_{AL} - w_L - r_{AL}^e\right) = 0$$

Let $w_S^m = h\left(v_S - w_S^m\right)$ denote the monopoly margin of the supplier yielding as profits $w_S^m F\left(v_S - w_S^m\right)$. The supplier chooses w_S^m. Consequently, with probability γ, the supplier chooses w_S^m and the large retailer chooses $w_L^{BR}(w_S)$, which results in the following fixed fee:

$$F_L = w_S^m F\left(v_S - w_S^m\right) \\ - \left[w_L^{BR}\left(w_S^m\right)\left[F\left(v_{AL} - w_L^{BR}\left(w_S^m\right) - r_{AL}^e\right) - F\left(v_S - w_S^m - \left(v_L - w_L^{BR}\left(w_S^m\right) - r_L^e\right)\right)\right] \\ + w_S^m F\left(v_S - w_S^m - \left(v_L - w_L^{BR}\left(w_S^m\right) - r_L^e\right)\right)\right]$$

Q.E.D.