ASSOCIATION OF CONVENIENCE STORES

The 'Waterbed Effect'. How Non-Cost Related Discounts to Large Retailers can Harm Consumers

This paper has been prepared by Europe Economics and Professor Roman Inderst of the University of Frankfurt and the London School of Economics on behalf of the Association of Convenience Stores Limited (ACS). ACS is supported in the current inquiry by the Scottish Grocers' Federation (SGF), the Northern Ireland Independent Retail Trade Association (NIIRTA) and the Federation of Wholesale Distributors (FWD)

15 November 2006

TABLE OF CONTENTS

The ‘Waterbed Effect’ - How Non-Cost Related Discounts to Large Retailers can Harm Consumers

1 OVERVIEW

1.1 This submission explores the way in which the so called 'waterbed effect' can operate, how smaller firms are disadvantaged and the wider impact on consumers as a whole.

1.2 The 'waterbed effect' is a shorthand term for the situation in which price reductions, which are not cost related, are negotiated with suppliers by large retailers and result in higher prices being charged by suppliers to smaller retailers either directly or through wholesalers. We examine the potential impact that such non-cost related discounts to large retailers can have on the competitive process and, thereby, on consumers, both in the short and in the long run.

1.3 This issue has received limited attention in previous competition inquiries and the potential harm to consumers has been dismissed too lightly.

1.4 The academic literature has largely neglected the issue of how selective discounts related to buyer power may affect the competitive process.[1] We fear that this gap in the literature, which seems mainly to be motivated by methodological difficulties, could serve as a justification for giving such theories less weight in the inquiry.

1.5 The "waterbed effect" is often dismissed on the grounds that it is just an "accounting exercise" that could not receive any support in a careful model of the market process. Recent submissions from a number of large grocery retailers have sought, without presenting any analysis of their own, to dismiss the idea of a waterbed effect as having no theoretical or empirical backing. This view, we argue, is ill-founded.

1.6 Finally, any theory of harm that works through a worsening of the position of competing firms is often subject to the criticism that the protection of weaker competitors is not the objective of antitrust policy. However, if consumers are hurt through the weakening of the competitive position of other retailers, then such an argument will tend to rule out of consideration some potentially important channels of consumer harm. In this submission, we identify in a formal model precise conditions under which provision of additional discounts to large retailers will harm consumers.

1.7 Later sections of this submission set out our detailed economic analysis of the operation of the waterbed effect, the main assumptions we have made and formal modelling of the situation. This analysis starts with a simple example which follows through the impact of a once-off increase in buyer power on wholesale and retail prices. This shows the starting point for a waterbed effect. We then extend the example to take into account changes in

[1] This is, for instance, documented by the fact that most of the limited number of contributions on buyer power treat all buyers as having equal strength, mainly to simplify the analysis. Issues of asymmetric power, which are at the heart of this submission, are thereby ignored. See, for instance: Dobson, P. and Waterson, M., 1997, Countervailing power and consumer prices, Economic Journal 107, 418-430; von Ungern-Sternberg, T., 1996, Countervailing power revisited, International Journal of Industrial Organization 14, 507-519.

the market structure which amplify the initial effect. In the final section we look beyond the effects on prices to take into account possible non-price effects. The more detailed mathematical analysis is presented in an appendix.

1.8 In this introductory section we set out a non-economists guide to our analysis and findings.

The Exercise of Buyer Power – the Simple Model

1.9 In our simple example buyers enter into bilateral contracts with suppliers. Cost related discounts may be given based on volumes purchased but further discounts are also available which are not cost related and which stem from the greater buying power of the larger purchasers. The existence of differential discounts of this sort, not related to cost, was clearly identified in the Commission's Supermarkets report in 2000.

1.10 One interpretation of the basis for buying power is that as a party to a bilateral contract grows in size its ability to reduce its supplier's profitability by withdrawing from a contract also increases. Alternatively the loss that a buyer might suffer from withdrawing from a contract will be reduced as its size increases. The bargaining power of the large retailer relative to its supplier is strengthened. For example, the threat of a large retailer to withdraw from a contract may threaten the supplier's continuing viability whereas the supplier is more likely to be able to replace orders lost from a smaller buyer. Equally the larger buyer has greater opportunity to find, or even create, alternative sources of supply spreading any additional costs over a large volume of sales. Bargaining power and the ability to extract additional discounts therefore increases with size.

1.11 The existence of size related discounts of this sort is fundamental to the operation of a waterbed effect. At heart the logic is very simple. A large retailer obtains an increased discount not related to cost because of its buyer power. This allows it to reduce prices to consumers and attract additional business. Some of that increased business will be at the expense of smaller retailers. The scale of activity of smaller retailers is therefore reduced and the discounts they can obtain from suppliers falls. Prices paid to suppliers by large retailers have fallen and prices paid by smaller retailers have risen.

1.12 From this simple proposition it is possible to identify further implications of the waterbed effect. In particular the waterbed effect will be greater:

(a) the more the growth in the larger retailer's market share is at the expense of smaller retailers rather than through expanding the size of the market as a whole;

(b) the larger the initial discounts that are obtained by the larger retailers;

(c) the greater the market share of the larger retailers.

1.13 The overall impact on consumers will depend on the detailed market circumstances but we set out the conditions in which the overall balance between reductions in price by larger retailers and increased prices in smaller outlets results in a net increase in the average price paid and a net loss of benefit to consumers.

The Effect of Consequential Changes in the Market

1.14 Changes in prices as a result of increased buyer power and the operation of the waterbed effect will lead to changes in the market which go beyond the first round price effects described above.

1.15 When buyer power is exercised, suppliers will recoup some of the revenue they lose through the waterbed effect and the increased prices charged to smaller suppliers. However the overall effect is that suppliers' profits are reduced. In a competitive supply market this will lead either to closure of some suppliers or, if the market is growing, to less new entry.

1.16 Retrenchment by suppliers in response to the initial exercise of buyer power will reduce the buying options available to smaller retailers and further weaken their bargaining position. This serves to magnify the initial waterbed effect.

1.17 A similar effect can occur at the wholesaling level. As the size of the independent sector served by wholesalers shrinks, the profitability of wholesaling is reduced and cut-backs will occur. The choice available to independent retailers at the wholesale level will be reduced and the prices they pay will rise.

1.18 These effects can be exacerbated by other developments such as the establishment of strong private labels by larger retailers. Where own label products are recognised as credible substitutes for branded goods the bargaining power of the supplier is further reduced and this can add to the retrenchment effect on smaller retailers described here.

Non-Price Effects.

1.19 So far the waterbed effect has been described in terms of changes in relative prices between large and small retailers. However the exercise of buyer power is also likely to affect the range and quality of goods available to smaller retailers and their customers.

1.20 As suppliers' profitability is squeezed their response may be to make cost savings either through reducing their product range or through cutting back on the development and promotion of new products. This may be a particular issue for 'second tier' brands which large retailers may no longer be prepared to support financially.

1.21 Again the development of strong private labels may be a particular threat to 'second tier' brands. Any cut back in the supply of these brands will have a greater effect on smaller retailers which cannot provide the same level of support for private labels as larger retailers.

Conclusion

1.22 This submission demonstrates that:

(a) there is a strong theoretical basis for the operation of a waterbed effect as a result of the negotiation of non-cost related discounts by larger retailers;

(b) this can harm not only the consumers using smaller retail outlets but consumers as a whole.

1.23 It is our contention that these effects cannot be dismissed in the way suggested by the large retailers. They are reflected in the decline in the number of smaller retailers, particularly independent retailers in recent years and in the associated decline in the number of wholesalers. This must be fully investigated by the Commission drawing on the detailed information it has available from submissions and questionnaires provided by retailers, wholesalers and suppliers.

2 THE WATERBED EFFECT IN A STATIC SETTING[2]

Overview

2.1 In this Section, we conduct our analysis while leaving the market structure, both at the retail, the wholesale and the supply level, unchanged. In other words, our arguments will not rely on exit or entry of firms at either level. Likewise, we take the quality of all goods and the range of goods stocked at retailers as constant.

2.2 We show that even in such a static setting, one should expect to observe a waterbed effect provided that discounts related to volume are observed in the first place. Moreover, our analysis identifies conditions under which the waterbed effect would be enhanced. Finally, we derive conditions under which the overall effect is to hurt both consumers that shop at the affected retailers and also consumers on average, despite the fact that prices at the larger retailer will fall.

2.3 In short, we can sum up our main results as follows:

(a) Our main analysis applies to settings where, first, there is buyer power which manifests itself in individual discounts and where, second, buyer power derives from size. Then if at least some of the growth of a larger retailer is achieved at the expense of other retailers, the same forces that give rise to a discount lead to a waterbed effect.

(b) As the same forces that generate size-related discounts are also responsible for the waterbed effect, we should expect the waterbed effect to be stronger if individual discounts are already substantial. More precisely, if buyers' individual terms already differ by a significant amount and if we observe that a large buyer obtains an *additional* discount, then we should expect to see at the same time a relatively larger deterioration of smaller retailers' terms of supply.

(c) Finally, though an additional discount to one retailer is likely to further lower its retail price and thereby to also intensify retail competition, smaller retailers' final prices may go up and, what is more, total consumer surplus may fall. This is again more likely if discounts to large retailers are already substantial.

Capturing Buyer Power

2.4 Our formal arguments rest on a framework where supply contracts are individually determined. This provides scope for individual discounts. In principle, there can be many

[2] The modelling in this section is based on Inderst, R., 2006, Leveraging buyer power, Mimeo

reasons why buyers obtain a discount, some of them related to a buyer's size and some of them related to other sources of buyer power.

2.5 In a framework of bilateral contracting, how joint profits are shared depends most importantly on how much loss either side can inflict on the other by withdrawing its business. Putting it differently, one side gets stronger and can thus extract a larger share of profits if it has relatively less to lose from a breakdown of negotiations, i.e., if, using the language of bargaining theory, its outside option becomes more valuable.

2.6 Our analysis in this Section focuses on discounts that relate to a buyer's size.[3] There could also be other reasons why size generates buyer power, such as the following:

(a) A retailer that controls a large share of a supplier's total business may be stronger in negotiations as it is harder for the supplier to find adequate alternative channels fast enough.

(b) A retailer that controls access to a fraction of a supplier's potential market, i.e., that acts as a gatekeeper to these segments of the retail market, can also potentially inflict a larger loss on a supplier.

(c) For a final example, a buyer who can more easily or at better conditions switch to other sources of supply should also obtain a better deal. The terms as well as the ease and credibility with which such a substitution may occur, could be linked to size for several reasons. Other suppliers may try to woo a large buyer with substantially lower per-unit prices because the large buyer's purchase volume will make the offer profitable even at a lower margin per unit. In addition, a larger buyer can spread any expenditures that are incurred when switching suppliers over a larger quantity.

2.7 Depending on the particular situation, different sources of buyer power may be more relevant than others. Unfortunately, the economic literature has not converged on a simple workhorse model that allows us to capture a wide range of the possible sources of buyer power. In fact, the literature that explicitly models the origins of buyer power, which is essential to understand its consequences and to link the respective theories and arguments to a particular case, is extremely limited.[4]

[3] A different source of buyer power could be the strength of the buyer's private labels.

[4] See for recent overviews: Inderst, Roman and Shaffer, Greg, The Role of Buyer Power in Merger Control, chapter for the ABA Antitrust Section Handbook, Issues in Competition Law and Policy (W.D. Collins, ed., in preparation), and Inderst, Roman and Mazzarotto, Nicola, Buyer Power in Distribution, chapter for the ABA Antitrust Section Handbook, Issues in Competition Law and Policy (W.D. Collins, ed., in preparation).

2.8 Consequently, to formalize our arguments in what follows it is necessary to focus on a particular source of buyer power. We do so by focusing on buyer power arising from the more valuable outside option of buyers that purchase an overall larger volume. This strikes us as realistic in a broad range of cases. What is more, we can use a very simple and parsimonious approach to formally capturing this source of buyer power.

2.9 The precise way in which this is done is the following.[5] Instead of continuing to purchase from some incumbent supplier, a retailer can also switch to another source of supply. This involves some costs, which may be either incurred at the level of the retailer or at that of the supplier and which allow for a broad range of interpretations. Larger retailers can essentially spread these costs over more units, which makes the option to switch suppliers both more profitable and more credible. As this increases the value of a large retailer's outside option, the incumbent supplier is forced to offer the retailer a better deal.

The Key Argument

2.10 We first provide an informal argument for the waterbed effect in a static setting. Subsequently, we deliver the formal approach.

2.11 A common criticism to the existence of a waterbed effect is the following. Even if one buyer obtains a (larger) discount, this does not imply that the terms of supply should change for other retailers. In fact, the argument goes, if it is possible for the supplier to raise its price to other retailers, the supplier would have already optimally done so.

2.12 The preceding argument seems to be based on the presumption that where a large retailer obtains an additional discount, this by itself will not affect other retailers, implying indeed that we should not expect a deterioration in their terms of supply. However, if retailers compete, which is what we assume in this analysis, and if buyer power derives from size, then this argument must itself be criticized along two lines.

2.13 First, if a large retailer obtains an additional discount and if this is at least partly passed on into lower retail prices then, provided that not all growth is achieved through expanding the market, this will reduce both the market share and the overall market size of other, smaller retailers. If terms of supply are indeed a monotonic function of overall size, which is the presumption with which we started out in the first place, then this *must* lead to higher prices for smaller retailers.

[5] One of the key references is Katz, M.L., 1987, The welfare effects of third degree price discrimination in intermediate goods markets, American Economic Review 77, 154-167.

2.14 Second, the argument takes the wrong starting point by simply assuming that a large retailer obtains an additional discount without asking why this is the case in the first place. In other words, we can criticize this argument on the same ground on which it seeks to question the logical consistence of the waterbed effect, namely by asking why a supplier should suddenly adjust its price. If a large buyer grows further, be it organically through a more competitive pricing structure or through acquisition, and if this increase in size then translates into a further discount, then to the extent that this expansion went along with a reduction of smaller retailers' business, we should once again see a deterioration of their terms of supply.

2.15 In sum, if we observe individual discounts and if we can link these discounts to size, then we should also expect to see a waterbed effect. The waterbed effect arises as both the large retailer's original expansion, which generates the additional discount in the first place, and the additional growth achieved on the back of the discount tend to reduce both the market share and the overall sales of other, smaller retailers.

2.16 Our arguments already point to several factors that determine how strong we should expect the waterbed effect to be even in a purely static setting, where we abstract from entry and exit. In particular, the waterbed effect should be stronger

(a) if the larger retailer's growth is achieved more by taking away market share from other, smaller retailers instead of expanding the market; and

(b) if there is much scope for larger buyers to obtain discounts in the first place, implying that there is also scope to raise prices to buyers that purchase less.

Formalizing the Argument

Details of the Model

2.17 In this Section, we formalize these arguments in a simple framework. This allows us, in particular, to derive additional conditions on when the waterbed effect should be particularly strong. Also, a formal framework is needed to analyze the impact on retail prices and thereby on consumer surplus.

2.18 We first sketch the key elements of this framework.

The retail market

2.19 We envisage a very simple picture of the retail industry. Altogether, there are some N>1 geographically separate markets. Each of these N markets can only sustain a limited number of outlets. For concreteness and ease of exposition, though neither the arguments nor the formal results do depend on this, we fix this number at two. The two outlets in each of the N markets can be operated by different firms.

2.20 For convenience only we suppose that there is only a single large retailer controlling altogether $n_L>1$ outlets. In what follows, we will focus on an expansion of this large retailer. The other outlets are either owned by independent retailers, each operating only one outlet, or a group of buyers. More formally, we suppose that the buyer groups jointly controls $n_G < n_L$ outlets, each in a separate market. The remaining $2N- n_L – n_G$ outlets are owned by single-store independent retailers.

Supply contracts

2.21 We consider bilateral negotiations, i.e. between the supplier and each individual retailer, over simple, linear wholesale contracts. That is, the contract specifies a simple fixed price w per unit.[6]

2.22 Buyer power arises as large buyers have a more attractive outside option, which consists of turning to an alternative source of supply. At the outset, as well as in the case where all negotiations are successful, all retailers will purchase from the same supplier. We also abstract from complications that would arise in the presence of multiple goods in the same or in different categories.

2.23 For simplicity, we also locate all of the contractual power with the supplier. In the parlance of bargaining theory, the supplier can thus make a take-it-or-leave-it offer to all retailers. Importantly, this simplification does not reduce the importance of buyers' outside option.[7]

Additional details of the formal model

2.24 We now flesh out the remaining details of the model. To capture competition between the two outlets in each of the N local markets, we use a standard framework, which is

[6] We acknowledge that supply contracts in the retail industry are often highly complex, allowing for various additional payments, such as those linked to promotional expenditures, as well as for various forms of (volume) discounts. However, it is also our understanding that for a wide range of goods the assumption of linear pricing, i.e., of a fixed price w per unit, may not be too far fetched in the following sense. With such a contract, the supplier grants an individual buyer an additional discount by lowering the per-unit price, which the retailer will then to some extent optimally pass through into the retail price. For an illustration only, suppose that a retailer's residual (inverse) demand is given by P=1-x, where P denotes the price prevailing at the final market. Production costs at the upstream firm are equal to $c \cdot x$ with $c<1$. The retailer will now optimally sell the quantity $x=(1-w)/2$ at a price of $(1+w)/2$. Hence, the retailer, whom for the moment we treat as a monopolist on the residual demand curve, passes on one half of a reduction in w. The academic literature distinguishes often between such simple linear contracts and more complex contracts that allow also for, e.g., up-front fees and additional discounts. In the extreme case, such additional contractual tools allow to shift profits between the retailer and the supplier without affecting the marginal per-unit price and thus also the retail price. This would imply a pass-through of zero. Though we take a linear contract, our results should extend qualitatively to other contracts as long as the pass-through is not exactly zero.

[7] There is also a more technical reason for why this approach may often be appropriate without loss of generality. Even in a more complex setting that allows both buyers and suppliers some say in the contract, e.g., in a standard alternating-offer bargaining game, the outcome may in the end be the same as when only the supplier can make the offer. This is sometimes referred to as the "outside option principle" and holds if, compared to the next best alternative, the incremental joint profits that can be realized with the incumbent supplier are sufficiently small compared with the total joint profits. Intuitively, in this case the buyer's outside option is already sufficiently attractive to fully pin down the outcome of negotiations. A seminal reference on the "outside option principle" is: Binmore, K., Rubinstein, A., and Wolinsky, A. (1986), The Nash Bargaining Solution in Economic Modelling, Rand Journal of Economics 17, 176-188.

commonly referred to as the “Hotelling framework”. This choice is motivated by the analytical tractability of the Hotelling framework and as it has become the main workhorse to model price competition in retailing.[8]

2.25 We denote the different markets by n=1,..,N. In each of these markets the two outlets, to which we refer to as A_n and B_n, are located at the endpoints of a street (or “line”). As we said previously, each outlet stocks only one good. Also each consumer demands at most one unit of the good. Consumers differ only in their location. They incur the "shoe-leather" costs tx>0 when patronizing an outlet that is at distance x. In the current context, we may literally express tx as a (time) cost that is incurred when shopping at a particular outlet. It turns out that in the Hotelling framework it is not important whether we adjust t, the costs “per mile” or the distance between the two outlets, which we thus set simply equal to “one”. Both affect the degree of “horizontal differentiation” and thus the degree of competition in the same way. In empirical studies, t could be proxied by the overall time it takes to travel to the closest alternative outlet.

2.26 The incumbent supplier produces the single good at constant marginal costs k. Each customer’s reservation utility for the supplier’s good is u. The supplier charges a retailer the constant (wholesale) price of $w(A_n)$ or $w(B_n)$, respectively. We simplify the analysis by specifying that retailers have the same own marginal costs c. They set the respective retail prices $p(A_n)$ and $p(B_n)$.

2.27 There exists also an alternative source of supply. If a retailer rejects the incumbent supplier's offer, it can access this alternative source of supply, though only at costs F>0.[9] While we, as well as the existing literature, specify for concreteness that these costs are incurred by the buyer, this need not necessarily be the case. Alternatively, F or a fraction of it, may have to be incurred by the new supplier. Importantly, F stays constant in our analysis. Consequently, even if some retailers may end up paying a higher price following a change in market structure this does not imply that there will be scope for another supplier to enter and make profits selling to these retailers.

2.28 Generally, we may suppose that the alternative supply option allows the respective retailer to procure at a wholesale price W a good that generates utility U for its customers.[10] To keep all our expressions short, given that we are mainly interested in qualitative results, we make the following simplifications.

---

[8] A well-known drawback of this framework is that it does not capture market expansion effects. As noted already above, these could have the tendency to somewhat attenuate our results.

[9] As we noted above, we follow here one, if not the only, *commonly* used approach in the academic literature to generate in a parsimonious way large-buyer discounts under linear costs.

[10] If a larger buyer also engages more actively in search in order to locate another supplier with a lower W or a higher U, then this would strengthen all our results, both regarding the size of discounts and thereby also the size of the waterbed effect.

2.29 We first simplify the analysis by setting all marginal costs under the incumbent supplier equal to zero: k=c=0. We should note that this simplification is done *only* for the purpose of simplifying the expressions in the main part of the paper. The formal derivation (in the Appendix) deals with the general case. Moreover, the numerical examples that we calculate below also allow for marginal costs above zero.

2.30 With the normalization to k=c=0, a buyer's input price is thus just equal to the supplier's margin, while the difference between the retail and the wholesale price is the retailer's margin.

2.31 Secondly, we specify that once costs F are incurred, which may also represent promotional expenditures, the alternative good generates the same utility and can thus, ceteris paribus, be sold at the same price as the incumbent's good, i.e., that U=u. In addition, we normalize its wholesale price W to zero, mirroring the zero marginal costs of the incumbent supplier.

2.32 As is formalized below, if F becomes small, then the supplier's margins, which are equal to $w(A_n)$ and $w(B_n)$, will also be only small, implying in particular that there will be little scope for individual discounts. In contrast, for high F individual wholesale prices may differ more substantially, provided that the respective retailers have different size.

Preliminary Analysis

2.33 With this simplifications, if retailers operate under the known input prices $w(A_n)$ and $w(B_n)$, then the well-known Hotelling solution generates the retail prices

2.34
$$p(A_n) = t + \frac{2w(A_n) + w(B_n)}{3},$$
$$p(B_n) = t + \frac{2w(B_n) + w(A_n)}{3},$$

2.35 provided that both outlets have positive market shares, which in turn is the case if $w(B_n)-w(A_n)<3t$ and $w(A_n)- w(B_n)<3t$. In words, the price charged at, say, outlet A_n is thus higher the more "differentiated" the two outlets are, i.e., the further they are apart, and the higher the two firms' purchasing prices. In particular, two thirds of an increase in the own marginal cost $w(A_n)$ are passed through into the retail price.[11]

[11] That also an increase in the other outlet's purchasing costs affects the retail price at outlet A_n is simply due to the fact that both retail prices are jointly determined in an equilibrium. As the purchasing price of the other outlet increases, which will induce also an increase in the respective retail price, also A_n finds it optimal to raise its price, though to a lesser extent than if its own costs were to increase by the same amount.

2.36 The respective profits of the two retail outlets are then

$$\Pi(A_n) = \frac{1}{2t}\left[t + \frac{w(B_n) - w(A_n)}{3}\right]^2,$$
$$\Pi(B_n) = \frac{1}{2t}\left[t + \frac{w(A_n) - w(B_n)}{3}\right]^2.$$

2.37 These are standard (textbook) formulas. While the respective expressions are particularly simple in the chosen Hotelling model, the properties that we will use in our subsequent analysis hold quite generally. Note, in particular, that profits are strictly higher the larger t, i.e., the larger the distance between outlets. Intuitively, profits are also decreasing in own marginal costs, i.e., the own purchasing price, and increasing in the marginal costs of the competing outlet.

2.38 We next analyze how individual wholesale prices are determined. For this we need for any given retailer the profits that it would realize in the case where there is no agreement with the incumbent supplier.

2.39 Take first an independent retailer A_n, i.e., a retailer that operates only this single outlet. If this retailer switches to a different source of supply, this will generate the additional (fixed) costs F. We obtain a relatively simple expression for the profits that an independent retailer controlling only outlet A_n would realize when rejecting the incumbent supplier's offer. These "disagreement" profits are given by

$$\Omega(A_n) = \frac{1}{2t}\left[t + \frac{w(B_n)}{3}\right]^2 - F.$$

2.40 If F is not too large, then the equilibrium wholesale price for A_n is now simply determined by the requirement that $\Pi(A_n) = \Omega(A_n)$. That is, the incumbent can raise $w(A_n)$ until the retailer is just indifferent between accepting the offer or taking up its outside option. [12] We relegate an explicit characterization of the solution to the Appendix.

[12] Holding $w(B_n)$ fixed, this clearly yields a unique solution for $w(A_n)$. If F was very large, making the retailer's alternative option very unattractive or not credible at all, then the incumbent supplier could essentially price like an unconstrained monopolist. We abstract from this case in what follows.

2.41 For the subsequent analysis, it is instructive to note the following intuitive results: The wholesale price $w(A_n)$ increases, ceteris paribus,

(a) as F increases. Intuitively, the higher F the larger the pricing power of the incumbent supplier.

(b) as $w(B_n)$ decreases. Intuitively, though the formal argument is slightly more involved as $w(B_n)$ affects both $\Pi(A_n)$ and $\Omega(A_n)$, the lower purchase price of the competing outlet, $w(B_n)$, the lower the market share and thus the total purchasing volume of outlet A_n.

2.42 To analyze next the impact of a retailer's size, as measured by the number of controlled outlets, we first consider the large retailer. The large retailer operates n_L outlets and is charged the wholesale price w_L, which clearly applies to all outlets that it operates. Hence, if the large retailer operates some outlet A_n, then the wholesale price at which goods for this outlet can be procured is given by $w(A_n)= w_L$. For simplicity, we suppose that the large retailer only operates outlets with label A.[13] Moreover, for the main part we also specify for simplicity that the wholesale price at all outlets B_n that compete with outlets of the large retailer is identical. We can thus simply abbreviate this wholesale price by w(B).

2.43 With this simplification, the profits that the large retailer realizes in total from the n_L outlets is then simply

$$\Pi_L = n_L \frac{1}{2t}\left[t + \frac{w(B) - w_L}{3}\right]^2,$$

2.44 i.e., n_L times the profits from a single outlet. Likewise, if the large retailer rejects the supplier's offer, the retailer's profits are

$$\Omega_L = n_L \frac{1}{2t}\left[t + \frac{w(B)}{3}\right]^2 - F.$$

2.45 Recall now once more that under the supplier's optimal offer, the retailer is just made indifferent between rejecting and accepting the offer. That is, we have again the requirement that $\Pi_L = \Omega_L$, which now transforms to

[13] Formally, the large retailer then controls all outlets A_n with $n \in N_L$

$$\frac{1}{2t}\left[t+\frac{w(B)-w_L}{3}\right]^2=\frac{1}{2t}\left[t+\frac{w(B)}{3}\right]^2-\frac{F}{n_L}.$$

2.46 This clearly shows how the fixed costs F are "spread over" the n_L outlets that are controlled by the large retailer. While these calculations, as well as the intuition for a large-volume discount, are straightforward, analyzing the market outcome is somewhat more complicated as all individual wholesale and retail prices are endogenous and must be solved simultaneously. This is clearly taken into account in the following analysis.

The Waterbed Effect if the Large Buyer Expands in an Unrelated Market

2.47 In this Section, we suppose that the large buyer grows by acquiring additional (independent) outlets. To simplify the exposition and focus on the key insights we assume that all outlets except those belonging to the large retailer are operated independently. This implies that we can treat symmetrically all of the markets in which the large retailer operates.

2.48 The first step of our analysis focuses on the impact that the acquisition has on both the large retailer's purchasing price w_L and the purchasing price of the small, independent stores that operate in the same markets as the large retailer, which we denote by w_I. The second step of the analysis will be to study the impact on the respective retail prices, which we denote by p_L and p_I, and thereby on consumer surplus.

2.49 As noted above, for a market equilibrium all wholesale and retail prices must be determined simultaneously. Nevertheless, it is instructive to walk over the resulting changes step-by-step. Following the acquisition of yet another outlet by the large retailer, the following changes take place:

(a) The larger retailer obtains a (further) discount following the increase in its total purchasing volume.

(b) The resulting reduction of w_L feeds through into a lower retail price p_L. Holding the price(s) of the small retailers constant for now, this reduces their competitiveness, thus leading to lower sales and a lower purchasing volume.

(c) The lower purchasing volume of the small, independent retailers, together with the increased competitiveness of the large retailer, will result in higher wholesale prices w_I.

(d) For small, independent retailers there as thus two conflicting forces that determine how their own retail prices change. While the increase in w_I tends to push up p_I, the

reduction in its competitor's retail price, p_L, works in the opposite direction as small retailers have to strive harder to remain competitive.[14]

2.50 It is the third step that is of key importance. As the large retailer becomes more competitive following an increase in the (non-cost related) discount, it takes away market share from the smaller retailers. This reduces the purchasing volume of small retailers. If purchasing prices (and discounts) are related to size, this necessarily implies a waterbed effect: Smaller retailers will have to pay a higher price per unit. This very general logic is also born out by the formal results from the model.

2.51 Importantly, the increased price paid by small retailers does not imply that other suppliers could now profitably step in and take away business from the incumbent supplier. Both before and after the growth of the large retailer the "competitive constraints" that determine the incumbent supplier's wholesale prices bind. For an illustration suppose that the costs F that must be incurred per retailer in order to switch supply arise at the level of the supplier. Hence, the costs F comprise all the expenditure that an alternative supplier would have to incur to bring its products on to the shelves of the retailer. [15] The way the small retailers' purchasing prices are determined makes sure that both before and after the growth of the large retailer an alternative supplier can not make a profitable, competing offer. Intuitively, as the small retailers' volume shrinks, their business becomes also less valuable to an alternative supplier.

2.52 If the large retailer's wholesale price changes by $dw_L<0$, then in our model the wholesale price of each of the competing small retailers *increases by* dw_I, which is given by[16]

$$dw_I = (-dw_L)\left[6t\frac{w_I}{m_I}\right],$$

where m_I denotes the small retailer's share in the respective local market. We should note at this point that this very simple expression is obtained under the various normalizations that we made, in particular relating to marginal costs at the retailer and supplier stage. Both in the Appendix and in the numerical examples below we will use more general expressions.

---

[14] Formally, in the analyzed (Hotelling) model prices of competing retailers are strategic complements: As one retailer lowers its price, the incentives for the other retailer to do so are strictly higher. This is a feature of most common models of price competition. However, it should be noted that if retailers' strategies were strategic substitutes, then following a higher discount for the large retailer it would be an immediate effect that the remaining customers of small retailers are hurt, given that both effects now work in the same direction to increase the price.

[15] That these up-front costs F can be paid for by a lump sum payment is inconsequential for the analysis. In a modified version of the model we could imagine, instead, that alternative suppliers compete on the basis of linear wholesale prices w such that, in equilibrium, the wholesale price from the outside option is determined by the requirement that the winning bidder just breaks even. This would likewise generate a volume discount such that all our qualitative insights would fully carry over.

[16] Formally, as we take derivatives these formulas apply strictly only for marginal changes.

2.53 Nevertheless, this simple formula is very instructive as it formalizes (and potentially allows to quantify in an empirical analysis) the conditions for which we should expect the waterbed effect to be stronger. We have the following results, which arise intuitively from this formula and which are made more formal in the Appendix.[17] The size of the waterbed effect, i.e., by what amount a small, independent retailer's price increases as that of its larger rival decreases, is larger

(a) the smaller the independent retailer's market share has already become. Importantly, this result is *not* obtained from a pure "accounting" view of the waterbed effect, namely that a fixed per-unit discount simply weighs in more if the respective buyer is larger and thus obtains the discount over a larger number of units.

(b) the stronger the supplier's position vis-a-vis retailers, as captured by F. Intuitively, this holds as in this case there is more scope for purchasing prices to substantially differ between small and large retailers in the first place.

The Impact on Consumer Surplus

2.54 We come next to the final step of the analysis where we analyze the impact on consumers. As noted above, while following an increase in its discount the larger retailer will surely lower its retail price, the impact on the retail price at small outlets should generally be ambiguous. However, our calculation show that, at least in this model, it is also likely that the waterbed effect dominates, implying a higher retail price p_I.

2.55 We relegate the numerical examples to the end of this Section. Until then, we will use our formulas to obtain once again some more general insights. For this we consider now a (marginal) reduction in the large retailer's wholesale price. Taking into account that this is passed through to final consumers and that, on the other hand, the small retailer's wholesale price increases due to the waterbed effect, we then ask when the overall effect is to increase the small retailer's final price. Subsequently, we further tighten the criterion of consumer detriment and ask when consumers will be worse off on average.

2.56 We find that, following a reduction of w_L and the subsequent increase of w_I , the retail price of the small retailer, p_I, *increases* if

$$m_I < \frac{1}{3t} w_I .$$

[17] The formal derivation of the following assertions takes into account that all three parameters w_L, w_I and m_I are endogenous.

2.57 This formula comprises the following key insight, which is made more formal in the Appendix. [18] If a large retailer obtains an additional discount, then this is more likely to lead to an increase in the *retail price* at small, independent retailers if the large retailer already has a substantial advantage, which translates into a lower market share of the small retailer m_I. Clearly, if the previous condition is satisfied, then all consumers who continue to shop at the small retailer will be hurt by the discount that the larger retailer obtains.

2.58 The simple structure of the Hotelling model allows us now to go one essential step further by calculating how total consumer surplus is affected. We find first that the average price that is paid by consumers, as weighted by the number of those who shop at the different outlets, is also strictly higher after the discount is granted to the large retailer if

$$m_I \frac{2 - m_I}{1 + m_I} < \frac{1}{3t} w_I .$$

2.59 This condition is slightly more complicated than the previous one. It is clearly also more stringent given that those consumers who now shop at the large retailer pay a lower price. Again, however, a crucial insight is that this condition is more easily satisfied if large retailers have a larger market share due to the discounts that they already obtain.

2.60 To calculate the impact on consumer surplus, however, we also have to take into account consumers' relative preferences for either outlet. In the Hotelling model this is again accomplished very simply. If both outlets in an given local market charged the same price, then any consumer would strictly prefer to shop at the nearest outlet. This preference for proximity is taken into account by calculating consumer surplus net of the "resulting shoe-leather costs per consumer", i.e., net of xt if a consumer lives at "location x" and shops at outlet A and net of (1-x)t if this consumer shops at outlet B.

2.61 Intuitively, in the model considered here total shoe-leather costs increase if the larger retailer, which is already frequented by some consumers for whom it is not the most nearby outlet, obtains a further advantage and, thereby, can increase its catchment area. Hence, taking into account consumers' (horizontal) preferences for shopping nearby, the condition for when a discount to larger retailer reduces consumer surplus is *strictly weaker* than the condition for when this raises the average retail price. The precise condition is contained in the Appendix. The Appendix also contains a worked-out numerical example.

[18] Again, the formal derivation of the following assertions takes into account that both w_I and m_I are endogenous.

The Waterbed Effect if the Large Buyer Grows at the Direct Expense of the Affected Smaller Retailer

2.62 It should be recalled that in the previous analysis there was a waterbed effect even though the large retailer's original growth, which triggered the additional discount in the first place, occurred in another market and did thus not by itself affect the market share of the considered smaller retailers. The reduction in smaller retailers' total sales and purchasing volume was thus generated only on the back of the increased discount.

2.63 Alternatively, the large retailer's growth could also be directly at the expense of smaller retailers. A straightforward case would be that where the large retailer takes over some of the outlets that previously belonged to a buyer group. In the notation of our model this would reduce the total number of outlets controlled by the buyer group to some value n_G-d, while the number of outlets controlled by the large retailer increases to n_L+d.

2.64 We omit a formal analysis of this case. It is, however, intuitive that in this case the increase of the buyer group's wholesale price is much more pronounced given that its sales decrease both directly due to the loss in outlets and indirectly as the larger difference in wholesale prices puts it at a further competitive disadvantage.

2.65 Finally, such an argument can be extended to cases where instead of growing by acquisition, the large retailer takes away business from smaller, independent retailers through other means. For instance, by expanding into non-food products the large retailer may be able to seriously expand the catchment area, in particular, of its largest shops.

3 THE WATERBED EFFECT IN A DYNAMIC SETTING

Overview

3.1 In the static analysis, we abstracted from potential long-run effects of the exercise of buyer power by large retailers. In this Section, in contrast, we show that taking these on board should further amplify the identified waterbed effect.

3.2 In our previous analysis, the formation of a larger retailer led to a reduction in this retailer's purchasing price but to an increase in that of its smaller rivals. As we show in the Appendix, the overall effect of this is that the supplier's total profits are strictly lower. The exercise of buyer power by the large retailer therefore takes away some of the economic rents that the supplier is able to capture as retailers cannot substitute its good without costs. As noted previously, these costs of substitution, as captured by the parameter F in our simple model, can have a wide range of interpretations.

3.3 In the long run, however, one would expect that the reduction in suppliers' profits will affect the upstream market structure. In what follows, we explore this idea further in a setting where in the long run all suppliers that are active in the market make zero profits. While we formally capture this in a model of open entry, albeit with associated costs, our analysis pertains equally to the case where firms have to continuously sink (fixed) costs to stay in business, in which case the exercise of buyer power will, as we argue, extend and amplify the working of a waterbed effect through exit at the level of suppliers or at that of intermediate services to smaller retailers, such as wholesalers.

3.4 Our formal analysis, which builds squarely on the simple model that we introduced in the previous section, explores one particular channel through which the growth of a large retailer can lead to an even larger waterbed effect, both in its reach to different retailers and in its absolute size per retailer. We sketch the key argument first before arguing that the underlying logic has a much wider appeal.

3.5 As a large retailer grows further, say for concreteness again through the acquisition of independent outlets, it can exercise more buyer power and thereby reduce its purchasing prices. This reduces a given supplier's profits, even taking into account, as we have already noted, that the supplier may simultaneously raise prices to other, smaller retailers.[19] In the long run, this will lead to an adjustment in the upstream market structure, either through exit of those suppliers who no longer expect to break even or through less

[19] It should be recalled that in our model, the given supplier will raise prices to those retailers whose business shrinks due to the expansion of the large retailer or due to more intense competition from the large retailer. Retailers in unrelated local markets would not be affected. This will be different in the dynamic extension analyzed in this Section.

new entry.[20] Exit or reduced entry again raises each supplier's expected profits by two channels. First, each supplier can then take a larger share of the total business. By itself, this should have no direct implications on the wholesale prices of individual retailers. Second, as there are fewer suppliers in the market they should exert less competitive constraints on each other. More precisely, in our current bargaining framework we would expect, by analogy to the picture of buyer power on the retail level, that the fewer suppliers there are the less profitable is a buyer's outside option when negotiating with each individual supplier. It is through this mechanism that other retailers, even those that operate in markets where they do not directly compete with the large retailers' outlets, will be affected by the additional discounts that suppliers must grant to the large retailer.

3.6 For outlets that compete with those of the large retailer, this mechanism further amplifies the waterbed effect that we already identified in a static environment, holding the upstream market and thus, in particular, retailers' alternative supply options constant. In addition, other independent retailers that have no or negligible overlap with the large retailer are now affected as well.

3.7 Furthermore, in principle this logic extends beyond suppliers, namely to the whole infrastructure that serves small, independent retailers. In this case, however, the argument would have to be slightly modified. Take, for instance, the case of the wholesale sector, focusing on wholesalers that compete in supplying to a particular set of small, independent retailers. As the wholesale segment's business shrinks, this may again lead to exit or less entry and, thereby, to fewer competitors as there are fewer remaining wholesalers. By pushing up wholesale prices, this further tends to put their clients at a competitive disadvantage vis-a-vis larger retailers' outlets.

3.8 Finally, although the following formal argument is again conducted in the particular model that we chose in the previous Section, it should hold more generally. Importantly, while in the static analysis the waterbed effect relied on competition between the large retailer and

---

1.1 [20] Another way in which the upstream market could be consolidated is through mergers among suppliers. Though we are not aware of a study of the UK market, evidence from the US shows that this is not only a theoretical possibility. Recent cross-industry studies in the financial economics literature on the impact of *downstream mergers* lend strong support to the presence of buyer power effects on upstream market structure. They document a substantial deterioration of suppliers' profits, where suppliers that were particularly reliant on the merging firms for sales revenues were affected worst. Most importantly for the present argument, they establish a causal link between the exercise of power from larger buyers and a "countervailing" consolidation of the supplier industry. See Bhattacharyya, S. and Nain, A., 2006, Horizontal acquisitions and buying power: A product market analysis, mimeo; or Fee, C.E. and Thomas, J., 2004. Sources of gains in horizontal takeovers: Evidence from customer, supplier, and rival firms, Journal of Financial Economics 74, 423-460.

smaller retailers, given that otherwise small retailers' purchase volume would be unaffected, this is no longer the case in the dynamic analysis. Consequently, also sources of buyer power that are not directly linked to size will now also lead to a waterbed effect.

3.9 For an illustration, take the case of private labels. Large retailers in the UK have developed strong private labels in many product categories. In particular, with respect to second- or third-tier branded goods private labels have become credible substitutes. This erodes suppliers' bargaining power, provided that their branded goods are still listed at all. Through the long-run adjustment in the upstream market, we should according to the argument presented here still expect that there will be a waterbed effect, resulting in the deterioration of the terms of supply of other, less powerful retailers.

Analysis of the Formal Model

3.10 In our formal model, our starting point is again that the large retailer further grows through acquiring additional outlets. To be brief and specific, we focus on the case where there is a single large retailer, controlling again n_L outlets, while all other, altogether $2N-n_L$, outlets are operated by small, independent retailers. (Recall that in each of the considered N local markets there compete exactly two outlets.) It will now also be convenient to denote the fraction of local markets in which the large retailer is present by $f_L = n_L/N$.

3.11 In this setting, using symmetry, there are three different wholesale prices. Independent retailers that compete against another independent outlets pay the wholesale price w_{II}. If an independent retailer competes against an outlet of the large retailer, then it pays the wholesale price w_{IL}. Finally, the large retailer pays the price w_L. From our previous analysis it follows immediately that $w_L < w_{II} < w_{IL}$.

3.12 We now suppose that there are altogether M suppliers in the upstream market. By imposing symmetry, each of these suppliers will thus serve N/M local markets. We further suppose that all suppliers are symmetric in that they all sell to the same number, namely n_L/M of outlets owned by the large retailer.[21] With these specifications, each supplier that is in the market realizes the profits[22]

[21] Hence, in this setting a large retailer multi-sources from different suppliers. Together, these specifications serve primarily the purpose of simplifying the formal argument. None of these specifications is essential for the argument, though introducing asymmetry, which could arise from strategic considerations in large retailers' procurement policy, would clearly heavily complicated any formal analysis.

[22] Recall that the total number of units sold in each local market adds up to one and that we denoted the (local) market share of the respective retailers by m_L and m_{IL}.

$$\pi_S = \frac{1}{M}\left[n_L(m_L w_L + m_{IL} w_{IL}) + (N - n_L) w_{II}\right] = \frac{N}{M}\left[f_L(m_L w_L + m_{IL} w_{IL}) + (1 - f_L) w_{II}\right].$$

3.13 If costs of entry or costs from staying in the market are K>0, then in the long run it must hold that π_S=K.[23]

3.14 The wholesale prices are still determined as in the previous Section, namely from the requirement that the respective supplier's power to raise prices is constrained by the value of retailers' alternative supply option. With an endogenous upstream market structure, as captured here by the number of operating suppliers M, this should now also arise endogenously. We capture this in a reduced form by stipulating that a retailer's costs of turning to another supplier, F, is now strictly decreasing in the number of suppliers that are active in the market. Formally, we now have a function F(M)>0 that is strictly decreasing over all M.

3.15 As with the role of F, also this specification is quite flexible and captures a number of different interpretations. One could be in terms of distance. As more suppliers operate in the market, it becomes easier to substitute away from a given, local supplier. Intuitively, by lowering F, the more suppliers there are in the market the lower all wholesale prices will be. In contrast, if there is exit or less entry, then this will raise wholesale prices.

3.16 With this background, the growth of the large retailer, as captured by an increase in the fraction of controlled outlets f_L, has now the following effects. Again, though some of these changes occur simultaneously, it is helpful to walk through the implications step-by-step.

(a) The acquisition allows the large buyer to grow further, thus further increasing its purchasing volume. In addition, a direct impact of the acquisition is that even if we were to hold all wholesale prices constant, then suppliers' profits would decrease nevertheless. This follows, in particular, as the acquired outlets can now purchase at the lower wholesale price of the large retailer.

(b) Moreover, the larger volume purchased by the large retailer implies now that its suppliers must lower the price, given that otherwise the retailer will take up its more profitable outside option. As w_L drops, suppliers' profits are lower.

[23] Note that we abstract here, as well as when we imposed symmetry, from so called "integer problems", namely that, in the current case, profits for some M=M' would be slightly above K but also slightly below K for M=M'+1. This is a common tool to simplify the analysis.

(c) This is somewhat, though not fully, compensated by the fact that the supplier can increase the price for those independent retailers that compete with outlets of the large retailers. Hence, for these retailers the "static" waterbed effect that we identified in the previous section applies.

(d) Either through exit or through less entry, in the long run suppliers' average profits must be again equal to K. This is achieved by a reduction in the number of suppliers M. A reduction of M increases a supplier's profits by both allowing each supplier to capture a larger share of the market and by enhancing each supplier's bargaining position through an increase in F.

(e) As F increases, all wholesale prices are pushed up. The overall effect is that wholesale prices for all independent retailers are higher, i.e., both for outlets that compete with the large retailer and for those that operate in other markets. For the large buyer, the overall effect is still to reduce its own wholesale price.

3.17 We finally turn again to an analysis of retail prices. The overall effect on retail prices is always unambiguous in markets where only independent retailers operate. The higher wholesale prices for all outlets in these markets are passed on to retailers. In fact, in the given model the pass-through is 100%. This in turn holds as 2/3 of an increase in a retailer's own wholesale price is passed through, while in equilibrium the price rises further by 1/3 of the (symmetric) wholesale price increase at the competing outlet.

3.18 For retail prices in markets where the large retailer operates, the insights from the static analysis hold. What is more, for a given reduction of the large retailer's wholesale price, in the long run the small retailers' wholesale price will *increase by more*. Formally, we now have that

$$dw_I > (-dw_L)\left[6t\frac{w_I}{m_I}\right].$$

3.19 As an immediate consequence of this, it is then also more likely that both the retail prices at independent outlets and the average retail price increase. Summing up, taking on board the long-run effects of the exercise of buyer power, we generally have that the conditions derived in the previous Section present *lower bounds* for when and to what extent the exercise of buyer power by large retailers will harm consumers through a waterbed effect on other retailer.

Impact on Non-price Variables

3.20 The waterbed effect, be it in the short- or the long-run, is only one possible channel by which the exercise of buyer power is likely to affect the competitiveness of other, smaller retailers and thereby consumer surplus. In the last Section of this submission we focus on

a second channel, namely the range and quality of goods that is available to smaller retailers and thereby to their customers.

3.21 That the exercise of buyer power can stifle suppliers' incentives to invest and innovate has been repeatedly conjectured in various policy reports. For instance,

(a) the Federal Trade Commission has raised concerns that when facing increasingly powerful buyers, "suppliers respond by under-investing in innovation or production";[24] and

(b) in a report prepared for the European Commission it is suggested that when facing powerful buyers, suppliers may "reduce investment in new products or product improvements, advertising and brand building".[25]

3.22 As suppliers only keep a smaller fraction from future profits if some of their buyers become more powerful, this may indeed reduce their incentives, in particular with respect to the development and introduction of *new* products. Powerful retailers, whose potential to extract a larger share of joint profits led to this underinvestment in the first place, may still end up being better off, both as the direct effect from obtaining lower prices is stronger and as they may have better access to alternative products, in particular in the form of private labels.

3.23 For first-tier branded goods, which strong retailers may ill afford to delist, this effect may play a smaller role than for second-tier brands. In fact, as we argue now, through its impact on these second-tier manufacturers the exercise of buyer power seems likely to have a potentially substantial impact on smaller retailers and consumers as a whole.

3.24 For this argument, we shift the focus to the role of private labels. Such a focus on private labels is warranted given the rather exceptional role (by international standards) that private labels play in the UK.

3.25 It should first be noted more generally that the presence of private labels can substantially enhance a retailer's bargaining position. By offering private labels next to other manufacturers' goods in a given category, a retailer enters into direct competition with its suppliers. In addition, stocking private labels makes shelf space scarcer. From a bargaining perspective, it may thus be profitable for a large retailer to develop private labels not primarily to realize additional efficiency gains but so as to enhance its

[24] FTC, 2001, Report on the Federal Trade Commission Workshop on Slotting Allowances and Other Marketing Practices in the Grocery Industry, Report by the Federal Trade Commission Staff, Washington, D.C. (p. 57).
[25] European Commission, 1999, Buyer power and its impact on competition in the food retail distribution sector of the European Union. DG IV. Brussels (p.4).

bargaining position, in particular vis-a-vis strong (top-tier) branded goods.[26] To achieve this goal, namely to enhance its bargaining position, large retailers may thus end up delisting weaker brands and stocking instead private label goods.

3.26 To the extent that the access to a large share of the national market is essential for a mass marketer to build up brand image and to achieve sufficient scale for promotional campaigns, e.g., by television ads, the delisting by large retailers may undermine the profitability of second-tier brands. As they reign back their investments, both in new products and brand image, this should have a marked impact on smaller retailers.

3.27 First, as these retailers do not substitute second-tier manufacturers with private labels, the quality and range of second-tier brands that is on their shelves will deteriorate. This should have an immediate negative impact on consumer surplus. Second, to the extent that these brands no longer exert competitive pressure on first-tier brands, this increases the bargaining and thus the pricing power of first-tier manufacturers vis-a-vis smaller retailers. The resulting increase in the purchasing price and thus ultimately also the final price of first-tier brands should have an additional negative impact on consumer surplus.[27]

3.28 Overall, as large retailers try to enhance their bargaining power by making increasingly use of private labels to substitute for second-tier brands, this should make it increasingly less profitable to develop and maintain such brands on the national market. Smaller retailers that tend to rely on these brands will end up having access only to goods of inferior quality and may pay more for the first-tier brands. In the end, we should thus expect consumer surplus to decrease.[28]

3.29 Even absent private labels, large retailers may have a tendency to reduce the overall range of products, compared to a group of smaller retailers that controls the same total number of outlets. Other than to save on costs in procurement and distribution, this may well be for strategic reasons. By having suppliers bid for the business to supply to all outlets, even though local preferences or income would call for a more flexible choice of product mix at different outlets, a large retailer can stimulate more intense competition amongst suppliers and thus extract a larger share of joint profits. In anticipation of this,

---

[26] In fact, for the US there is evidence that in the presence of strong national brands private labels are indeed positioned closer to these brands, possibly in an attempt to shore up bargaining power (e.g., Scott-Morton, F., and Zettelmeyer, F., 2000, The strategic positioning of store brands in retailer-manufacturer bargaining; Sayman, S., Hoch, S.J., and Raju, J.S., 2002, Positioning of store brands, Marketing Science 21, 378-97.

[27] It could be argued that smaller retailers would optimally (re-)organize so as to produce own private-label goods. Unless the group's headquarters takes over a large share of all central functions, however, diverging interests may, among other factors, make this a less than perfect substitute. Moreover, if in the end all retailers or retailing groups offer their own labels, this may reduce transparency by making price comparisons much harder than under intrabrand competition, which should tend to push up retail prices.

[28] We omit a formalization of these arguments, which is relatively straightforward. To see this, note that to enhance the retailer's bargaining power in the benchmark case a private label is introduced merely as an (identical) substitute to a second-tier brand. As national marketing will thus become less profitable, second-tier manufacturers will invest less in keeping their brand image and, consequently, will also invest less in sustaining a high quality and attractiveness of their products.

suppliers may also end up developing and marketing their products so as to cater more for "average" preferences. To the extent that smaller retailers purchase from the same suppliers, this may lead to a reduction in variety on their shelves without yielding for them the associated benefits of lower purchasing prices.[29]

[29] This has been formally derived in Inderst, R. and Shaffer, G., 2004, Retail mergers, buyer power, and product variety, forthcoming Economic Journal.

APPENDIX 1: DETAILED MODELLING AND NUMERICAL EXAMPLE

The Appendix is organized as follows. Part A1 derives the formal calculations for the static analysis. Part A2 then provides a numerical example. Part A3 contains the formal material for the dynamic analysis.

A.1 Static Analysis

A1.1 We first add more results to the case where two independent outlets compete in a given market. Holding $w(B_n)$ fixed, for a single-outlet retailer A_n the prevailing wholesale price $w(A_n)$ is determined from the requirement that $\Pi(A_n) = \Omega(A_n)$, i.e., that

$$\frac{1}{2t}\left[t + \frac{w(B_n) - w(A_n)}{3}\right]^2 = \frac{1}{2t}\left[t + \frac{w(B_n) - k}{3}\right]^2 - F.$$

A1.2 Note now that, in contrast to the case in the main text, we have specified that the new source of supply allows procurement at constant marginal prices of k. If we simplify the analysis and also assume that the incumbent supplier produces at the same marginal costs k, then both $w(B_n)$-k and $w(A_n)$-k are the incumbent supplier's margins. It is convenient to solve in some of our analysis for these margins instead of the wholesale price. We thus denote them by $M(B_n)= w(B_n)$-k and $M(A_n)= w(A_n)$-k, respectively,

A1.3 We obtain from $\Pi(A_n) = \Omega(A_n)$ that $M(A_n)$ must be equal to

$$M(A_n) = (3t + M(B_n)) - \sqrt{(3t + M(B_n))^2 - 18Ft}.$$

A1.4 Hence, we have also that

$$w(A_n) = k + (3t + w(B_n)) - \sqrt{(3t + w(B_n))^2 - 18Ft}.$$

A1.5 Intuitively, irrespective of $w(B_n)$ we have that $w(A_n)$ is strictly increasing in F and that for F=0 it must hold that $w(A_n)$=0, i.e., that the incumbent supplier has no pricing power as the retailer can switch at ease to an equally attractive alternative supply option.

A1.6 If also the other competing outlet, B_n, is operated by a single-outlet retailer, then for $w(B_n)$ we obtain a symmetric condition. Solving out, we obtain for this special case the symmetric wholesale prices

$$w(A_n) = w(B_n) = k + 3t\left[\sqrt{1 + 2F/t} - 1\right]$$

A1.7 This reveals, in particular, that wholesale prices are strictly lower the lower F, as already noted above, but also the lower the measure of horizontal differentiation, t. Both results confirm the intuitive appeal of the chosen modelling framework.

A1.8 Also, note that

$$\frac{\partial M(A_n)}{\partial M(B_n)} = -\frac{M(A_n)}{3t + M(B_n) - M(A_n)} < 0,$$
$$\frac{\partial w(A_n)}{\partial w(B_n)} = -\frac{w(A_n) - k}{3t + w(B_n) - w(A_n)} < 0.$$

A1.9 We add next more formal results to the analysis where a large retailer faces small, independent retailers. Generally, total (equilibrium) profits of the large retailer are then just the sum of per-outlet profits over all its outlets, or

$$\Pi_L = \sum_{n \in N_L} \Pi(A_n) = \sum_{n \in N_L} \left[\frac{1}{2t} \left[t + \frac{w(B_n) - w(A_n)}{3} \right]^2 \right].$$

A1.10 Likewise, when rejecting the supplier's offer, the outside option of the large retailer is given by

$$\Omega_L = \sum_{n \in N_L} \Omega(A_n) = \sum_{n \in N_L} \left[\frac{1}{2t} \left[t + \frac{w(B_n) - k}{3} \right]^2 \right] - F.$$

A1.11 Again, the prevailing purchase price w_L is chosen to make the retailer just indifferent with $\Pi_L = \Omega_L$. In particular, if all these outlets B_n can be treated symmetrically, this becomes

$$\frac{1}{2t} \left[t + \frac{w(B) - w_L}{3} \right]^2 = \frac{1}{2t} \left[t + \frac{w(B) - k}{3} \right]^2 - \frac{F}{n_L}.$$

A1.12 From these observations, the equilibrium on the wholesale market is then characterized by the following two equations:

$$2M_I M_L + 6tM_I - (M_I)^2 = 18tF,$$
$$2M_I M_L + 6tM_L - (M_L)^2 = 18tF / n_L.$$

A1.13 It can be shown that, at least for all F not too large, this system has a unique solution with $w_L < w_I$. A comparative analysis in the underlying parameters, F, t and n_L, can then be carried out simply by implicit differentiation of this system. In this way, one can confirm the assertions made in the main text. For an example, note that after total differentiation we have that

$$\begin{pmatrix} 2M_L + 6t - 2M_I & 2M_I \\ 2M_L & 2M_I + 6t - 2M_L \end{pmatrix} \begin{pmatrix} dM_I \\ dM_L \end{pmatrix} = 18t \begin{pmatrix} 1 \\ 1/n_L \end{pmatrix} dF.$$

A1.14 For not too large F, the determinant of this system, which we denote by D, is surely strictly positive such that we have next

$$\frac{d(M_I - M_L)}{dF} = \frac{d(w_I - w_L)}{dF} = \frac{n_L(2M_I + 6t) - (2M_L + 6t)}{Dn_L} > 0.$$

A1.15 This confirms that the relative discount increases if there is more scope for volume discounts given that the incumbent supplier is sufficiently differentiated, here via F, with respect to potential alternative sources of supply.

A1.16 Next, the size of the waterbed effect is obtained by implicitly differentiating the equation for w_I with respect to w_L. This gives

$$\frac{\partial M_I}{\partial M_L} = -\frac{M_I}{3t - (M_I - M_L)} = -\frac{1}{6t}\frac{M_I}{m_I},$$
$$\frac{\partial w_I}{\partial w_L} = -\frac{w_I - k}{3t - (w_I - w_L)} = -\frac{1}{6t}\frac{w_I - k}{m_I}.$$

A1.17 Note now, for instance, that from $\frac{d(w_I - w_L)}{dF}$>0 we have that also $\frac{dm_I}{dF}$<0 such that, together with $\frac{dw_I}{dF}$>0, the absolute value of $\frac{\partial w_I}{\partial w_L}$, which captures the strength of the waterbed effect, is strictly increasing in F. In this sense, we can indeed say that the larger the scope for discounts and thus the larger the resulting difference in retail prices and market shares, the more impact will a further discount have through the waterbed effect.

A1.18 For the impact on the retail price of the small, independent outlets, we use that in the Hotelling model

$$\frac{dp_I}{dw_L} = \frac{\partial p_I}{\partial w_L} + \frac{\partial p_I}{\partial w_I}\frac{\partial w_I}{\partial w_L} = \frac{1}{3}\left[1 + 2\frac{\partial w_I}{\partial w_L}\right].$$

A1.19 Hence, the retail price at the small retailer's outlet *increases* if $\frac{\partial w_I}{\partial w_L} < -\frac{1}{2}$, which transforms to the condition that

$$m_I < \frac{1}{3t} M_I.$$

A1.20 Again, an immediate observation is that this condition is more easily satisfied the higher F, which both lowers m_I and raises M_I (and thus also w_I.)

A1.21 To calculate the impact on the average retail price, we have that

$$\begin{aligned}&\frac{dp_{Average}}{dw_L}\\&= m_L \frac{dp_L}{dw_L} + m_I \frac{dp_I}{dw_L}\\&= m_L \frac{1}{3}\left[2 + \frac{\partial w_I}{\partial w_L}\right] + m_I \frac{1}{3}\left[1 + 2\frac{\partial w_I}{\partial w_L}\right].\end{aligned}$$

A1.22 From this we have that a discount to the large retailer increases the average retail price, if $\frac{\partial w_I}{\partial w_L} < -\frac{2-m_I}{1+m_I}$, which becomes

$$m_I \frac{2-m_I}{1+m_I} < \frac{1}{6t} M_I.$$

A1.23 The left-hand side of this condition is strictly increasing in m_I over all $m_I \leq 1/2$, implying again that also this condition is more easily satisfied if the market share of the small retailer is already low. (Again, note also that, say, a higher F will tend to both increase the right-hand side and, by increasing the difference in wholesale and thus also retail prices, decrease the left-hand side.)

A1.24 Finally, we calculate the impact on total consumer surplus, including the direct (shoe-leather) costs from their shopping trips. For this, note first that for given market shares total "shoe-leather" costs are

$$SC = t\left[\int_0^{m_I} x dx + \int_{m_I}^1 (1-x) dx\right] = \frac{t}{2}\left[2(m_I)^2 + 1 - 2m_I\right].$$

A1.25 We thus have for $m_I < 1/2$ that

$$\frac{dSC}{dw_L} = \left[\frac{m_I - 1/2}{3}\right]\left[1 - \frac{\partial w_I}{\partial w_L}\right] < 0,$$

A1.26 which implies that SC strictly increases as the large retailer's purchasing price further decreases.

A.2 Numerical Example

A1.27 For a numerical example, we make the following specifications. First, we specify that the large retailer originally controls twice the number of outlets of a small retailer. For instance, we could simply imagine that small retailers procure through a buyer group. For simplicity, we specify that the small retailer operates "one" outlet and the large retailer originally "two" outlets. We then suppose that the large retailer simply doubles again, to "four" outlets. While being convenient, all that is important for the analysis is the relative size of the different retailers.[30]

A1.28 We set t=0.7 and F=0.2, while choosing marginal costs k=7 for the supplier. We should note that, generally, the absolute values of these variables have no particular meaning as we can scale all expressions with any given factor. Consequently, we will report, in particular, ratios and percentages in what follows.[31]

A1.29 If the large retailer originally operates "two" outlets, i.e., twice as much as the compared small retailer, then we obtain the respective wholesale prices $w_I \approx 8.43$ and $w_L \approx 7.38$. Hence, the large retailer obtains a discount of 12.4%. The respective retail prices are $p_I \approx 8.78$ and $p_L \approx 8.43$. The margins of the two retailers are then 12.4% and 4% , respectively. As the large retailer grows, we find that the discount of the large retailer increases from 12.4% to 26.4%. Precisely, the wholesale price of the large retailer decreases to 7.15, while that of the small retailer increases to 9.04. The large retailer's margin is now 14.3%, while that of the small retailer is down to below 1%. Finally, the average retail price is strictly higher after the further expansion of the large retailer, though only marginally so as this averages both the price decrease at the large retailer and the price increase at the small retailer. (Precisely, the average price increases by slightly less than 1% from 8.5156 to 8.5161.)

A1.30 We next state the general expressions that were used in these calculations. We use here that suppliers produce at constant marginal costs k, while retailers' own marginal operating costs are given by c. With these specifications, we obtain the equilibrium prices

$$p_L = t + c + k + \frac{2M_L + M_I}{3},\ p_I = t + c + k + \frac{2M_I + M_L}{3}.$$

A1.31 Note next that the market shares are given by

$$m_L = \frac{1}{2} + \frac{1}{2t}[p_I - p_L],\ m_I = \frac{1}{2} + \frac{1}{2t}[p_L - p_I],$$

[30] In fact, for a very small percentage growth we are basically back to the marginal analysis that we conducted so far, using how a small change dw_L affects dw_I and thereby retail prices.

[31] The parameters in the example were chosen to "calibrate" the resulting retail margins and discounts. Of course, the example should not suggest that the net effect on average retail prices is always to the detriment of consumers.

A1.32 and thus

$$m_L = \frac{1}{2} + \frac{1}{6t}[M_I - M_L], m_I = \frac{1}{2} + \frac{1}{6t}[M_L - M_I].$$

A1.33 This allows to calculate the average retail price

$$p_{Average} = m_L p_L + m_I p_I.$$

A1.34 In our calculations, the absolute values of prices are not informative as they are arbitrary to a scaling factor. Hence, using ratios is more informative. We obtain for the margins of both retailers

$$r_L = \frac{p_L - (c + w_L)}{p_L}, r_I = \frac{p_I - (c + w_I)}{p_I},$$

A1.35 which becomes

$$r_L = \frac{t + \frac{M_I - M_L}{3}}{t + \frac{M_I + 2M_L}{3} + c + k}, r_I = \frac{t + \frac{M_L - M_I}{3}}{t + \frac{M_L + 2M_I}{3} + c + k}.$$

A1.36 We also denote the percentage discount by

$$Dis = \frac{w_I - w_L}{w_I} = \frac{M_I - M_L}{M_I + k}.$$

A1.37 With these formulas at hand, we can calculate all values for the example after having solved for M_L and M_I.

A.3 Dynamic Analysis

A1.38 We are now more specific at some points in order to close the formal analysis of the extended model. We are first more specific about how wholesale prices are determined. This is most immediate for w_{II}. For given F, we can still apply from our previous analysis the result that

$$w_{II} = k + 3t\left\lfloor\sqrt{1 + 2F/t} - 1\right\rfloor.$$

A1.39 Likewise, for all other independent retailers it must hold that

$$2M_{IL}M_L + 6tM_{IL} - (M_{IL})^2 = 18tF.$$

A1.40 For the final equation, which derives from the condition that the large retailer does not take up its outside option, recall that we specified that all suppliers are symmetric. Then, w_L must now leave the large retailer indifferent between continuing to procure from these suppliers or, instead, taking its whole business elsewhere at the costs of F. We thus obtain again the requirement that[32]

$$2M_L M_{IL} + 6tM_L - (M_L)^2 = 18tF / n_L.$$

A1.41 Holding all else constant, the average supplier profit reduces by

$$d_L[w_{II} - (m_{IL}w_{IL} + m_L w_L)],$$

A1.42 where d_L is the number of outlets that the large retailer newly acquires. That this is indeed strictly negative follows immediately from the fact that under the supplier's problem to optimally choose its wholesale prices the participation constraints for both retailers bind.[33] Consequently, if profits would rise and not fall (as they actually do), then the supplier could clearly have profitably offered the same pair of wholesale prices, namely w_{IL} and w_L beforehand, instead of w_{II} to both retailers in a given market. In addition, holding now M and thus also w_{II} constant, in all markets where the large retailer already operated the respective supplier's total profits, $w_{IL} + w_L$, further decrease. We thus have indeed that π_S is strictly increasing in n_L and thus f_L.

A1.43 On the other side, π_S is decreasing in M given that this both lowers F and thus all wholesale prices and reduces the share of each supplier's business. Together with the previous arguments we have thus established that a higher f_L leads to a strictly lower M. Formally, this is established by implicit differentiation of the zero-profit condition that π_S=K, which yields $dM/df_L<0$. (This treats M as a continuous variable, which is allowed by all our definitions.)

A1.44 We analyze next the total effect on wholesale and retail prices. In contrast to the static analysis, is that also wholesale and thus retail prices of outlets in markets where the large

[32] Given constant marginal costs of production, namely zero, it is indeed optimal for the large retailer to take all its purchases elsewhere. It may be noted that this creates a "public good" problem (to prevent switching of the respective buyer) among the various suppliers, which we solve by taking the symmetric solution. Note also that while this form of single-sourcing represents an (off-equilibrium) outside option, which is not taken up in equilibrium, we can think of the existing supply arrangement, where the retailer purchases from different sources, as the, potentially more efficient, long-run arrangement. (Any cost advantages from procuring more locally are, in our model, absorbed by the respective supplier given that suppliers have all contractual power, which is why we need not explicitly extend the model in this direction.)

[33] As noted above, this holds in turn always if F is not too large.

buyer does not compete are now affected. In fact, from our previous equations we have for the respective retail price p_{II} that[34]

$$\frac{dp_{II}}{df_L} = \frac{dw_{II}}{df_L} = \frac{9t}{3t + M_{II}} \frac{dF}{dM} \frac{dM}{df_L} > 0.$$

A1.45 Finally, we show that for those retailers that compete with the large retailer the waterbed is now stronger than in the static setting.

A1.46 Though the exogenous change in our analysis is an increase in the number of outlets operates by the large retailer, take again as given a reduction in w_L. For a marginal change, taking now also into account the simultaneous adjustment of F, we have that

$$\begin{aligned} &\frac{\partial w_{IL}}{\partial w_L} \\ &= -\frac{M_{IL} - 9t(\partial F / \partial w_L)}{M_L + 3t - M_{IL}} \\ &< -\frac{1}{6t} \frac{w_{IL} - k}{m_{IL}}. \end{aligned}$$

[34] It should be noted that the increase in w_{II} affects both competing outlets in the respective markets.