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ABSTRACT

Retail Mergers: Buyer Power and Product Variety

This Paper analyses the impact of retail mergers on product variety. We show that a merging firm may want to enhance its buyer power *vis a vis* suppliers by delisting products and committing to a 'single-sourcing' purchasing strategy. Anticipating this, suppliers will strategically choose to produce less differentiated products, which further reduces product variety. If negotiations are efficient the loss in product variety reduces overall industry profit and, possibly, also consumer welfare. With linear tariffs, however, there may be a countervailing effect as the more powerful retailer passes on lower input prices to final consumers.

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1 Introduction

In the United States and several OECD countries many retail markets have become heavily concentrated.[1] Furthermore, cross-country mergers have produced a number of powerful global retailers such as Wal-Mart. This trend has made policy makers increasingly concerned about its impact not only on downstream competition amongst retailers but also on their suppliers. Various workshops and policy papers commissioned by competition authorities in the United States (e.g., FTC (2001) on slotting allowances and other marketing practices of retailers) and in Europe (e.g., EC (1999) on buyer power and its impact on competition) document the increasing concern with buyer power. In particular, policy makers fear the trend may have negative consequences for upstream product quality as well as for product innovation and variety.[2]

This paper presents a theory to explain why retail mergers increase buyer power and why they may lead to a socially inefficient reduction in product variety. We argue that, following a merger, the consolidated retailer may find it profitable to no longer carry the products of all previous suppliers. By committing to reduce the number of its suppliers (adopting a delisting policy), the consolidated retailer can induce each of its previous suppliers to compete more aggressively for its patronage. This enables it to capture a larger share of industry profit. The drawback is that by delisting suppliers whose products provide a better fit to local preferences in some outlets industry profit is reduced. The trade-off for the retailer, then, is whether to adopt a delisting policy and capture a larger share of a smaller industry profit or be content with capturing a smaller share of a larger industry profit. The former is sometimes more profitable.

According to our theory, a consolidated retailer can obtain better deals from suppliers not only because it threatens to no longer carry their products but because it actually does delist some of the previously stocked goods. This has immediate welfare implications, which sets our paper apart from most of the extant literature on buyer power, where delisting is only an off-equilibrium threat. (The literature is reviewed below.) The loss of variety is further aggravated as suppliers, in anticipation of further consolidation among their buyers, optimally (re-)position their products and, thereby, reduce product differentiation. This makes suppliers better positioned to serve all outlets of a consolidated retailer who has adopted a single-sourcing policy.

The overall reduction in product variety leads to an unambiguous reduction in industry surplus and, potentially, also total welfare if supply contracts are efficiently negotiated. With linear

[1] See, for instance, the OECD (1999) report on buyer power and the FTC (2001) report on slotting allowances.

[2] Some of the major policy issues are discussed in Dobson and Waterson (1999) and Rey (2000).

tariffs, however, there exists an important countereffect. Increased competition for the consolidated retailer's account and less product differentiation reduces the retailer's purchase prices. As some of these savings are passed on to consumers, this reduces the double-marginalisation problem and increases consumer surplus.

The profitability of the delisting strategy, which is at the heart of our analysis, originates from the difference in the supplier base of the merged retailers. If retailers used previously the same suppliers, this strategy has only costs but no benefits. In our model, retailers have different suppliers base as their outlets are located in different regions our countries where consumers differ in preferences.[3] This may make our theory particularly applicable to the analysis of the reasons and consequences of cross-country retail mergers, where standard horizontal merger motives do not apply.[4] Examples of the increasing number of recent cross-country mergers are the takeover of Asda (UK) and Wertkauf (Germany) by Wal-Mart (US), of Spar (Germany) by Intermarche's (France), and of SHG Makro (Netherlands) by Metro AG (Germany).[5]

The joint prediction that consolidated retailers can obtain more favorable terms and may reduce their supplier bases seems to be consistent with available evidence. As we finish this paper, the UK's Competition Commission recommended to block the acquisition of Safeway, the fourth largest grocery retailer in the UK, by any of the top three retailers—Tesco, Sainsbury's, and Asda (Competition Commission (2003)). A key concern hereby was buyer power. Data collected for this report and previously for the detailed study on grocery retailers in 2000 (Competition Commission (2000)) showed that recent consolidations in the UK grocery retail industry may have lead to further deterioration in suppliers' negotiating strength and to more concentration in retailers' supply base.[6]

Policy reports and responses by policy makers in other countries provide additional evidence that consolidated retailers pursue the envisaged strategies. For instance, the French Competition Council actively pursues a policy of imposing fines on retailers that delist (OECD (1999, p. 294)). Also, one of the main remedies in the Carrefour/Promodes merger of 2000 was that contracts

[3]As we argue, however, our theory also applies if suppliers have different locations and transportation costs matter.

[4]More generally, standard horizontal merger motives, i.e., the internalization of cross-price effects, may also have only limited applicability for national mergers as competition authorities usually impose very strict divestiture requirements for retailers operating in overlapping markets.

[5]Industry reports suggest that these consolidated groups increasingly apply global procurement strategies. See, for instance, the references in Competition Commission (2003) on Asda's benefits from Wal-Mart's global procurement strategy.

[6]These acquisitions include that of Asda by Wal-Mart, that of Kwik Save by Sommerfield, and that of Booker by Iceland.

with "dependent" suppliers must not be changed to their disadvantage over three years following the merger.[7] In particular, this excluded unilateral delisting. Furthermore, the policy report OECD (1999) mentions incidences where, following a merger, retailers threatened suppliers with delisting and also carried out these threats.

As a final motivating case, in Belgium, three large breweries (Interbrew, Alken-Maes, and Haacht) control the beverage stocking (soft drinks and other non-alcoholic beverages) decisions of thousands of outlets in the on-premise (hotels, restaurants, and cafes) distribution channel. Each has its own network of outlets. Rather than allow suppliers to negotiate with outlets separately, however, each brewery acts as the 'gatekeeper' to its own network, selling exclusive access in an all-or-nothing manner to whomever gives it the best deal. The European Commission has been concerned that his practice might unfairly favor some suppliers over others and blur to the detriment of consumers any differences in local and regional preferences among outlets in a network.[8]

Our paper contributes, from a theoretical perspective, to the growing literature on buyer power. According to the extant literature, larger retailers can obtain better terms as (i) they can break collusion between suppliers (Stigler (1964), Snyder (1996)), (ii) they negotiate less "on the margin" of concave industry profits (Chipty and Snyder (1999), Horn and Wolinsky (1988), von Ungern-Sternberg (1996), Dobson and Waterson (1997), Inderst and Wey (2003))[9], (iii) they can threaten more credibly to integrate backwards or to sponsor new entry in the upstream industry (Katz (1987), Fumagalli and Motta (2000)), or (iv) they represent a more risky source of profits than several independent buyers (DeGraba (2003)). Interestingly, while these theories predict that the formation of a larger buyer reduces suppliers' profits they also assert that it does not affect buyers' choice of suppliers. This is markedly different in our theory.

One implication of this difference is that our theory of buyer power has immediate welfare implications. In particular, it offers support to the often expressed view that the exertion of buyer power will lead to lower product variety.[10] (The reduction in product variety is further ag-

[7] Carrefour/Promodes EC/DGIV, 2000, Case No. COMP/M.1648.

[8] Such concerns have lead to the stipulation of a market share threshold in the Vertical Block Exemption rule, which took effect on 1 June 2000 (see Commission Reg. (EC) No 2790/1999).

[9] For experimental results on this see Norman, Ruffle, and Snyder (2003).

[10] The standard argument is that lower profits may induce suppliers to lower quality and R&D expenditures. With the possible exception of new product introduction, incentives for quality improvement and product innovation depend, however, not on absolute profit levels but on their marginal change. Inderst and Wey (2002) show that this observation may often lead to the opposite result, i.e., that incentives for product improvement may actually increase with more concentrated buyers. From this perspective, our argument offers a more robust support for why retail mergers may lead to a socially inefficient reduction in product variety.

gravated as suppliers choose less differentiated products in anticipation of a further consolidation among buyers.) The extant literature has largely ignored the welfare impacts of buyer power. Exceptions are Von Ungern-Sternberg (1996) and Dobson and Waterson (1997), who analyze the welfare trade-off between (further) monopolization of the downstream market and a reduction in the double-marginalisation problem,[11] and Inderst and Wey (2002, 2003), who analyze how the result that large buyers negotiate less "on the margin" affects suppliers' incentives.

The rest of this paper is organized as follows. Section 2 introduces the economy. Section 3 analyses efficient negotiations with separate and merged retailers. Section 4 contains the main results on product variety. Section 5 discusses the case of linear contracts. Section 6 concludes.

2 The Economy

2.1 Products and Markets

There are two suppliers $s \in S = \{A, B\}$, each of which produces a single good, and two retailers $r \in R = \{a, b\}$, each of which owns a single outlet.[12] We assume the two outlets operate in independent markets, in which the respective retailer is a local monopolist. This assumption allows us to abstract from the standard monopolization effects of a downstream merger.

The characteristics of the good of supplier s are fully captured by a real-valued parameter θ^s. (We denote parameters and functions relating to retailers by subscripts, and those relating to suppliers by superscripts.) We assume goods A and B are sufficiently close substitutes that it is not profitable to allocate limited shelf space at a given outlet to both goods. Hence, each outlet stocks at most one good.[13] If a good with characteristics θ is sold at price p, the demand at outlet r equals $D_r(\theta, p)$, which is continuous and almost everywhere continuously differentiable in both parameters. We also assume that $D_r(\theta, p) = 0$ for high values of p. We specify that consumers at outlet a have a relatively higher preference for goods with a lower value of θ than those at outlet b: $dD_a/d\theta < dD_b/d\theta$ whenever $D_r > 0$ for one $r \in R$.

Though our qualitative insights do not depend on this, the exposition of results is heavily

[11] In the case of retail mergers, a further monopolization of the (relevant) final market can often be easily avoided by stipulating the divestment of outlets in overlapping markets. Consequently, when formulating its recommendation on the potential acquisition of Safeway, the Competition Commission's arguments built on coordinated effects across all outlets (Competition Commission (2003)).

[12] The assumption of an exogenous limit to the number of products offered by a single firm is standard. This could be justified by appealing to limited organizational capacities in production, marketing, and distribution. Though an analysis of the case where suppliers can offer a range of products with different characteristics would be interesting, this would also introduce new - and well known - issues such as spatial preemption (and its credibility).

[13] There may also be technological constraints that could make it infeasible or at least very costly to offer two products in the very same category (e.g., in the example of the Belgish breweries).

simplified by assuming that suppliers have symmetric and constant marginal costs c. Denote next by $\Pi_r(\theta) := \max_p D_r(\theta, p)(p - c)$ the maximum feasible profits that can be realized when supplying a good with characteristics θ at outlet r. We assume that $\Pi_r(\theta)$ is strictly quasiconcave (where $\Pi_r(\theta) > 0$) and that $\Pi_r(\theta) > 0$ holds for some θ. There is an interior optimum choice $\widehat{\theta}_r := \arg\max_\theta \Pi_r(\theta)$. By our previous assumption on demands, it follows that $\widehat{\theta}_a < \widehat{\theta}_b$.

The role of θ in local demand $D_r(\theta, p)$ may capture differences in regional preferences. Suppose, for instance, that outlet a is in the north and outlet b is in the south of a country.[14] Likewise, the two outlets may be in different countries, in which case we consider a cross-country merger. Consumers shopping at the two outlets may have overall different tastes. Alternatively, consumers may differ in income and wealth, which creates different preferences for quality.[15] Lastly, our results would also go through if the goods were identical but suppliers were differentiated by the physical location of their factories, with non-negligible costs of transportation.

2.2 Strategies and Choices

We have the following strategic variables: (i) downstream market structure, (ii) product characteristics of both suppliers, and (iii) quantities and prices. We next determine how these variables are chosen.

Consider first market structure. We focus on the possibility of a merger between retailers. In our model, a merger will always be (at least weakly) profitable for retailers. But a merger may not always be possible. For instance, the owners or the management of a retailer may not be prepared to relinquish control. Likewise, an acquisition or a merger may come at prohibitively high transactions costs. What is more relevant for our discussion, however, is that the competition authority may adopt a more or less lenient merger policy for the retail industry. We take the policy of the competition authority as an exogenous variable, which is captured by the probability μ with which a retail merger between A and B will occur. Below we discuss the implications of a shift in the competition policy regime as expressed by a decrease or an increase in μ.

Product characteristics θ^s for supplier $s \in S$ are non-contractible. Hence, supplier s will choose θ^s to maximize its respective profit, taking into account the simultaneous choice of the other supplier and its implications for subsequent negotiations with retailers.

[14] Incidentally, this may fit the potential acquisition of Safeway by Wm Morrison, the only remaining non-financial bidder for Safeway. (See the Introduction.)

[15] Admittedly, we have assumed that θ does not affect costs of production. We could, however, imagine that, holding production costs per sales unit (e.g., package) constant, a higher θ represents a smaller quantity of a good of higher quality. Consumers could then have different preferences along this quantity-quality trade-off. Alternatively, we can allow production costs to depend on θ, making it more costly to produce goods of higher quality.

Negotiations between retailers and suppliers proceed simultaneously as follows. If retailers have merged, the merged retailer can conduct negotiations for each outlet separately, or it can link the two negotiations by committing to a single-sourcing strategy, i.e., announce that only one supplier will get the single account for both outlets. If retailers stay separate, each will negotiate over the supply of only one good.[16] We apply the axiomatic Nash bargaining solution to pin down the distribution of surplus. We postpone details until the next section.

We finally put the choices of market structure, product characteristics, and negotiated contracts and prices in the correct sequential order. We consider the following timing of events:

$t = 1$: Suppliers choose non-cooperatively their respective product characteristics θ^s.

$t = 2$: A merger between retailers occurs with probability μ.

$t = 3$: Retailers choose their purchasing strategy, i.e., whether or not to commit to a single-sourcing policy. (This is only a non-trivial choice for a merged retailer.)

$t = 4$: Retailers and suppliers negotiate under the chosen purchasing strategy.

$t = 5$: Retailers set prices for final consumers, goods are supplied, and payoffs are realized.

3 Negotiations between Retailers and Suppliers

3.1 Negotiations with Separate Retailers

Our choice of bargaining procedure is guided by the following considerations. First, we want contracts to be sufficiently complex to disentangle profit maximization from profit sharing. This ensures that there is no double-marginalization problem. Second, we want to accommodate any distribution of bargaining power between the upstream and downstream firms. Third, as is standard, we want to ensure that the supplier who will not win a given account makes a best effort to do so, i.e., it will provide the respective retailer with the highest possible outside option. (With this specification the outcome of our bargaining model coincides with that of an auction between suppliers if suppliers have all bargaining power in case of negotiations.)

It turns out that the following specification of the bargaining procedure generates these characteristics. Suppose that each (independent) firm has two sales representatives (or account managers), who act independently but in the interest of the respective firm. (There will be no problem of coordination failure.) Negotiations proceed simultaneously, where agents form

[16] One interesting possibility short of a merger is for the retailers to form a buyer group (e.g., networks of hospitals in the U.S. often form group-purchasing organizations to negotiate with otherwise powerful drug suppliers). These groups often offer exclusive-dealing arrangements to suppliers in exchange for lower prices. However, it should be noted that a buyer group is not a perfect substitute for a merger. For instance, in a buyer group, it may be difficult to agree on a single-sourcing strategy because individual retailers may prefer different suppliers.

rational expectations about the outcomes of all other negotiations. Note that only one supplier, say s, can win the account to supply retailer r. The contract agreed with the other supplier serves only as an outside option for negotiations between r and s. Also, our procedure will ensure that efficient quantities are chosen both on and off the equilibrium path. We specify that retailer r and supplier s negotiate over a menu of prices $T_r^s(x)$, from which r is subsequently free to pick any quantity. The menu $T_r^s(x)$ truthfully reflects the supplier's costs, which pins down its slope: $dT_r^s(x)/dx = c$.[17] The level of $T_r^s(x)$ is next determined by the specification that the supplier can extract the fraction $\beta \in [0, 1]$ of the realized net surplus. Note that if s will not win the account in equilibrium (which will occur if r prefers the contract agreed with the other supplier), the net surplus with s is clearly zero and $T_r^s(x) = cx$ holds for all x.[18]

Note that for small β, the retailer has more bargaining power. For large β, the supplier has more bargaining power. Our assumption of a fixed division of realized net surplus admits several interpretations. If the suppliers can make take-it-or-leave-it offers to the retailer, then $\beta = 1$. If the retailer can make take-it-or-leave-it offers to the suppliers, then $\beta = 0$. If the two firms divide the gains from trade equally, as in symmetric Nash bargaining, then $\beta = 1/2$.[19]

Our assumption that negotiations are efficient rules out the well-known problem of double-marginalisation and, thereby, ensures that the subsequently chosen quantity will maximize total industry profit. A problem of double-marginalisation would arise, however, if contracts could not be made sufficiently complex. In Section 5 we discuss the alternative case of linear contracts where the only source of profits for a supplier is a (constant) mark-up above its marginal cost c.

Without loss of generality, let $\theta^B \geq \theta^A$. For what follows, it will be sufficient to focus on the case where no good is inferior at both outlets: $\Pi_a(\theta^A) \geq \Pi_a(\theta^B)$ and $\Pi_b(\theta^B) \geq \Pi_b(\theta^A)$. (Recall that product characteristics are chosen optimally.) In case of indifference, we can further assume, without loss of generality, that retailer a chooses good A and retailer b chooses good B.

Consider, for instance, negotiations between retailer a and suppliers A and B. In equilibrium, good A will be supplied. As noted above, this implies that (i) $T_a^B(x) = cx$, i.e., a's outside

[17] The specification of truthful menus has the advantages of (i) implying that the losing supplier is willing to sell at cost and (ii) resolving the possible coordination problem between the two "agents" of a given supplier or retailer. Instead, if negotiations were only over simple forcing contracts, stipulating a single price-quantity pair, simultaneous negotiations would not necessarily lead to the efficient (joint profit maximizing) choice of suppliers at each outlet. However, imposing a refinement that chooses the efficient equilibrium and stipulating that the losing supplier sells at cost would generate the same profits as negotiations over truthful menus.

[18] This depends clearly on the fact that suppliers have linear costs. Otherwise, e.g., with convex costs, we would have to calculate the maximum feasible profits *given* that supplier B already supplies to retailer b in equilibrium. This modification would, however, not affect our arguments.

[19] A non-cooperative game with alternating offers would generate the same outcome (see Binmore, Rubinstein, and Wolinksy (1986)).

option is to procure from B at cost, and (ii) when purchasing from A, a chooses the quantity that maximizes industry profits. Consequently, the *net surplus* realized by purchasing from A is equal to the difference in maximum industry profits $\Pi_a(\theta^A) - \Pi_a(\theta^B)$. Because A receives the fraction β of net surplus, it realizes the profits $\beta[\Pi_a(\theta^A) - \Pi_a(\theta^B)]$. Denoting equilibrium profits of retailers and suppliers by U_r and U^s respectively, we have the following results.

Lemma 1. *If* $\theta^B \geq \theta^A$ *and no good is inferior at both outlets, i.e., if* $\Pi_a(\theta^A) \geq \Pi_a(\theta^B)$ *and* $\Pi_b(\theta^B) \geq \Pi_b(\theta^A)$*, negotiations with separate retailers yield the following profits:*

$$\begin{aligned} U^A &= \beta\left[\Pi_a(\theta^A) - \Pi_a(\theta^B)\right], \\ U^B &= \beta\left[\Pi_b(\theta^B) - \Pi_b(\theta^A)\right], \\ U_a &= (1-\beta)\Pi_a(\theta^A) + \beta\Pi_a(\theta^B), \\ U_b &= (1-\beta)\Pi_b(\theta^B) + \beta\Pi_b(\theta^A). \end{aligned}$$

At each outlet the choice of the supplier and of the supplied quantity maximize industry profits.

For $\theta^A = \theta^B$ products are undifferentiated and the two suppliers earn zero profits. For $\theta^A \neq \theta^B$ and $\beta > 1$, each supplier earns positive profits. If $\beta = 1$ the profit of each supplier is equal to its incremental surplus at the respective retailer. We would obtain the same profits from a game where suppliers post competing take-it-or-leave-it offers (i.e., an auction).[20]

3.2 Negotiations with the Consolidated Retailer

Suppose now the two retailers have merged. We distinguish between two procurement strategies.

Unrestricted procurement

With unrestricted procurement, the retailer can choose the same good at both outlets, or it is possible to choose one good at outlet a and the other good at outlet b. As our negotiation procedure again ensures the efficient choice of a supplier at a given outlet, it is immediate that the outcome of negotiations under unrestricted procurement is identical to that with separate retailers.

Lemma 2. *If retailers merge and follow an unrestricted procurement strategy, the outcome of negotiations are unchanged compared to the case with separate retailers. In particular, the consolidated retailer now realizes the profits*

$$U_{a,b} = (1-\beta)\left(\Pi_a(\theta^A) + \Pi_b(\theta^B)\right) + \beta\left(\Pi_a(\theta^B) + \Pi_b(\theta^A)\right).$$

[20] Auctions for menu contracts are also considered in Rey and Stiglitz (1995) and O'Brien and Shaffer (1997).

Single-sourcing strategy

With a strategy of single-sourcing, the consolidated retailer chooses the same good at both outlets. Commitment to such a strategy could be made credible by, for instance, implementing changes in the distribution system that would make it very costly or even impossible to deal with more than a limited number of goods. Alternatively, top management's decision to "prune" the supplier base would make the threat of delisting credible at the level of individual product categories.

A single-sourcing strategy has both advantages and disadvantages. If goods are differentiated, single sourcing leads to a loss of variety, thereby reducing total industry profits. But for the consolidated retailer, this loss can, in some cases, be more than compensated by an increase its share of profits. This trade-off is explored next.

Under single-sourcing, each supplier negotiates over a single contract $T^s(x)$ to supply both outlets. Under our bargaining procedure, the retailer will purchase from the supplier with which total industry profits are higher, i.e., with the supplier $s \in S$ maximizing $\Pi_a(\theta^s) + \Pi_b(\theta^s)$. Suppose this is supplier A. Then the retailer's outside option is to procure for both outlets from supplier B at cost. Consequently, the successful supplier A can only extract the fraction β of the difference between $\Pi_a(\theta^A) + \Pi_b(\theta^A)$ and $\Pi_a(\theta^B) + \Pi_b(\theta^B)$. We thus have the following result.

Lemma 3. *Suppose the consolidated retailer follows a single-sourcing strategy. Then the choice of the single supplier and of the supplied quantity maximize industry profits. If* $\Pi_a(\theta^A) + \Pi_b(\theta^A) \geq \Pi_a(\theta^B) + \Pi_b(\theta^B)$ *then supplier* A *is chosen and profits are given by:*

$$\begin{aligned} U^A &= \beta \left[\left(\Pi_a(\theta^A) + \Pi_b(\theta^A) \right) - \left(\Pi_a(\theta^B) + \Pi_b(\theta^B) \right) \right], \\ U^B &= 0, \\ U_{a,b} &= (1-\beta) \left[\Pi_a(\theta^A) + \Pi_b(\theta^A) \right] + \beta \left[\Pi_a(\theta^B) + \Pi_b(\theta^B) \right]. \end{aligned}$$

The case where supplier B *is chosen is symmetric.*

If both goods are equally attractive under a single-sourcing strategy, both suppliers realize zero profits. If one supplier has an advantage to supply to both outlets, it obtains the fraction β of the respective incremental contribution.

Comparing Lemmas 2 and 3, we obtain the following key result.

Proposition 1. *Suppose* $\theta^A \neq \theta^B$. *Then the consolidated retailer is strictly better off under single-sourcing if and only if* $\beta > 1/2$, *i.e., if suppliers' negotiating strength is sufficiently high.*

The intuition for Proposition 1 is straightforward. There are two opposing effects. On the one hand, single sourcing reduces total industry profits if $\theta^A \neq \theta^B$. On the other hand, single-sourcing makes suppliers less differentiated at the *level of the consolidated retailer,* i.e., single sourcing reduces the incremental contribution of the chosen supplier(s). This allows the retailer to extract a larger share of industry profits. To see this most clearly, take the case where both suppliers are equally well positioned to win the consolidated account, i.e., $\Pi_a(\theta^A) + \Pi_b(\theta^A)$ is equal to $\Pi_a(\theta^B) + \Pi_b(\theta^B)$. In this case, single-sourcing fully erodes differentiation among suppliers, while if $\theta^A \neq \theta^B$ they are still differentiated at the level of individual outlets and could thus extract profits from separate retailers.[21] If suppliers can extract more than half of their incremental contribution, this benefit more than compensates for the reduction in industry profit, making a single-sourcing strategy optimal for the consolidated retailer.

What is key in making single-sourcing profitable for the merged retailer is the difference in their supplier base before the merger. It is easy to see that if both retailers chose the same supplier, i.e., either A or B, before a merger, a merger would not be profitable and it would also not lead to a change in the goods carried at both outlets. That the two outlets carry different goods before the merger is due to both the differentiation of suppliers' goods and, in particular, the differences in consumer preferences at the two outlets. As noted above, this may capture variations in consumer tastes across regions or countries. Retail mergers across national borders may thus be particularly profitable as it leads to global procurement strategies that can make suppliers compete more aggressively for the consolidated account.

To formally capture the role of differentiation for the profitability of a merger and a single-sourcing policy, consider the case where $\beta > 1/2$ and where suppliers' characteristics are constrained to the range $\widehat{\theta}_a \leq \theta^A < \theta^B \leq \widehat{\theta}_b$.[22] Using previous results, the profits from a single-sourcing strategy are equal to $(2\beta - 1)\left[\Pi_b(\theta^B) - \Pi_b(\theta^A)\right]$. Given quasiconcavity of industry profits in θ, the difference in profits is increasing in θ^B and decreasing in θ^A. We thus have the following result.

Corollary 1. *For $\beta > 1/2$ and if $\widehat{\theta}_a \leq \theta^A < \theta^B \leq \widehat{\theta}_b$, the benefits from a single-sourcing strategy are increasing in the differentiation of suppliers' products. I.e., benefits increase in θ^A*

[21] This effect has been recognized in the literature on optimal bundling by a monopolist. See the seminal papers by Adams and Yellen (1976), Palfrey (1983), and McAfee, McMillan, and Whinston (1989). However, to our knowledge, its potential implications for downstream mergers and the subsequently optimal procurement strategy have not been recognized. In the procurement literature, the strand of literature closest to ours is that of split-award contracts. There, the focus of optimal lot design is, however, different. For instance, split-award contracts can limit suppliers' informational rents (e.g., Riordan and Sappington (1989)), they can attract more competition (e.g., Perry and Sakovics (2001)), and they can lead to more efficient production (e.g., Anton and Yao (1989)).

[22] We show below that in equilibrium characteristics are always in this range.

and decrease in θ^B.

Note finally that both suppliers are worse off under a single-sourcing policy. (This holds, of course, only if $U^s > 0$ is satisfied with separate retailers for both $s \in S$.) This is immediate for the supplier whose good is no longer stocked. Using the expressions in Lemmas 1-3, we see that the profits of the chosen supplier are also reduced. In the case of supplier A, its profits are reduced by the amount $\beta[\Pi_b(\theta^B) - \Pi_b(\theta^A)] > 0$. Hence, A's loss from a single-sourcing strategy are increasing in product differentiation, which also follows already from Corollary 1.

In what follows, we will restrict attention to the case of $\beta > 1/2$. In this case, Proposition 1 implies that a merger will lead to a single-sourcing policy and the delisting of one good. For $\beta < 1/2$, a merger has no impact on profits, implying that μ, the probability of a retail merger occurring, would have no impact on the choice of product varieties and their availability.

4 Product Variety and Welfare

4.1 Product Differentiation and Product Availability

Recall now the sequence of moves introduced in Section 2. At the very first stage, $t = 0$, suppliers simultaneously choose the characteristics of their products. In doing so, they take into account the probability μ with which subsequently a merger between retailers will occur.

Take first the case where $\mu = 0$. Then, in any pure strategy equilibrium of the game in $t = 0$ one of the suppliers will choose $\widehat{\theta}_a$ and the other $\widehat{\theta}_b$, i.e., the product characteristics that maximize industry profits at the respective retailers a and b. Now suppose that $\mu > 0$. In this case, in any pure strategy equilibrium of the game in $t = 0$, the supplier that will subsequently win the consolidated account under single-sourcing will optimally choose its product's characteristics to cater to more "average preferences". (Existence of an equilibrium in pure strategies is shown in the proof of Proposition 2 below.)

Suppose supplier A would win the account under single sourcing. Then, from Lemmas 1-3, A's expected payoff is

$$\begin{aligned} U^A &= \mu\beta\left[\left(\Pi_a(\theta^A) + \Pi_b(\theta^A)\right) - \left(\Pi_a(\theta^B) + \Pi_b(\theta^B)\right)\right] \\ &\quad +(1-\mu)\beta\left[\Pi_a(\theta^A) - \Pi_a(\theta^B)\right]. \end{aligned} \tag{1}$$

The payoff of supplier B, who is delisted after a merger, is

$$U^B = (1-\mu)\beta\left[\Pi_b(\theta^B) - \Pi_b(\theta^A)\right].$$

In a pure-strategy equilibrium the unique optimal choice of supplier B is thus independent of μ and equal to $\widehat{\theta}_b$. The choice of supplier A maximizes (1). We have the following result.

Proposition 2. *The stage game at $t = 1$, where suppliers choose product characteristics, has an equilibrium in pure strategies. We can distinguish between the following cases.*
i) $\mu < 1$: In any pure-strategy equilibrium one supplier, say supplier B, chooses the same product characteristics $\widehat{\theta}_b$ regardless of the likelihood of a retail merger . In contrast, the other supplier, say supplier$A$, chooses $\widehat{\theta}_a$ only if $\mu = 0$. For all $\mu > 0$, θ^A is strictly increasing in μ and *$\theta^A > \widehat{\theta}_a$. Hence, goods become less differentiated the higher the likelihood of a retail merger.*
ii) $\mu = 1$: In any pure-strategy equilibrium a supplier who is subsequently chosen with positive probability chooses the unique value θ^s that maximizes $\Pi_a(\theta^s) + \Pi_b(\theta^s)$.

Proof. See Appendix.

Suppose again that only the product of supplier A is carried in case of single-sourcing. As μ increases, it becomes optimal for supplier A to choose a less differentiated product variant, which caters more to "average preferences" instead of only to those of consumers who shop at outlet a. While this repositioning of A's product increases industry profits *conditional* on there being a merger, an increase in the *ex ante* likelihood of a merger, μ, unambiguously reduces expected industry profits. If no merger occurs, supplier A will have chosen a suboptimal variety for outlet a. And if a merger does occur, delisting good B will further reduce the available product variety.

Corollary 2. *Total expected industry profits are strictly decreasing in μ.*

Proof. Total expected industry profits if supplier A is chosen under single-sourcing are

$$\mu \left[\Pi_a(\theta^A) + \Pi_b(\theta^A)\right] + (1-\mu)\left[\Pi_a(\theta^A) + \Pi_b(\theta^B)\right]. \tag{2}$$

Differentiating (2) with respect to μ and recognizing that θ^A satisfies the first-order condition for (1) yields $\Pi_b(\theta^A) - \Pi_b(\theta^B)$. Since $\theta^A < \theta^B$ and $\theta^B = \widehat{\theta}^B$, strict quasiconcavity of $\Pi_b(\theta)$ implies that the derivative is strictly negative. The case where supplier B is chosen is symmetric. **Q.E.D.**

Without further assumptions on consumer preferences and local demand, we can not make any claims on how consumer surplus and total welfare change in μ. This is a well-known problem in the analysis of product differentiation and quality choice. However, one case that does allow clear predictions is the case where we can write inverse demand $P_r(\theta, x)$ in the additive form

$$P_r(\theta, x) = \max\{p_r(x) + \psi_r(\theta), 0\} \tag{3}$$

and where the function $P_r(\theta, x)$ is generated by the preferences of a representative consumer. Assuming additionally that revenues are strictly quasiconcave (where they are positive), it is easily established that the sign of $\frac{d\Pi_r(\theta)}{d\theta}$ depends only on the sign of $\frac{d\psi_r(\theta)}{d\theta}$. Moreover, total welfare is increasing whenever $\frac{d\psi_r(\theta)}{d\theta} > 0$ and decreasing whenever $\frac{d\psi_r(\theta)}{d\theta} < 0$.

Condition (3) is satisfied in the example of Section 4.2 below where we use linear demand. If the condition holds, we have the following result.

Corollary 3. *If the inverse demand is of the additive form in (3) and captures the preferences of a representative consumer, then (expected) welfare is also strictly decreasing in μ.*

Proof. Since revenues are strictly quasiconcave and since $D_r = 0$ for high p, we obtain at each outlet r a unique optimal quantity $x_r^*(\theta)$. The envelope theorem then implies that $\frac{d\Pi_r(\theta)}{d\theta} = x_r^*(\theta)\frac{d\psi_r(\theta)}{d\theta}$. Moreover, implicit differentiation of the first-order condition for $x_r^*(\theta)$ shows that the sign of $\frac{dx_r^*(\theta)}{d\theta}$ is determined by the sign of $\frac{d\psi_r(\theta)}{d\theta}$. Total welfare at outlet r is $W_r = \int_0^{x_r^*(\theta)}[p_r(x)+\psi_r(\theta)]dx - cx^*(\theta)$. Differentiating this with respect to θ, we obtain $\frac{dW_r}{d\theta} = \frac{\partial W_r}{\partial \theta} + \frac{\partial W_r}{\partial x}\frac{dx_r^*(\theta)}{d\theta}$, where the signs of $\frac{\partial W_r}{\partial \theta}$ and $\frac{dx_r^*(\theta)}{d\theta}$ are equal to the signs of $\frac{d\psi_r(\theta)}{d\theta}$. Additionally, we have from standard results that $\frac{\partial W_r}{\partial x} > 0$ at $x = x_r^*(\theta)$.[23] Hence, we have established that welfare realized at outlet r changes in the characteristics of the supplied good in the same way as industry profits change. The assertion follows then from Corollary 2. **Q.E.D.**

Recall now our interpretation of μ as a measure of the leniency of merger policy in the retailing industry. In particular, a higher μ corresponds to a greater likelihood of a retail merger, and thus to a more lenient merger policy. This may reduce welfare. By Corollary 3, we see that when demand is of the additive form in (3), a retail merger - and, what is more, the expectation of it - will unambiguously reduce welfare. This result follows despite the absence of standard monopolization effects in our model (recall that the separate retailers are local monopolists). The adverse effects on welfare from a more lenient merger policy arise solely from the reduction in product variety that occurs ex-post when a consolidated retailer adopts a single-sourcing strategy, and the reduction in product variety that occurs ex-ante when suppliers choose their product characteristics while anticipating the possibility of a downstream merger. As we show below, however, this finding depends crucially on the assumption of efficient contracting, i.e., no double marginalization. With linear pricing, a more lenient merger policy may improve welfare.

[23] Precisely, note first that $\frac{\partial W_r}{\partial x} = P_r(\theta, x) - c$, while the first-order condition for profit maximization gives $\frac{d\Pi_r}{dx} = P_r(\theta, x) - c + x\frac{dP(\theta,x)}{dx}$. The claim follows as $P(\theta, x)$ is strictly decreasing whenever $P(\theta, x) > 0$.

4.2 Example 1

In what follows, we provide a simple example with linear demand to illustrate the model and results. In Section 5 we will again turn to this example and show how the results can change fundamentally when suppliers and retailers can only negotiate over linear contracts.

Consider the linear-demand function $D = 1 - d - p$. If a retailer faces a constant per-unit purchase price $c < 1 - d$ it optimally chooses the retail price $p = (1 + c - d)/2$. This generates the quantity $x = (1 - d - c)/2$, the industry profit $\Pi = (1 - d - c)^2/4$, and the welfare $W = 3(1 - d - c)^2/8$.[24] For $r = a$ we set $d = \theta^2/z$ to obtain $D_a(\theta, p) = 1 - p - \theta^2/z$, while for $r = b$ we set $d = (1 - \theta)^2/z$ to obtain $D_b(\theta, p) = 1 - p - (1 - \theta)^2/z$, where $z > 0$. Consequently, the product characteristics $\widehat{\theta}_a = 0$ and $\widehat{\theta}_b = 1$ maximize industry profits at the respective outlets.

The case where suppliers can choose any value for θ has no closed-form solution if $\mu > 0$. Therefore, without losing much insight, we confine ourselves in this example to the case where θ can only be chosen from a finite set. Precisely, we allow for three values $\theta \in \Theta = \left\{\widehat{\theta}_a, \theta^*, \widehat{\theta}_b\right\}$, where $0 < \theta^* < 0.5$. Moreover, we choose the following parameters: $c = 0$, $z = 5$, and $\beta = 1$.

What product characteristics will suppliers choose? From Proposition 2 we have $\theta^B = \widehat{\theta}_b$. Substituting this into expression (1) shows that supplier A strictly prefers θ^* to $\widehat{\theta}_a$ if and only if

$$\frac{(1 - (\theta^*)^2/5)^2}{4} + \mu\frac{(1 - (1 - \theta^*)^2/5)^2}{4} > \frac{1}{4} + \mu\frac{(1 - 1/5)^2}{4},$$

which transforms to the requirement

$$\mu > \theta^* \frac{10 - (\theta^*)^2}{16 - 4\theta^* + (\theta^*)^3 - 4(\theta^*)^2}. \tag{4}$$

The right-hand side of (4) is strictly increasing in θ^*. Intuitively, the larger the difference $\theta^* - \widehat{\theta}_a$ the more likely must a merger be to make θ^* optimal. Below, where we study linear contracts, it will be convenient to specify θ^*. We choose $\theta^* = 0.2$, for which the threshold for μ determined by (4) becomes $\mu > \frac{83}{627} \approx 13.2\%$. That is, the likelihood of a merger must exceed 13.2% to induce supplier A to choose the less differentiated product with characteristics θ^*.

Since the characterization of demand (and inverse demand) satisfies the conditions of Corollary 3, we know that total expected welfare is strictly decreasing in the probability of a merger.

Results for Example 1. *The example leads to the following results:*

i) If $\mu > 13.2\%$, supplier A chooses the less differentiated product variant $\theta^A = \theta^* = 0.2$. Otherwise, supplier A chooses the more differentiated product variant $\theta^A = \widehat{\theta}_a = 0$.

ii) Total expected welfare is strictly decreasing in μ.

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[24] To obtain the last expression we assume that the linear demand is generated by a representative consumer with quadratic utility function. Then we have $W = \int_0^x (1 - d - x)dx - cx$.

5 Linear contracts

So far we have assumed that negotiations are efficient (no double marginalization). It is as if suppliers sell at their (constant) marginal costs and participate in industry profits via a fixed payment. Retail contracts are indeed often complex, including, for instance, volume discounts, slotting fees (to obtain shelf space), pay-to-stay fees (for continuation of stocking), display fees (for special merchandise), and presentation fees (for the privilege of making a sales presentation). Despite this complexity, however, there are indications that marginal purchase prices for retailers are not equal to marginal production costs for suppliers, i.e., there is some degree of double marginalization in the industry. In particular, there seems to be a strong feeling among some competition authorities that increased buyer power is beneficial as reduced purchase prices are partially passed on to consumers. With efficient bargaining this would clearly not be the case.[25]

In what follows, we consider now the opposite extreme to our previous case and assume that negotiations are inefficient. Suppliers extract rents only via a uniform purchase price.

5.1 Analysis

As most of the analysis is analogous to the case with efficient contracting, we are rather brief. We also restrict consideration to the case where suppliers have all the bargaining power ($\beta = 1$) or, likewise, where they compete by making simultaneous take-it-or-leave-it offers.[26]

Separate retailers

Suppose that supplier A wins the contract for retailer a. Then, B offers a the uniform price $m_a^B = c$. To beat B's offer, the uniform price m_a^A that is offered by A must thus ensure that

$$\max_p \; (p - m_a^A) D_a(\theta^A, p) \geq \Pi_a(\theta^B). \tag{5}$$

In words, the maximum profit that retailer a can realize when buying from supplier A must be at least $\Pi_a(\theta^B)$. There are two possible cases. In the first case, the constraint (5) is not binding for A's optimal choice of m_a^A, i.e., even if supplier A were a monopolist, it would optimally offer a sufficiently low price m_a^A such that retailer a's profits would still satisfy (5). Intuitively, this would be the case if goods A and B were sufficiently differentiated and consumers had strong

[25] For an endogenization of non-efficient contracts in retailing, see Iyer and Villas-Boas (2003).

[26] The case with $\beta < 1$ does not yield new insights beyond those obtained already for efficient negotiations. Moreover, we would have to establish that the bargaining set with linear contracts is still concave in order to apply the axiomatic Nash approach. While this holds for our linear example, it may not be satisfied for more general demand functions. (The standard remedy in this case would be to use lotteries over contracts.)

preferences.[27] In what follows, we focus on the more interesting second case where competition by B constrains A's offer. In this case, optimality requires that A chooses m_a^A such that (5) is just binding. As retailer a's profits are strictly decreasing in m_a^A (as long as $D_a > 0$), this yields a unique offer m_a^A at which the constraint (5) binds. Note also that in equilibrium the supplier whose product offers the highest feasible profits $\Pi_r(\theta^s)$ still wins the contract to supply r.

Consolidated retailer with a single-sourcing policy

Under a single-sourcing policy each supplier offers to supply both outlets at the constant price m^s.[28] The analysis is then analogous to the case with separate retailers, i.e., (i) the supplier s for whom $\Pi_a(\theta^s) + \Pi_b(\theta^s)$ is highest wins the account, (ii) the losing supplier offers $m^s = c$, and (iii) the winning supplier offers m^s such that the retailer is just indifferent between the two offers.

Compared to unrestricted procurement, single-sourcing is strictly better for the retailer. If supplier A wins the single contract, the retailer's profit under single-sourcing equals $\Pi_a(\theta^B) + \Pi_b(\theta^B)$, which for $\theta^A \neq \theta^B$ strictly exceeds its profit under an unrestricted procurement strategy, $\Pi_a(\theta^B)+\Pi_b(\theta^A)$. The following proposition summarizes results for the case with linear contracts.

Proposition 3. *Suppose that suppliers compete in linear contracts (uniform purchase prices). Moreover, suppose that $\theta^B \geq \theta^A$ and that good A (B) is sufficiently attractive to retailer a (b) to constrain the offer of the other supplier. Then we have the following results:*
i) Separate retailers: Supplier A is chosen by retailer a and m_a^A uniquely solves

$$\max_p (p - m_a^A) D_a(\theta^A, p) = \Pi_a(\theta^B).$$

Supplier B is chosen by retailer b and m_b^B uniquely solves

$$\max_p (p - m_b^B) D_b(\theta^B, p) = \Pi_b(\theta^A).$$

ii) Consolidated retailer: Single-sourcing is strictly profitable if $\theta^A \neq \theta^B$. In this case supplier A is chosen if $\Pi_a(\theta^A) + \Pi_b(\theta^A) \geq \Pi_a(\theta^B) + \Pi_b(\theta^B)$ and the offer m^A solves

$$\max_p (p - m^A) D_a(\theta^A, p) + \max_p (p - m^A) D_b(\theta^A, p) = \Pi_a(\theta^B) + \Pi_b(\theta^B).$$

The case where supplier B is chosen is symmetric.

[27] Formally, suppose $p^*(m_a^A) := \arg\max_p [(p - m_a^A) D_a(\theta^A, p)]$ and $m^* := \arg\max_{m_a^A} (m_a^A - c) D_a(\theta^A, p^*(m_a^A))$ are unique. Then supplier A's offer is not constrained by $B's$ offer if $(p^*(m^*) - m^*) D_a(\theta^A, p^*(m^*)) \geq \Pi_a(\theta^B)$.

[28] Alternatively, supplier s could offer two different prices for supplying outlets a and b. This would, however, not be feasible as the merged retailer would optimally buy all goods at the lower of the two prices.

It is worthwhile to note that retailers' profits are the same as with efficient contracts and $\beta = 1$. This is intuitive. In both cases a retailer can only extract from its chosen supplier the value of its outside option, and its outside option is to buy from the other supplier at cost.

Endogenous product characteristics and welfare

With efficient contracts, the only effect a merger has on welfare is through its impact on product availability and the choice of product characteristics. With linear contracts, we obtain a new effect. Enhancing buyer power and shifting profits to the retailer is not welfare neutral. Since in this case suppliers compete with marginal incentives, the competition to be the chosen supplier at a given outlet takes place through lower wholesale prices. This has the added benefit of reducing double-marginalization. Thus, there is a trade-off. The possibility of single-sourcing, whether or not a merger actually occurs, reduces variety, by making suppliers more homogeneous, but it also intensifies competition, by reducing double-marginalisation. This additional effect complicates the welfare analysis with linear contracts. In what follows, we will confine ourselves to discussing the implications on welfare in our previously introduced linear-demand example.

5.2 Example 2

Take the example from Section 4.2 where we specified a linear-demand function $D = 1-d-p$. If a retailer faces the constant unit price $m < 1-d$, it optimally chooses the price $p = (1+m-d)/2$ and the resulting quantity $x = (1-d-m)/2$ to realize the profits $U_r = (1-m-d)^2/4$. Setting $c = 0$ to facilitate the exhibition of results, the supplier's resulting profits are mx. Recall next that we substitute $d = \theta^2/z$ for $r = a$ and $d = (1-\theta)^2/z$ for $r = b$. We further specify $z = 5$.

Separate retailers

Suppose retailer a is supplied by supplier A. If A was not restricted by competition, it would want to maximize $x_a m_a^A$, where $x_a = (1-(\theta^A)^2/5 - m_a^A)/2$. This gives

$$m_a^A = (1-(\theta^A)^2/5)/2 \tag{6}$$

and retailer a realizes $U_a = (1-(\theta^A)^2/5)^2/16$. If A's offer is constrained by B, A's offer must leave to a at least the outside option $\Pi_a(\theta^B) = (1-(\theta^B)^2/5)^2/4$, where we used that $m_a^B = c = 0$. It is now immediate that supplier B, which will only supply retailer b in equilibrium, will optimally choose $\theta^B = \widehat{\theta}^B = 1$. Requiring that $U_a = \left(1-(\theta^A)^2/5 - m_a^A\right)^2/4$ is equal to $\Pi_a(\theta^B) = (1-1/5)^2/4$ yields then

$$m_a^A = (1-(\theta^A)^2)/5. \tag{7}$$

Since the constrained choice of m_a^A in (7) is always smaller than the unconstrained choice in (6), the presence of supplier B with $\theta^B = \widehat{\theta}^B$ sufficiently constrains supplier A's choice of m_a^A. That is, we have $m_a^A = (1 - (\theta^A)^2)/5$.

We can proceed like this also for supplier B. Recall that we have restricted the choice of θ to three values $\theta \in \Theta = \left\{\widehat{\theta}_a, \theta^*, \widehat{\theta}_b\right\}$, where we further specified $\theta^* = 0.2$. For $\theta^A = \widehat{\theta}^A = 0$ we get from symmetry that B offers $m_b^B = (1 - (1 - \theta^B)^2)/5$, which from $\theta^B = 1$ simplifies to $m_b^B = 0.2$. If $\theta^A = \theta^*$, being supplied by supplier A becomes more attractive for retailer b, which constrains even more the choice of m_b^B. Precisely, as $U_b = \left(1 - m_b^B\right)^2/4$ must again equal $\Pi_b(\theta^A)$, we obtain in this case $m_b^B = (1 - \theta^*)^2/5$.

How does the choice of A's product characteristics affect welfare? Taking again a representative consumer and having $c = 0$, the linear demand $D = 1 - d - p$ gives rise to the welfare $W = (1 - d)x - x^2/2$ if quantity x is chosen. With $\theta^A = \theta^*$ the products of A and B become less differentiated. With linear contracts this may, however, not be bad news to consumers as it also increases competition between suppliers and, thereby, reduces the offers m_r^s. Note that this applies both to supplier A, who wins the contract at retailer a, and to supplier B, who wins the contract at retailer b. Since a lower value of m_r^s induces each retailer to lower its final price to consumers, this increases industry profits and total welfare. In our example it turns out that this positive effect more than compensates the welfare loss due to a reduction in product variety. That is, welfare is strictly higher under $\theta^A = \theta^*$. To be precise, we obtain for $\theta^A = 0.2$ and $\theta^A = 0$ the respective welfare levels 0.655 and 0.640.[29]

Consolidated retailer with a single-sourcing policy

In the case of supplier A choosing $\theta^A = 0$, the outcome after a merger is extremely simple. Both suppliers are in the same position to compete for the supply at both outlets. Consequently, we have $m^A = m^B = c = 0$.

In the case of $\theta^A = \theta^*$, supplier A has a distinctive advantage as it offers a good with intermediate product characteristics. We can again show that supplier A can nevertheless not choose its unconstrained optimal price m^A as supplier B's offer is still sufficiently attractive for the consolidated retailer. Consequently, m^A is chosen such that the retailer realizes just its outside option $\Pi_a(1) + \Pi_b(1)$. As the retailer's profits are equal to the sum of $(1 - m^A - (\theta^A)^2/5)^2/4$ at outlet a and $(1 - m^A - (1 - \theta^A)^2/5)^2/4$ at outlet b, we obtain for $\theta^A = \theta^* = 0.2$

[29] We obtain for outlet b the quantity $\frac{1}{2} - \left(1 - \theta^A\right)^2/10$ and the resulting welfare $\frac{3}{8} - \frac{3}{40}\left(1 - \theta^A\right)^2$, while we obtain for outlet a the quantity $\frac{2}{5} - (\theta^A)^2/10$ and the welfare $\frac{8}{25} - \frac{7}{50}(\theta^A)^2 + \frac{3}{200}(\theta^A)^4$. Summing up, we then obtain the total welfare $\frac{3}{25}(\theta^A) - \frac{11}{50}(\theta^A)^2 + \frac{1}{50}(\theta^A)^3 + \frac{1}{100}(\theta^A)^4 + \frac{16}{25}$.

the value $m^A = 0.0285$.[30] Hence, even if supplier A chooses the less differentiated variant, it can charge only a relatively low price if retailers merge. This effect on the retailer's purchase price will prove decisive when we next compare welfare levels.

Endogenous variety and welfare

We first compare welfare levels under all possible scenarios and analyze subsequently which of these scenarios actually arise in equilibrium. We obtain the following ordering:

i) Without a merger and with $\theta^A = \theta^*$ total welfare is highest and equal to $W = 0.655$.
ii) With a merger, single-sourcing, and $\theta^A = \theta^*$ total welfare is $W = 0.641$.
iii) Without a merger and with $\theta^A = \widehat{\theta}_a$ total welfare is $W = 0.640$.
iv) With a merger, single sourcing, and $\theta^A = \widehat{\theta}_a$ total welfare is lowest and equal to $W = 0.615$.

Recall now the different effects at work. First, $\theta^A = \theta^*$ has the advantage of intensifying competition, which reduces purchase prices. Second, $\theta^A = \theta^*$ is an inferior choice if supplier A supplies retailer a, but in case of single-sourcing it is better than $\theta^A = \widehat{\theta}_a$ for supplying retailer b. Third, a single-sourcing policy intensifies competition and, therefore, again reduces purchase prices and increases output. Finally, a single-sourcing policy inefficiently reduces product variety.

In our specific case it turns out that the highest welfare would be achieved if products were less differentiated with $\theta^A = \theta^*$, which intensifies competition, while still both goods are sold as retailers stay separate. However, if $\mu = 0$, it is not optimal for supplier A to choose the less differentiated variant $\theta^A = \theta^*$. Thus, having $\theta^A = \theta^*$ and $\mu = 0$ is not feasible. Intuitively, supplier A will only choose the less differentiated product if the probability of a subsequent merger μ is sufficiently high. Taking this into account, we finally obtain the following results.

Results for Example 2. *The example leads to the following results:*
i) If $\mu > 11.1\%$, supplier A chooses the less differentiated product variant $\theta^A = \theta^*$. Otherwise, supplier A chooses the more differentiated product variant $\theta^A = \widehat{\theta}_a$.
ii) Expected welfare is strictly decreasing in μ over both regimes, i.e., for $\mu < 11.1\%$ and $\mu > 11.1\%$. At $\mu = 11.1\%$, where supplier A switches to θ^*, expected welfare strictly jumps up. This is also the highest feasible value for expected welfare.

The remaining calculations leading to these results are contained in the Appendix.

Compare now the outcomes with efficient contracts (Example 1) to those with linear contracts (Example 2). In the former case a very stringent merger policy ($\mu = 0$) is best. In contrast, in

[30] Precisely, note that $\frac{1}{4}\left(\frac{124}{125} - m^A\right)^2 + \frac{1}{4}\left(\frac{109}{125} - m^A\right)^2$ is for sufficiently low m^A strictly decreasing in m^A. The first value m^A where it becomes equal to $\frac{41}{100}$ is $m^A = \frac{233}{250} - \frac{1}{50}\sqrt{2041} \approx 0.0285$.

the latter case one would like to induce supplier A to chose a less differentiated product variant, which intensifies competition with B and reduces the double-marginalization problem.

Though our comparison is clearly confined to a very specific example, this highlights an important question for analyzing welfare implications of buyer power. Should we reasonably assume that contracts are sufficiently complex to allow for efficient negotiations or should we assume that contracts are relatively incomplete and simple, with linear contracts being a good approximation? In the first case, shifting rents to retailers has no direct impact on output and welfare, whereas in the second instance it increases output and welfare. An answer to this question, while being key for the analysis of welfare, may depend on the specific circumstances.

6 Conclusion

This paper analyses the impact of retail mergers on product variety. In our main analysis we compare two procurement strategies for a consolidated retailer. It may either be willing to still buy from both previous suppliers or it may commit to a single-sourcing policy. A single-sourcing policy may be profitable as it increases competition between suppliers by reducing their differentiation. The benefits of more competition (or a higher bargaining power for the retailer) may more than outweigh the loss in industry profits due to a reduction in product variety.

As suppliers anticipate the single-sourcing strategy of a consolidated retailer, the likelihood of a retail merger influences their optimal choice of product characteristics. If negotiations are efficient we find that, as mergers become more likely, e.g., due to a more lenient merger policy, expected industry profits and potentially also welfare are reduced. With linear contracts, however, there may be a countervailing effect as the merged retailer passes on lower input prices to final consumers.

Our model provides a parsimonious theory of the origins and (welfare) consequences of buyer power. It emphasizes the role of delisting, both as an (off-the-equilibrium) threat and as an active (on-the-equilibrium) strategy to exert buyer power. The profitability of a retail merger and of a subsequent single-sourcing strategy depends crucially on differences in the retailers' *previous* supplier bases and, thereby, on differences in consumer preferences at their respective outlets. As noted in the Introduction, this makes our theory of buyer power and retail mergers particularly applicable to cross-country mergers, where standard explanations based on horizontal merger theory seem to be less appropriate.

This observation may be particularly relevant for competition policy. Looking at the *downstream* market, mergers between firms operating in "overlapping" markets should have more serious consequences for price strategies and welfare. In retail mergers, stipulating the divestiture of outlets in overlapping markets is a common way to deal with these concerns. In contrast, looking at the *upstream* market, our analysis suggests that mergers in non-overlapping markets may provide more scope for firms to lever up their position vis-a-vis their suppliers. As we show, this may have serious consequences for product variety and welfare.

There are some obvious ways to enrich the simple model studied in this paper. First, to obtain a descriptive theory of retail mergers we would like to have a countervailing force that makes it sometimes unprofitable for retailers to merge. In the current model a merger between retailers is always at least weakly profitable. Second, to study overall industry dynamics one should also allow for mergers between suppliers. These extensions are beyond the scope of this paper.

Appendix: Omitted Proofs

Proof of Proposition 2

Take first the case where $\mu < 1$.

We argue first that in any pure-strategy equilibrium one supplier chooses the respective characteristics $\widehat{\theta}_r$. Suppose this was not the case and none of the suppliers chooses $\theta^s \in \left\{\widehat{\theta}_a, \widehat{\theta}_b\right\}$. If one of the suppliers is not chosen in case of a merger, it can by $\mu < 1$ profitably deviate to some $\theta^s \in \left\{\widehat{\theta}_a, \widehat{\theta}_b\right\}$, which maximizes its profits in case no merger takes place. Hence, it must be the case that both suppliers are chosen with positive profitability under single-sourcing. As this implies that $\Pi_a(\theta^A) + \Pi_b(\theta^A)$ equals $\Pi_a(\theta^B) + \Pi_b(\theta^B)$, they both realize zero profits if a merger takes place. By $\mu < 1$ it is then again strictly profitable to deviate to some $\theta^s \in \left\{\widehat{\theta}_a, \widehat{\theta}_b\right\}$, which maximizes profits in case no merger takes place. Note that the latter argument also implies that in any pure-strategy equilibrium only one supplier can be chosen with positive probability under single-sourcing. If this was supplier A, it follows from strict quasiconcavity of $\Pi_r(\theta)$ (where positive) that also the objective function in (1) is strictly quasiconcave. Also, there exists a finite solution as the finiteness of $\widehat{\theta}_a$ and $\widehat{\theta}_b$ implies $d\Pi_r(\theta)/d\theta < 0$ for both $r \in R$ and all sufficiently high θ and $d\Pi_r(\theta)/d\theta > 0$ for both $r \in R$ and all sufficiently low θ. As industry profits are smooth in product characteristics θ, the strict monotonicity of θ^A follows from implicit differentiation and strict quasiconcavity.

It remains to show that supplier B can not profitably deviate to some θ^B where supplier B is chosen under single-sourcing, i.e., where $\Pi_a(\theta^B) + \Pi_b(\theta^B) > \Pi_a(\theta^A) + \Pi_b(\theta^A)$. Define by $\widetilde{\theta}^s$

the value of θ that maximizes the expected profit if s is chosen, i.e., (1) for supplier A and the symmetric expression for supplier B. Note next that quasiconcavity implies that the derivative of supplier B's (A's) expected profits is negative (positive) for $\theta < \widetilde{\theta}^s$ and positive (negative) for $\theta > \widetilde{\theta}^s$. Suppose now that $\Pi_a(\widetilde{\theta}^A) + \Pi_b(\widetilde{\theta}^A) \geq \Pi_a(\widetilde{\theta}^B) + \Pi_b(\widetilde{\theta}^B)$, i.e., supplier A would be chosen under single-sourcing if both suppliers chose their preferred characteristics $\widetilde{\theta}^s$. (Otherwise, we can show existence of a pure-strategy equilibrium where supplier B is chosen under single-sourcing.)[31] If there exists no value θ^B such that $\Pi_a(\theta^B) + \Pi_b(\theta^B) \geq \Pi_a(\widetilde{\theta}^A) + \Pi_b(\widetilde{\theta}^A)$ we are clearly done as supplier B cannot compete with supplier A for the joint account under single-sourcing. Otherwise, there exists by strict quasiconcavity a value $\overline{\theta}^B$ where $\Pi_a(\overline{\theta}^B) + \Pi_b(\overline{\theta}^B) = \Pi_a(\widetilde{\theta}^A) + \Pi_b(\widetilde{\theta}^A)$, while $\Pi_a(\theta^B) + \Pi_b(\theta^B) < \Pi_a(\widetilde{\theta}^A) + \Pi_b(\widetilde{\theta}^A)$ for all $\theta^B > \overline{\theta}^B$. Moreover, comparing supplier B's profits with total industry profits under single-sourcing and appealing once more to strict quasiconcavity shows that $\overline{\theta}^B < \widetilde{\theta}^B$. Consider now supplier B's strategy to deviate from $\theta^B = \widehat{\theta}_b$ to some other θ where it will be chosen under single-sourcing. Clearly, any such deviation is only successful if $\theta^B \leq \overline{\theta}^B$. Deviating to $\theta^B = \overline{\theta}^B$ yields the expected profits $(1-\mu)\beta\left[\Pi_b(\theta^B) - \Pi_b(\theta^A)\right] + 0 \cdot \mu$ as both suppliers are equally attractive under single-sourcing. But by $\overline{\theta}^B < \widetilde{\theta}^B$ and strict quasiconcavity we know that a further decrease in θ^B will only reduce supplier B's expected profits even if it is chosen under single-sourcing. Hence, we have shown that $\theta^B = \widehat{\theta}_b$ is indeed supplier B's best response. This completes the proof for Case (i).

In Case (ii) single-sourcing will occur with probability one. As the retailer will choose the supplier with which $\Pi_a(\theta) + \Pi_b(\theta)$ is maximized and as $\Pi_a(\theta) + \Pi_b(\theta)$ is strictly quasiconcave, the claim follows immediately. **Q.E.D.**

Omitted calculations for Example 2

We complete the calculations. We first analyze the optimal choice of θ^A, given that $\theta^B = 1$. Suppose first $\theta^A = 0$. If a merger takes place supplier A realizes zero profits. If a merger does not take place, supplier A supplies retailer a at the previously derived price of $m_a^A = (1-(\theta^A)^2)/5 = 0.2$. As retailer a chooses the output $x_a = (1-(\theta^A)^2/5 - m_a^A)/2 = 0.4$, supplier A realizes $m_a^A x_a = 0.8$. Thus, if supplier A chooses $\theta^A = 0$ its expected profits are $(1-\mu)0.8$.

Suppose now $\theta^A = \theta^* = 0.2$. If a merger takes place, we have calculated $m^A = 0.0285$. The merged retailer will choose $x_a = (1-(\theta^A)^2/5 - m^A)/2 = 0.482$ for outlet a and $x_b = (1-(1-\theta^A)^2/5 - m^A)/2 = 0.422$ for outlet b. Hence, supplier A's profits are $(x_a + x_b)m^A = 0.0258$. If no merger takes place and $\theta^A = \theta^*$, we obtained $m^A = (1-(1/5)^2)/5 = 0.192$ and the supply

[31] Note that we do not claim uniqueness. There is some scope for the existence of two pure-strategy equilibria.

of $x_a = (1 - (\theta^A)^2/5 - m^A)/2 = 0.400$ to outlet a, yielding the profits $x_a m^A = 0.077$. In total, for $\theta^A = \theta^*$ the expected profits are $0.0258\mu + (1-\mu)0.0768$.

Comparing profits for $\widehat{\theta}_a$ and θ^*, we obtain that supplier A prefers $\widehat{\theta}_a$ for $\mu < 0.111$.

We calculate next expected welfare for the two scenarios. Suppose first $\mu > 0.111$, implying $\theta^A = 0.2$. From previous results we know that total welfare equals 0.655 in case of no merger and 0.641 in case of a merger. This yields the ex-ante welfare $0.655 - 0.0140\mu$. Proceeding likewise for $\mu < 0.111$ and $\theta^A = \theta^*$, we obtain the expected welfare of $0.640 - 0.0250\mu$. Finally, substitution shows that welfare is maximized at the lowest feasible value μ at which $\theta^A = \theta^*$.

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