

Implications of Buyer Power and Private Labels on 'Vertical Competition' and Innovation

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Executive Summary (English)

This study, which was conducted for the German Markenverband (Association of Brand Manufacturers), contributes to the ongoing discussion among practitioners of competition law and policy on the implications that the growing consolidation of retailers has on welfare and efficiency in the economy. Its focus is the allocation of functions between manufacturers and retailers in the vertical chain, notably the function of innovation. The respective ‘vertical competition’ over functions between branded goods manufacturers and large retailers has been largely overlooked in the discussion, which needs to be corrected so as to correctly assess the implications of buyer power and of the growing importance of private labels for competition and welfare. This report specifically works out various channels for why as retailers grow in size, this may cause inefficiency by crowding out innovations of branded goods manufacturers. At the heart of the various arguments is the ‘gatekeeping’ function that retailers frequently maintain.

In many sectors retailers do not (or no longer) represent merely a transparent window to the market place for manufacturers, as often pictured in economic textbooks. Instead, they have often turned into powerful competitors over functions in the vertical chain. Such functions comprise, for instance, product innovation, quality certification, as well as distribution and marketing. Control of a larger share of these functions, notably but not exclusively through private labels, ensures large retailers not only a larger share of the overall created value but also a better strategic position in their negotiations with brand manufacturers.

This report first sketches how as retailers have grown in size, functions have increasingly shifted to large retailers, notably in European food retailing. With respect to private labels, this comprises increasingly also the function of innovation. This observation provides the background for the formal economic analysis, which is at the core of this report. The analysis considers a simplified economic model in which a branded goods manufacturer and retailers can develop a new product and bring it to the market. The key result is that as the large retailer grows in size, this can lead to an inefficient shift of innovative activity away from the branded goods manufacturer and to the large retailer, which can further be detrimental to smaller retailers. What is key for this potential inefficiency to arise is an asymmetry between manufacturers and retailers, as the latter control access to consumers, in particular when they can act as ‘gatekeepers’. Competition law and policy may even strengthen such ‘gatekeeping’, e.g., by granting retailers unrivalled ownership over the final price through a strict implementation of a prohibition of retail price maintenance. From this perspective, the present report relates to the discussion in the companion report (Inderst 2013), which analyzes potential inefficiencies that arise from such mandated ‘price ownership’ by retailers.

The present report shows how both a ‘hold-up problem’ and a large retailer’s ‘rent appropriation incentives’ can contribute towards an inefficient substitution of manufacturer innovative activity. Importantly, this may even distort horizontal competition in retailing when, by ‘crowding out’ the innovative activity of branded goods manufacturers, a large retailer gains a competitive advantage vis-à-vis smaller retailers (an innovation ‘waterbed effect’). The formal analysis also shows how the threat of imitation of manufacturers’ innovation by large retailers with private labels can aggravate these inefficiencies and the resulting harm to competition.

Executive Summary (Deutsch)

Diese Studie, die für den Markenverband erstellt wurde, trägt bei zur aktuellen Diskussion über die Implikationen von Nachfragemacht im Handel für Wohlfahrt und Effizienz in der Volkswirtschaft. Hierbei liegt der Schwerpunkt auf der Frage nach der Verteilung der Funktionen zwischen Handel und Herstellern in der vertikalen Wertschöpfungskette. Die zugrundeliegende Frage nach dem ‚vertikalen Wettbewerb‘ um diese Funktionen wurde bislang in der wettbewerbspolitischen Diskussion weitgehend ausgeblendet, trotz der zunehmenden Verbreitung von Handelsmarken und der Übernahme großer Teile der Wertschöpfungskette durch nachfragemächtige Händler. Die ökonomische Analyse zeigt, wann eine solche durch Nachfragemacht induzierte Funktionenverlagerung zu Ineffizienzen führt. Insbesondere wird gezeigt, wie Nachfragemacht in Verbindung mit Eigenmarken zu einer ineffizienten Verlagerung von Innovation weg von Markenherstellern und hin zu Händlern führen kann, was neben einem Wohlfahrtsverlust auch eine Verzerrung des Wettbewerbs im Handel nach sich ziehen kann.

Nachfragemächtige Händler haben sich zu ernsthaften Konkurrenten auch für Markenhersteller um wesentliche Funktionen in der Wertschöpfungskette entwickelt. Diese Funktionen umfassen beispielsweise Produktinnovation, die Zertifizierung von Qualität (aus der Perspektive der Konsumenten) oder aber Marketing und Distribution. Die Kontrolle über einen größeren Anteil dieser Funktionen, insbesondere mittels Handelsmarken, sichert Händlern einen höheren Anteil an den in der Wertschöpfungskette erwirtschafteten Profiten und insgesamt eine stärkere Verhandlungsposition gegenüber Herstellern.

In diesem Bericht wird zunächst im Überblick dargestellt, wie insbesondere im europäischen Lebensmittelsektor Händler einen zunehmend größeren Anteil an den Funktionen in der Wertschöpfungskette übernehmen. Die Diskussion von Produktinnovationen im Bereich Handelsmarken bildet dann den Ausgangspunkt für die formale Analyse mittels eines ökonomischen Modells. Das Hauptergebnis der formalen Analyse ist, dass einhergehend mit dem Wachstum eines nachfragemächtigen Händlers sich die Funktion der Innovation ineffizient weg von den Herstellern und hin zu nachfragemächtigen Händlern und ihren Eigenmarken verlagern kann. Zentral ist hierbei die Tatsache, dass der Händler den Zugang zu den Endkunden kontrolliert, insbesondere wenn er als ‚gatekeeper‘ operieren kann. Das Wettbewerbsrecht und seine Durchsetzung können diese Kontrolle noch verstärken, indem sie beispielsweise durch die restriktive Umsetzung eines Preisbindungsverbotes die Kontrolle über den Preis einseitig in die Hände der Händler legen. In diesem Sinne schließt dieser Bericht auch an den Bericht von Inderst (2013) an, in dem direkt die möglichen Ineffizienzen analysiert werden, die sich vor allem bei Markenprodukten aus einem solchen zwingenden ‚price ownership‘ des Handels ergeben.

Die ökonomische Analyse zeigt, wie ein ‚hold-up‘ Problem sowie die Anreize von Händlern, sich dadurch einen größeren Teil der gesamten Profite zu sichern, dazu führen kann, dass sich Innovationsaktivität weg vom Hersteller und hin zu nachfragemächtigen Händlern verschiebt, selbst wenn dies ineffizienter ist, oder aber ganz ausbleibt. Dies kann auch den Wettbewerb im Handel verzerren, wenn dadurch die Wettbewerbsfähigkeit kleinerer Händler (ohne starke Eigenmarken) beeinträchtigt wird (‚Innovations-Wasserbetteffekt‘). Die formale Analyse zeigt auch, wie eine drohende Imitierung einer Herstellerinnovation durch einen großen Händler diese Ineffizienzen noch verschärfen kann.

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1 Introduction

This study, which was conducted for the German Markenverband (Association of Brand Manufacturers), contributes to the ongoing discussion among practitioners of competition law and policy on the implications that the growing consolidation of retailers has on welfare and efficiency in the economy. Traditional economic analysis, as presented by standard economic textbooks, often completely ignores distribution and retailing activities. Firms are treated as if they compete directly for the patronage of final consumers or as if they were selling through a retailing industry that, possibly due to perfect competition, represents just a ‘transparent window’ to the market place.¹ Furthermore, when retailing and the role of vertical relationships are considered, more often than not the picture is that of manufacturers confronting retailers with ‘take-it-or-leave-it’ offers and managing channels through the judicious use of wholesale contracts that target a particular retail price. However, this picture bears little resemblance to the real world in many industries, which is of concern because competition policy in Europe is increasingly informed by economics.

Large retailers have gained impressive buyer power through organic growth and mergers. This increase has been helped by a change in shopping habits, such as a trend towards one-stop shopping favouring large retail outlets and reducing consumers’ loyalty towards brands, as well as retailers’ own increasingly global procurement strategies. In addition, the advent of private labels has resulted in retailers directly competing with manufacturers in certain product segments. As discussed in more detail in this report, retailers increasingly compete with branded products as they move their private labels upmarket.

The shift of power and functions to retailers may often be attributable to more fundamental changes, such as changes in shopping habits or technology that, for instance, may render it more efficient if retailers take on a larger role in distribution. The growth and exercise of buyer power, especially when due to consolidation in the retailing industry, may, however, negatively affect not only horizontal competition but also the efficient allocation of roles and functions in the vertical relationship. Which functions (such as those of innovation, distribution or marketing) are performed (more) by retailers or by manufacturers is then possibly not only determined by efficiency considerations, but also the result of the exercise of buyer power and can even become a strategic tool aimed at increasing future (bargaining) power.

These possibilities have not yet been acknowledged sufficiently, either among scholars or among practitioners of competition law and policy. One objective of this report is, consequently, to broaden the discussion on manufacturer–retailer relationships and, notably, on the exercise of buyer power in this direction – that is, towards an inclusion of the perspective of ‘vertical competition’ over functions. I provide both stylised evidence of such competition and, in some cases, of a pronounced shift of functions away from manufacturers and towards retailers, as well as a formal economic analysis that ad-

¹ See, for instance, the discussion in Inderst and Mazzarotto (2008).

dresses the issues of efficiency and welfare. Motivated by developments in the private label segment of food retailing, I ask, in particular, whether one can expect that, as retailer size and buyer power grow, the function of *innovation* to be allocated efficiently between manufacturers and retailers. The formal analysis isolates various forces for why, with the growth of large retailers, manufacturers' innovation could be inefficiently 'crowded out.' I review these forces below.²

The formal analysis of innovation incentives in this report highlights only one possible area where retailer consolidation and the exercise of buyer power can lead to an inefficient shift of functions. The results should inform competition policy, which – as I also discuss in a short review of the literature on buyer power – has indeed become increasingly concerned about the impact of consolidation in the retailing industry and the exercise of buyer power. Broadly speaking, one also needs to address how such consolidation and the exercise of buyer power *inefficiently* tilt the balance in the vertical competition for functions. What should also be noted, however, is that competition policy and antitrust law may already tilt this balance, notably through legal provisions (and their tight enforcement) that restrict manufacturers' ability to control retail prices for their own products,³ even when in competition with private labels or even when they find themselves in such long-term vertical competition over functions.

That such retailer 'price ownership', as supported by law, can by itself have negative efficiency implications is discussed (and formally analysed) in a companion report (Inderst 2013). Focusing on the role of price for a brand's (quality) image, the arguments therein explicitly relate to branded products. That study also links the discussion of retailer versus manufacturer price ownership to buyer power and the idea of vertical competition that I elaborate on in the current report. Together, the two reports on price ownership and vertical competition thus call for a broadening of the discussion on how competition law and policy view the relationship between retailers and manufacturers in light of an increasing consolidation in the retailing industry, the rise of private labels and overall the exercise of buyer power.

I now summarise the results of the formal economic analysis on innovation and imitation in this report. To isolate the different forces that are at work, the analysis proceeds in two steps. In the first step the analysis abstracts from retail competition. In the second step retail competition is introduced. In the absence of retail competition, the focus is on the 'gatekeeping' function that a retailer occupies with respect to consumers. That is, while the retailer always has access to consumers, irrespective of whether it sells a branded product or a private label product, the brand manufacturer relies on the retailer's patronage. The formal analysis shows that this can give rise to an inefficient shift of innovative

² The benefit of the formal analysis allows to clearly isolate these long-term forces, through which retailer consolidation can reduce efficiency. What the analysis, however, does not intend to do is quantify the importance of these effects in particular cases and, thereby, weigh them against possible efficiency rationales of retailer innovation, such as closeness to consumers.

³ This includes the prohibition of retail price maintenance (RPM) and of measures through which a manufacturer could more indirectly impact the retail price, such as a combination of recommended retail prices and specific incentive schemes or the refusal to deal with retailers. For a discussion of these alternatives, see Inderst (2013, Section 3).

activity away from brand manufacturers to the retailer (and its private label products) as a retailer sufficiently gains in size. The first reason for this is a hold-up problem, which undermines the manufacturer's return from an innovation. This is potentially seriously aggravated when the retailer can also threaten with imitation of a brand manufacturer's innovation. The second reason is a 'rent-appropriation' motive of the retailer: the retailer's control of final consumers puts it in a position to extract a larger share of total profits when it innovates through the private label product, instead of relying on the brand manufacturer. In the latter case, in particular, the shift of innovative activity towards the retailer is thus not driven by an efficiency rationale, but only by the retailer's motive to appropriate a larger share of total industry profits. Overall, the analysis shows how even when the retailer's innovation costs are higher than those of a brand manufacturer, there can be a 'crowding-out' of manufacturer innovative activity.

Such a 'crowding-out' can become more severe when there is retail competition. The formal analysis considers here a setting where a large retailer competes with smaller retailers in different local markets. I show that there are now two different inefficiencies that can arise, in addition to the two forces that are isolated already without competition. When investment costs are not too large, there can be inefficient duplication, as an innovation is made both by the large retailer and the brand manufacturer. More seriously from a competition perspective is the second inefficiency. There, only the large retailer invests, while the absence of an innovation by the brand manufacturer now deprives smaller retailers of an equally competitive product. I call this a 'waterbed effect' that harms smaller retailers once the activity of a large retailer crowds out manufacturer innovation. When it dampens or even replaces manufacturer innovation, in a large retailer's own innovative activity reduces smaller retailers' access to innovation and puts them at a competitive disadvantage.

Taken together, the formal analysis in this report thus isolates various reasons for why consolidation in the retailing industry and the (further) growth of a large retailer can inefficiently tilt innovative activity towards large retailers, thereby even 'crowding out' the innovative activity of brand manufacturers. More generally, though competition policy has already become increasingly concerned about the exercise of buyer power, this report shows that consolidation in the retailing industry and the exercise of buyer power by large retailers, together with the increasing importance of private labels, may have detrimental effects on welfare and competition that hitherto have been overlooked. As noted previously, retailers' control of final consumers is a key facilitator for this. To the extent that competition law and policy prevent the creation of a level playing field through restricting manufacturers control over prices, this asymmetry may be aggravated.

This report is organised as follows. Section 2 documents a shift in power towards retailers. For this I first rely on the extant literature to broadly define buyer power and work out the various sources of it. I then specifically refer to recent developments in European food retailing to document the growth in retailers' buyer power. Next, section 3 builds on section 2 by illustrating how –in particular large and powerful– retailers have increasingly taken over functions in the vertical relationship, notably – though not exclusively – through their private labels. There, I first describe the general tendency for such a shift of functions towards retailers, again with a focus on food retailing. Then, I discuss in de-

tail the rise of private labels. The discussion of private labels ends with a description of recent trends, according to which retailers increasingly compete head-on with brand manufacturers through their private label products. This involves, in particular, first-movership and innovation, at least in some selected product categories. Based on this background of increasing consolidation and buyer power as well as the rise of private labels, Section 4 provides an economic analysis of the allocation of innovative activities between manufacturers and large retailers. Section 5 summarizes results from this study. Technical material is collected in Section 6.

2 Buyer Power in Retailing

2.1 Sources of Buyer Power

I refer to buyer power very broadly as the bargaining strength that a buyer has with respect to the suppliers with whom it trades.⁴ For the presentation of a simple framework, I consider the bilateral negotiations between a buyer and a seller. In a slightly more abstract way, I call these two parties A and B and I assume that they can jointly realise profits of z . How these profits are shared should depend most on what each of the two parties could realise even without its counterparty. That is, the buyer (retailer) could delist the respective product and negotiate with another seller and the seller (manufacturer) could instead turn to different distribution channels. I denote the profits from these alternatives by v_A and v_B respectively, which economists usually refer to as the outside options. In what follows, I introduce and discuss several determinants of buyer power from the perspective of these outside options, thereby asking, for instance, how a retailer's size makes its own outside options more valuable and possibly those of a manufacturer less valuable. The same reasoning applies with respect to private labels.

In order to continue with the somewhat abstract framework, note that the 'net surplus' that is realised from successful negotiations is the difference $z - v_A - v_B$. This difference is what is essentially on the table when the two parties A and B negotiate. Suppose that this amount is shared equally, which yields a simple formula for the outcome of this bargaining problem: Party A realises the sum of its outside option v_A plus one-half of the net surplus $z - v_A - v_B$, while party B realises the sum of its outside option v_B plus, again, one-half of $z - v_A - v_B$. In what follows, I discuss some determinants of buyer power with regard to their effects on the respective outside options, notably, retailers' size and their 'gate-

⁴ As discussed in detail, for instance, in Inderst and Mazzarotto (2008), this is not the only way in which competition economics has looked at buyer power. In fact, the textbook view of buyer power (known as monopsony power) is also different: It presumes that upstream and downstream firms interact in a market (e.g., Blair and Harrington 1993). In the simplest case, buyer power then represents the perfect mirror image of seller power: Just as sellers can raise prices by withholding supply, buyers can reduce (wholesale) prices by withholding demand. However, such exercise of buyer power rests on the following assumptions: Purchasing larger quantities increases market price (e.g., since increasing marginal costs imply an upward-sloping supply curve) and there is no scope for an individual buyer to exert power by obtaining a specific discount. This situation implies, in particular, that withholding demand also benefits other buyers. However, I do not find this perspective on buyer power appropriate for the present report. Instead, the textbook view is more appropriate for competitive commodity markets, where the assumption of a uniform trading price may be justified.

keeping role' and private labels. At this point I report, however, only the basic arguments and relate them more broadly to the literature. In the following section I discuss in detail the respective developments in European food retailing.

As discussed in Section 2.2, in some sectors, such as food retailing, retailers have grown in size, both organically and through domestic and international mergers and acquisitions. Size may increase a retailer's buyer power by raising the value of its own outside options in a variety of ways.

First, if a buyer is large enough, it can credibly threaten to incur even substantial costs and integrate backwards, thereby rendering the supplier redundant.⁵ I later use precisely this possibility to relate size to the threat of imitating a brand manufacturer's innovation. Size may also determine how credibly a buyer may threaten to switch to another supplier, where switching involves non-negligible one-off costs. In addition, size may make a buyer more knowledgeable about alternative sources of supply, as it makes it profitable to have a more professional purchasing process for even relatively narrow product categories.⁶ For all of these reasons, size may confer buyer power by increasing the value of the outside options that are available to the buyer. The resulting discounts and other improvements of terms and conditions will then exceed those that would be justified solely on the basis of improved efficiencies (e.g., from handling a larger buyer's volume).

Empirical research largely confirms the role of size as a determinant of discounts. Several studies, particularly among the earlier literature on buyer power, find a negative relation between buyer concentration and suppliers' profit margins.⁷ More recently, event-based studies in the financial economics literature show that, generally, buyer mergers have a negative impact on suppliers' profits.⁸ Interesting evidence also appears in the findings of the United Kingdom's repeated inquiries into the national food (grocery) retail market, which, for instance, revealed a widening differential in purchasing conditions in the course of only a few years.⁹ This issue is discussed in the next section.

Size may not only increase the value of the buyer's outside options, but also reduce the value of the seller's outside options. A manufacturer losing a large contract and thus having to search for alternative distribution channels for a large fraction of total output or capacity may severely reduce the price and thus the profit that the seller can still realise.¹⁰ This situation may particularly apply when a retail-

⁵ This argument is formalised in Katz (1987) and Sheffman and Spiller (1992).

⁶ The importance of 'buyer sophistication', which often grows with size, is outlined in more detail in Nordemann (1995) and Steptoe (1993). In addition, larger buyers may employ more competitive procurement methods, such as auctions.

⁷ Lustgarten (1975) and Schumacher (1991) are representative studies. Note, however, that size and market concentration are not always fully interchangeable.

⁸ See Bhattacharyya and Nain (2006). Fee and Thomas (2004) show how these effects due to buying power are more pronounced if the downstream industry is already relatively concentrated.

⁹ When reviewing the prices paid for the top five branded lines of 26 large suppliers, the five largest multiples bought goods more cheaply than any other party (Competition Commission 2000). These findings were broadly confirmed in an assessment of a proposed merger in 2003 (Competition Commission 2003).

¹⁰ See Inderst and Wey (2004). The various inquiries by the UK's Competition Commission showed that even nationwide brands are often highly dependent on a few retail chains. For instance, on average three-quarters of

er acts as a gatekeeper in a given (local) market. If a retailer faces little or no competition in a given (local) market, a supplier has no alternative channels to serve those consumers. Thus, sales made through such a retailer may be more difficult to replace than those made through a retailer in a highly competitive market.¹¹ The impact of such gatekeeping on innovation activity is analysed formally in Section 4.

A final important determinant of buyer power in retailing is the use of private labels. These not only allow retailers to directly control a larger fraction of their total business, but also enhance their bargaining position vis-à-vis branded goods manufacturers. I explore private labels in more detail in Section 3.2.

2.2 Buyer Power in European Retailing

While concentration among retailers varies from industry to industry and from country to country, various sources agree that food retailing has become increasingly concentrated in most European countries. This is particularly due to a wave of mergers and acquisitions.¹² In addition, buying groups (coalitions of retailers formed to secure more weight and scale in procurement negotiations) have grown in size. For illustrative purposes, Table 1 shows the evolution of the food retailing market shares of the top five firms (five-firm concentration ratio or CR5) in the five major markets of the European Union from 2005 to 2010. All but one market show a considerable increase in concentration based on this measure.¹³

	2005	2010
France	73.0	73.0
Germany	61.0	75.0
Italy	28.0	32.0
Spain	57.0	64.0
UK	69.0	74.0

sales of even large suppliers went through only three retailers (Competition Commission 2000; see Section 2.2 for additional details).

¹¹ For the role of gatekeepers see, for instance, Mazzarotto (2003), Dobson and Waterson (1997), and von Ungern-Sternberg (1996). Moreover, the immediate loss of profits may be aggravated if a supplier is particularly dependent on a retailer. For instance, if the supplier has high financial commitments and no/insufficient access to credit facilities, losing a substantial fraction of its business (particularly on short notice) may cause it financial distress. Any ‘threshold’ value of lost business or profits that would trigger such financial distress should depend, among other things, on the supplier’s financial condition and potential to flexibly scale down business or find alternative sales channels.

¹² See Clarke et al. (2002, Table 7.8).

¹³ The European Commission (2011, Chapter 5) and the Organisation for Economic Co-operation and Development (2006, Chapter 1) provide more details on the growth of buyer power in European food retail across different countries.

Table 1: Concentration in European food retail markets in 2005 and 2010 (top 5, as percentages).¹⁴

Figure 1 shows the development of the market shares (as well as prospective growth) of the five leading full-range food retailers in Germany since 1995 in more detail.

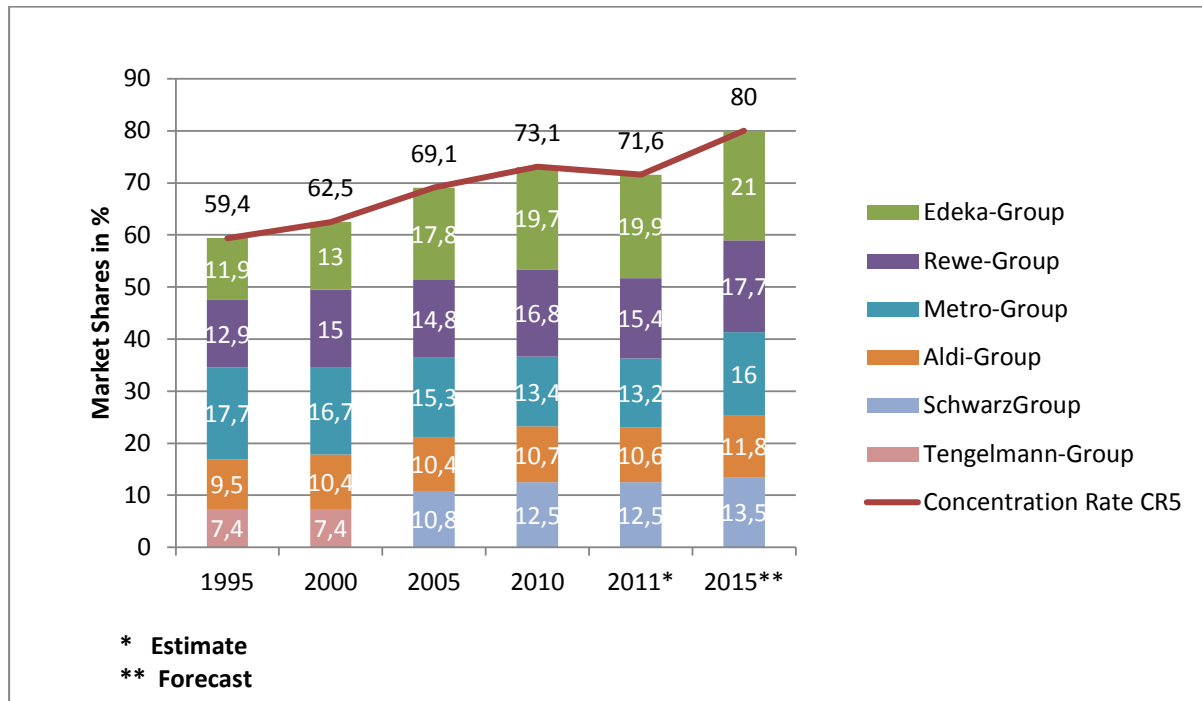


Figure 1: Development of market shares in the German food retail market from 1995 to 2015¹⁵

The red line in Figure 1 represents the combined market share of the top five retailers. According to the data used here, the top five retailers in 1995 (EDEKA, Rewe, Metro, Aldi, and Tengelmann) accounted for around 60 per cent of total sales.¹⁶ By 2010, the combined market share of the top five retailers had grown to approximately 73 per cent.

The growing concentration directly affects the importance of individual retailers for manufacturers. More than 10 years ago already, British food suppliers sold, on average, one-third of their UK sales to the biggest British customer and nearly 70 per cent to their top five customers.¹⁷ A survey of German brand suppliers suggests that, on average, German food suppliers sell 27 per cent to the largest German customer and around 60 per cent to their top three customers.¹⁸

¹⁴ Data from Europanel. Source: British Brands Group (2012).

¹⁵ Data from Nielsen Trade Dimensions. Source: Monopolkommission (2010, 2011). Note: Differences in data sources account for the slightly different market share figures throughout this report. While other sources even suggest that concentration is still higher, for the present argument such details are not key, as all sources and study suggest both a high level of concentration and notably a considerable increase over the last decade.

¹⁶ From 2005, the composition of the five leading trading companies changed (with Tengelmann replaced by the Schwarz Group, which operates the Lidl discount stores and Kaufland hypermarkets and supermarkets).

¹⁷ See Competition Commission (2000).

¹⁸ See DIW (2010) and von Schlippenbach and Pavel (2011). The numbers for Dutch suppliers, as another example, are comparable (see Landbouw-Economisch Instituut 2009).

Recent evidence on the exercise of buyer power comes from the UK Competition Commission's Supermarkets reports.¹⁹ For instance, reviewing the prices paid for the top five branded lines of 26 large suppliers, the UK Competition Commission found that the top five retailers with the largest market share paid significantly lower prices than other retailers. It also ascertained, more generally, a substantial volume-related discount.²⁰ Further survey evidence on the buyer power of retailers is provided by a German study conducted in 2009. There, for instance, 90 per cent of respondents reported earning their lowest margin with one of their three largest customers.²¹

The exercise of buyer power is, however, not limited to securing price concessions, but can be directed towards more favourable non-price terms as well.²² Such additional non-price terms may comprise lump sum payments (e.g., to initiate or continue trading with the buyer) or listing fees and slotting allowances, but could also include non-financial benefits (including exclusive arrangements).²³ Again, the aforementioned reports of the UK Competition Commission provide evidence on the extent to which large and strong buyers employ such practices.²⁴ As summarised in Table 2, the Competition Commission finds evidence that various practices (grouped here into eight categories) were applied by the major retailers.²⁵

Such practices and, in particular, their use by large and powerful retailers are also documented for Germany by the aforementioned survey. Accordingly and as summarised in Table 3, around three-quarters of the suppliers interviewed for this survey mentioned that at least one of their three largest trading partners had demanded retroactive discounts over the last five years.²⁶ Tellingly, the likelihood that a retailer demanded such a retroactive discount increased significantly with its importance for the supplier.²⁷

¹⁹ See the Competition Commission (2000, 2008). See also Dobson (2005) and the European Commission (2011) for further discussions of the results for retailer buyer power in the British food industry.

²⁰ For example, expressed in terms of comparisons to the price paid by Tesco, it was found in 2000 that a number of smaller chains paid around 10 per cent more. The Groceries Market Investigation, which was concluded in 2008, revealed a statistically significant relation between price and volume purchased. The difference between the volume purchased by a very small customer and that purchased by a very large customer would result, according to these estimates, in a price differential of more than 10 per cent, which may be the outcome of the exercise of buyer power (and thus go beyond any efficiencies that arise from volume purchases).

²¹ See DIW (2010) and von Schlippenbach and Pavel (2011).

²² Dobson (2005) and the European Commission (2011) provide a review of the relevant non-price terms.

²³ Other arrangements that powerful buyers may enforce include shifting the burden of risk (e.g., from returns) and the provision of liquidity (through late payments) to suppliers.

²⁴ In total, the Competition Commission identified 52 practices associated with retailer buyer power that were employed by the major food retailers and that were thought to potentially distort competition.

²⁵ In addition, in its 2008 inquiry, the Competition Commission concluded that nearly half of the observed non-price retailer buyer practices concerned the transfer of risks and unexpected costs. Furthermore, when measured by complaints received, retrospective payments were particularly widespread in this category.

²⁶ See DIW (2010) and von Schlippenbach and Pavel (2011).

²⁷ Czibik and Mako (2008) also find for the Hungarian retail market that larger retailers demand larger refunds.

Category of practices	No. of practices	No. of retailers engaging in practices (min - max)
Payments for access to shelf space	8	5–13
Imposing conditions on suppliers' trade with other retailers	2	1–4
Applying different standards to different suppliers	1	3
Imposing an unfair imbalance of risk	12	1–12
Imposing retrospective changes to contractual terms	8	1–7
Restricting suppliers' access to the market	1	10
Imposing charges and transferring costs to suppliers	8	2–13
Requiring suppliers to use third-party suppliers nominated by the retailer	2	2–11

Table 2: Assessment of UK supermarket practices concerning relations with suppliers in 2000.²⁸

Category of practice	Frequently	Rarely or never	Prefer not to say
Demand for retroactive discounts	74%	24%	2%
Problem with regular retrospective payments	54%	46%	0%
Cancellation of planned promotion	39%	61%	0%
Delisting of products	30%	70%	0%

Table 3: Assessment of German retailer practices in 2009.²⁹

The preceding account of the growing buyer power in European food retailing and of its exercise vis-à-vis manufacturers is surely far from complete. Its main purpose is to provide a background for further analysis. It is therefore useful to summarise the following key observations. Though differences between national markets exist and persist, overall there has been a marked consolidation in the industry. This has led, in particular, to the rise of several very large retailers that are also active across different European countries and even worldwide. While consolidation may have reduced horizontal competition, I abstract from this and focus instead on the vertical dimension. Various studies suggest the increasing exercise of buyer power by these large retailers. In what follows, I make first some additional observations to complement this picture. Notably, I turn to the question of how functions have shifted increasingly to retailers, particularly through their increase in size. I further give more details on private labels, which both provide evidence of this shift in functions and represent another, particularly important lever of buyer power. The final formal analysis in this report brings this all together by working out how the function of innovation may inefficiently switch to retailers and their private label products through an increase of size (and the exercise of size-related buyer power, more generally).

²⁸ Source: Dobson (2005), adapted from the Competition Commission (2000).

²⁹ Supplier complaints (as a percentage) regarding practices by at least one of their three largest trading partners over the last five years. Source: DIW (2010).

3 ‘Vertical Competition’ over Functions in the Vertical Chain

3.1 A General Shift in Functions

As already noted in the introduction, economists traditionally view retailers, if considered at all in their analyses,³⁰ as agents that bridge the distance between manufacturers and consumers, in both time and space. They offer products in stores that are closer to consumers than, say, the manufacturers’ plants.³¹ But they do much more and increasingly so, as has been duly recognised by business scholars. This fact needs to be equally recognised in the economics literature, which, as noted above, underlies much of today’s thinking about competition policy and antitrust.

While, in a nutshell, retailers still carry out the final step in the distribution of merchandise and are still primarily engaged in the activity of purchasing products from other firms to resell those goods to consumers, such a description disguises the increasing role that retailers play across all functions. For instance, through their private labels they engage in product innovation or they build up their own (umbrella) branding to act as a certifier for quality, thereby increasingly taking over functions that were previously performed exclusively by brand manufacturers. Furthermore, retailers often take over an increasing part of distribution: Where manufacturers previously delivered right to individual stores and possibly even controlled the display of their products, large retailers may now collect shipments directly at the factory gates.

Apart from changes in technology or consumer shopping habits, this development is undoubtedly also being driven by the increasing size of retailers. Large-scale retail chains have developed across all countries and have taken market share from small, previously independently owned shops. Chains and buyer groups are no longer only regional or national but increasingly international, sometimes employing far more people than manufacturing companies and operating thousands of stores worldwide. Section 2 has already broadly discussed the rise of the buyer power of large retailers in European food retailing. In addition to being leading players in the distribution channel, large retailers are ready to assume marketing and logistics leadership in their vertical relationship with manufacturers.³²

The following more detailed view on distribution alone is instructive. Here, the reality in most markets no longer conforms to the classical segmentation of manufacturers, wholesalers, and retailers when it comes to the role they play in the distribution of products. Instead, many different forms of how prod-

³⁰ In much of the analysis in economic textbooks, retailing rarely plays a role, very much in contrast to the marketing literature and marketing courses, where channel management and control are a key issue. This neglect in economics is, for instance, reflected in the fact that the distribution of power between retailers and manufacturers is usually not considered at all. In fact, economic models of vertical relationships typically assume that manufacturers (or often a single monopolistic manufacturer) can make take-it-or-leave-it offers to downstream firms. See, for instance, the treatment in the still leading textbook on industrial organization by Tirole (1988).

³¹ They thereby provide consumers with an appropriate assortment of different products, thus offering breadth and variety, and also reduce lot sizes to quantities (packages) suitable for consumers. The various traditional roles have been covered extensively in the business literature. See the overviews in Coughlan et al. (2008) or van Watershoot et al. (2010).

³² These shifts are covered broadly in textbooks on retail management and marketing (e.g., Zentes et al. 2011).

ucts are stocked and shipped have developed and often co-exist. They differ with respect to who takes ownership of products and when, who is responsible for keeping inventory, or when and how new orders are elicited. In some instances manufacturers (still) retain much of the responsibility, for example, to ensure freshness of their products.³³ In addition, there are various ways in which retailers and manufacturers cooperate with the use of modern IT solutions or in which a retailer uses a particular manufacturer to help coordinate and manage a whole category. That said, there is a strong tendency, especially in food retailing, for larger retailers to increasingly take over a larger share of these functions.³⁴

Until the 1980s it was common practice for manufacturers to deliver products directly to the individual stores.³⁵ As already noted above, arguably many of the changes that have resulted since then may have been largely driven by the realisation of efficiency gains as retailers grew in size, such as in the form of economies of scale or economies of density. Retailers have gradually moved towards central warehousing, so that manufacturers now usually deliver to a retailer distribution centre,³⁶ from which retailers can then supply their stores more efficiently.³⁷ Despite the aforementioned variety of different concepts of distribution and inventory management, there is still a tendency towards further ‘backwards integration’ (e.g., with retailers collecting goods directly from suppliers rather than relying on supplier delivery³⁸).

While I cannot do justice in describing the whole process of shifts in functions and roles, which clearly varies considerably between sectors and across national markets, it is important for competition analysis and antitrust to recognise the key shifts. Even though the development is not always so clear-cut, it is fair to say that (food) retailers, driven mainly (though surely not exclusively) by size, have taken over a larger part of the various functions that are performed in the vertical chain. The distribution example illustrates that this relation also holds when retailers still buy and resell manufacturers’ own

³³ For instance, this may particularly be the case with vendor-managed inventories and the use of consignment stock concepts. In the latter case the manufacturer remains responsible, including for potential damages and losses, right until the products are placed on a retailer’s shelf.

³⁴ It should again be noted that this report focuses largely on food retailing. This focus shows up in both the previous section, where I cite evidence of increasing buyer power in this sector, as well as in the following section, which deals with the spread of private labels in food retailing. The distribution of functions has notably developed quite differently across sectors, for example, with the rise of manufacturer-owned or dedicated outlets in the clothing sector.

³⁵ See, for instance, Mercer (1993).

³⁶ In particular, very large retailers with a high density of stores may then use centrally located distribution centres. Such economies of density have been described for Wal-Mart in Holmes (2011). For the United Kingdom, see Fernie et al. (2000) and the Competition Commission (2008).

³⁷ See, for instance, le Blanc et al. (2006). A retailer distribution centre receives incoming orders from manufacturers and redistributes them to individual stores (Buzzell and Ortmeier 1995). Benefits may include shorter lead times, inventory reduction (backroom stock centralised in retailer distribution centres), or the general streamlining of administrative processes (e.g., McKinnon 1990; Voss et al. 2005; Yang and Cheng 2010).

³⁸ The Competition Commission (2008). In this respect, the practice of factory-gate pricing is worth noting, where retailers essentially buy products directly at the factory gate and take care of further distribution. Costs of transportation are then clearly no longer included in the price that suppliers charge. The respective ‘value added’ is then created entirely by the retailer (le Blanc et al. 2006).

(branded) goods. The shift in functions has arguably been even more pronounced when it comes to private labels. This development is described next.

3.2 The Rise and Change of Private Labels

The market share of private labels in European food retailing has risen significantly, albeit with considerable national differences. For instance, based on sales volume in 2011, private labels accounted for 10 per cent in Greece, against 42 per cent in the United Kingdom (see Figure 2).³⁹

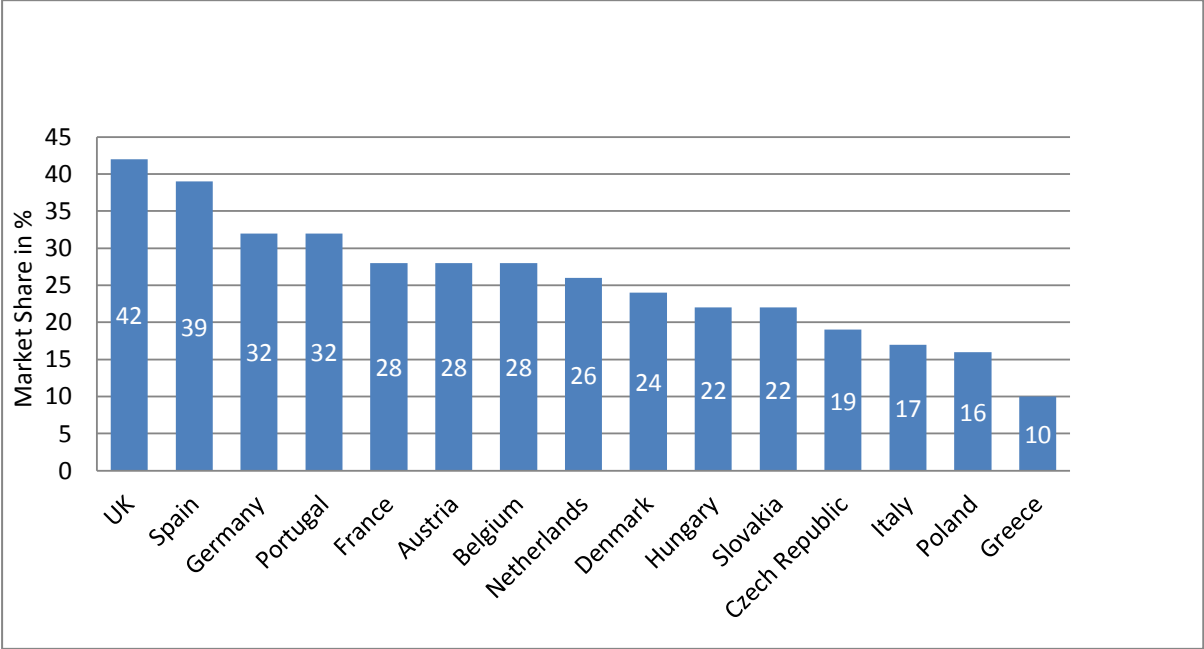


Figure 2: Market share of private labels based on sales volume in 2011 (in per cent)⁴⁰

I now focus on Germany. Among Western European countries, private label penetration is particularly strong in Germany, where it has almost doubled between 2000 and 2012, from 21.8 per cent to 39.8 per cent.⁴¹ For some product categories it is much higher still.⁴² In addition, some retailers and retailer formats have a particularly high share of private labels. This is particularly true for ‘hard discounters’ such as Aldi, which in 2010 reportedly had a private label share of total turnover of more than 90 per

³⁹ As for growth, from 2003 to 2009 this share increased by two to seven percentage points in Western and Southern Europe (except Spain) and by 10 to 26 percentage points in Spain and Central Europe (European Commission 2011).

⁴⁰ Data from Nielsen. Source: Metro-Group – Metro Handelslexikon (2012/2013, p. 61). Unless stated otherwise, here and in the following, market shares are calculated based on the turnover of fast-moving consumer goods, excluding fresh food.

⁴¹ The figure for 2000 is based on GfK data and reported in Wey (2011). Furthermore, *Lebensmittel Zeitung* (2013), based on Nielsen data, reports an increase in the share of private labels from 36.2 per cent in 2006 to 38.8 per cent in 2012 for German food retailers of more than 100 m².

⁴² The market share in the top 5 product categories (ranked by private label market share) was above 80 per cent in 2008 (European Commission 2011).

cent.⁴³ This is particularly important, since such hard discounters have gained market share over the last decade and now account for a substantial share of the overall retail market in Germany.⁴⁴ However, the perception that private labels are predominantly associated with discounters or, at least, with lower-value ('budget') products may be highly misleading in light of recent developments, such as a shift towards higher-value products and, notably, the use of private labels by supermarkets (rather than discounters). Thus, as discussed next and particularly in the following section, retailers increasingly compete head-on with branded goods manufacturers. The possible implications for innovation are analysed in Section 4.

During the 1980s and 1990s, private labels were almost exclusively of the budget type. From the retailers' perspective, cost savings in production, distribution, and marketing were originally seen as the primary motivation for the introduction of private labels.⁴⁵ These budget private labels were positioned at the lower end of the quality and price range.⁴⁶ Characteristic of this low-price, low-quality strategy are so-called 'me too' products, positioned closely to established national brands.⁴⁷ Private labels were then especially successful in markets where no strong national brands were present and, at this stage, private label products could basically only replace products with a weak 'brand image' (or, at most, national B-brands).⁴⁸ As Figure 3 shows, however, over recent years in particular, private labels in Germany have grown in the segment of added-value and 'premium' products. While, according to these figures, brand manufacturers that produce market leaders still hold their respective market shares, I argue below why this may be about to change, with large retailers increasingly taking over market leadership in some areas.

⁴³ See Monopolkommission (2010, 2011).

⁴⁴ German discounters increased their combined market share of total turnover from 32.1 per cent in 2000 to 43.2 per cent in 2007 (GfK and Accenture 2008).

⁴⁵ Cost savings could be so substantial that private labels, although sold at a lower price, still generated higher profit margins than the respective national brands. With data from this early stage of private label products, Hoch and Banerji (1993), for instance, report that retailer gross margins on private labels are 20–30 per cent higher than on national brands. The question of private labels also relates somewhat to that of vertical integration, which has been discussed extensively in the economics literature. The possible efficiency gains of such vertical integration may relate to a reduction of transaction cost (Williamson 1971) or a reduction of 'double marginalisation' (Spengler 1950).

⁴⁶ For supermarkets in particular, private labels were initially part of a low-price, low-quality strategy allowing retailers to compete with discounters for the low-income and price-sensitive buyer segment (Hassan and Monier-Dilhan 2006).

⁴⁷ Sometimes retailers chose similar-sounding names and package designs to piggyback onto the respective national brand's reputation (Kumar and Steenkamp 2007).

⁴⁸ Originally they were successful for products where consumers required less trust, since they can immediately inspect quality or there is little risk of disappointment. According to European Commission's (2011), this applies, for instance, to plastics and wrapping products. The market share of private labels is also high for frozen and deli products, followed by dairy and dry groceries (European Commission 2011). For other product categories, such as personal care, cosmetics, and baby food, the share of private labels is particularly low. For these products, consumers perceive the risk of being disappointed by a new product as more severe and thus tend to rely on the reputation for quality that could initially be provided only by an established national brand (GfK 2010).

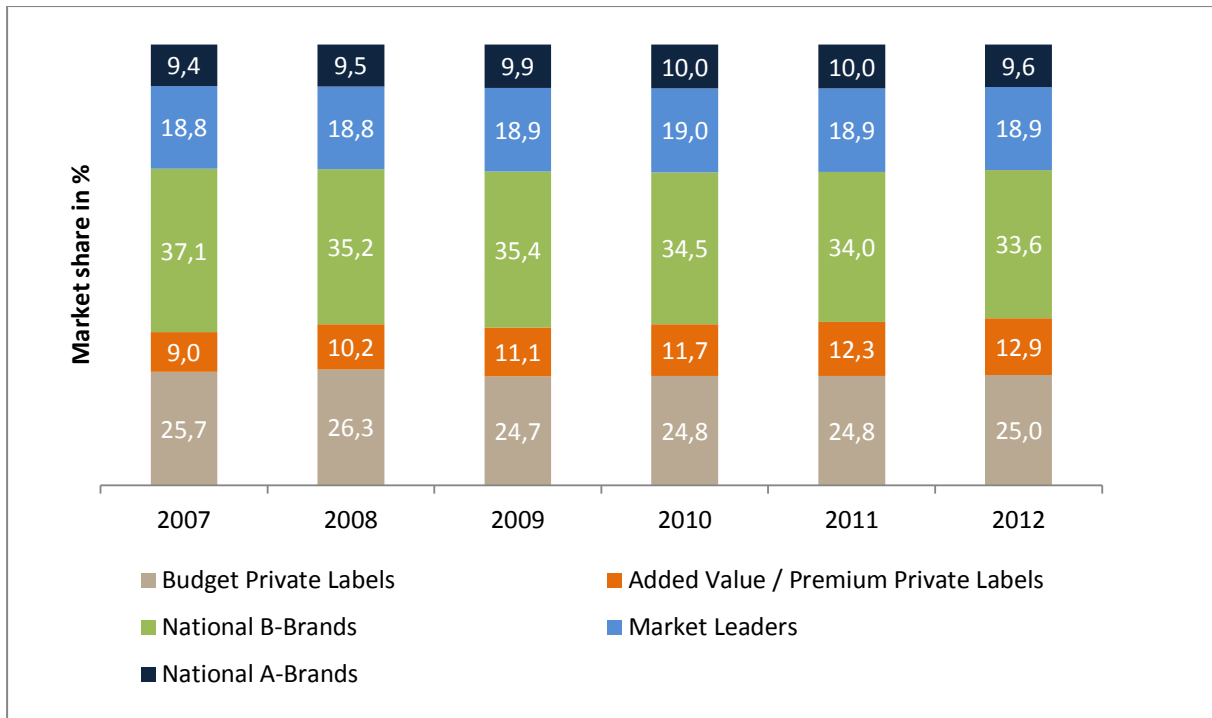


Figure 3: Market share development of industrial brands versus private labels in Germany⁴⁹

For Germany, I now consider the example of a market segment that has developed over the last decade: that of organic food and beverages. This example will illustrate very clearly the change in the landscape, more so than considering more established segments of the market, where, for instance, manufacturers can still rely on brand names that were introduced decades or even a century ago. In the case of organic food and beverages, the private label share in Germany is already greater than that of national brands (see Figure 4).⁵⁰

Retailers were quick to introduce their own private label product lines, thereby capturing this segment to a large extent.⁵¹ They are also increasingly doing so by means of their reputation and image, which they are building up steadily. Thus, important functions such as marketing or the certification of quality, for which the store image is now essential, are shifting away from the supplier and to the retailer.⁵² In particular, a novel dimension of this development is that, increasingly, supermarkets are no longer advertising based on promotions, but – just like brand manufacturers – are building an image of their own. Apart from again shifting the power balance towards retailers, especially since that should in-

⁴⁹ Source: GfK (2013b).

⁵⁰ The rise of organic private labels or, more generally, that of private labels in the ‘ethical food’ segment, has also been documented elsewhere (Daskalova 2012, with examples). Clearly, retailers’ position in this segment may have additional reasons, as noted below.

⁵¹ Manufacturers with a strong brand also struggle with the problem that an ‘organic variant’ will either dilute the respective brand image or only be perceived as a ‘marketing campaign’ (GfK 2013a).

⁵² Because a retailer can introduce a premium private label across different product categories throughout its assortment, private label products can serve as a ‘reliability umbrella’ (Ezrachi and Reynolds 2009). See also Marvel and McCafferty (1984) for a theoretical consideration.

crease store loyalty relative to brand loyalty, this development also provides retailers with a platform to quickly react to changes in consumer behaviour and tastes with their own private label products.⁵³

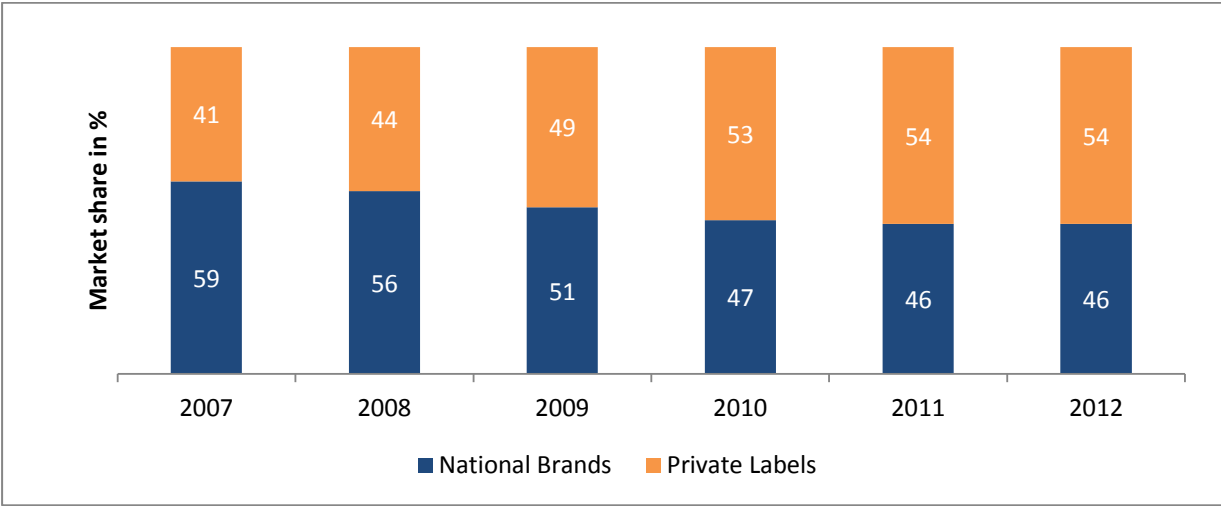


Figure 4: Market share development of manufacturer brands versus private labels in the German organic food and beverages market⁵⁴

As for the initial intention of introducing private labels to save costs, there are clearly efficiency rationales for retailers taking on a growing role in spotting and reacting to changing tastes, such as their closeness to consumers. Overall, however, it must be recognised that the introduction of private labels can also be driven by strategic considerations in retailers’ efforts not only to achieve efficiencies, but also to capture a larger share of total profits in the vertical relationship.

Arguably, the presence of private labels can substantially enhance a retailer’s bargaining position vis-à-vis brand manufacturers.⁵⁵ By stocking private labels next to national brands in a given category, a retailer not only makes shelf space scarcer but also enters into direct competition with its suppliers.⁵⁶ Retailers may thus be tempted not only by possibly higher margins but also by longer-term strategic considerations to use their control of the shelf space to the benefits of private labels.⁵⁷ In this respect it

⁵³ While I do not document this with market share data, it is said that retailers are also gaining advantage vis-à-vis manufacturers in other rapidly growing or newly developing areas, such as regionally/locally produced goods or, for example, prepared foods to address consumers’ changing eating habits in single households. Such a trend towards more innovation and even first-mover behaviour is possibly even more evident in markets besides Germany. Daskalova (2012) mentions the Netherlands and the United Kingdom in particular.

⁵⁴ Source: GfK (2013b).

⁵⁵ See Bontems et al. (1999) and Dobson (2005). This relation was already recognised early on in the literature, for example, by the prominent marketing scholar Neil Borden for the United States in the 1940s (as cited in Steiner 2004).

⁵⁶ If the branded good is (temporarily) delisted, some of the lost sales can be recaptured through higher sales of the private label good.

⁵⁷ For instance, private labels may receive more eye-level placements or overall better positioning (Competition Commission 2011). According to literature discussed in Steiner (2004), retailers may also price their private labels and branded goods strategically, for example, to make their own brand look cheaper. In the longer term,

is interesting to note that, apart from their roles of distributing manufacturer product and as competitors through private labels, retailers can also be seen as renting out (sometimes explicitly through separate fees) shelf space on which manufacturers rely to obtain access to their own customers.

In the long term, the penetration of private labels and retailer consolidation, as a main source of buyer power, may also be mutually reinforcing.⁵⁸ A high concentration ratio favours the introduction of private label products, since retailers are more likely to reach a critical size, scale, and image to develop and promote their own private label products, as discussed above. But the rise of private label products itself could reinforce the process of retail market concentration, given the improved bargaining position and possibly the risk of a ‘waterbed effect’ on smaller retailers’ terms and conditions.⁵⁹ I discuss this in Section 4, where I also formally analyse another waterbed effect that works through innovation: Since large retailers rely on their private label products, rather than continuing to stock branded products as well, they may crowd out brand manufacturer innovative activity, which could be detrimental particularly to the smaller retailers.⁶⁰

In this report, I do not intend to review comprehensively the potential benefits and drawbacks of the growth of private label products.⁶¹ The realisation of cost efficiencies and their use for aggressive price competition, for instance, may benefit consumers. To the extent that they are, however, used strategically mainly with a view to influencing buyer power, inefficiencies may arise.

In addition, with a view to the long term, private labels together with the increasing consolidation in the retailing industry may not only shift the balance in the vertical relationship but may also have unwanted horizontal effects. As noted above, private labels can both stimulate and dampen competition. Even when private labels were previously associated with a reduction in costs and prices, in the longer term this may change when private labels increasingly occupy the premium segment and could sometimes substitute rather than complement even premium manufacturer brands (see the analysis below). These developments and possible (in)efficiencies are, however, not the subject of this report.

the preferable treatment of private labels may ensure retailers greater store loyalty at the expense of manufacturer brand loyalty. See also Daskalova (2012) for various reasons why a retailer would give preference to private labels.

⁵⁸ For a comparison and a view on this joint development see, for instance, Herbert (2009).

⁵⁹ See Dobson and Inderst (2008).

⁶⁰ With growing size and an increasing reliance on private label products, brand manufacturers may also find it difficult to run a ‘mixed strategy’ of producing both national brands and private labels (e.g., Moati et al. 2007; Quelch and Harding 1996).

⁶¹ See the Competition Commission (2011), Daskalova (2012), and Bergès-Sennou et al. (2004). Empirically, the impact of private label penetration on product prices has been analysed in various contributions. The introduction of private label products should in the short run exert downward pressure on manufacturers of national brands and thus, given sufficient retail competition, lead to lower retail prices for national brand products (Mills 1995). Some studies suggest, however, that such a price increase need not occur across all products, including affected national brands (on this topic and more generally, see Chintagunta et al. 2002; Ward et al. 2002; Gabrielsen et al. 2002; Bontems et al. 2005). Furthermore, private labels tend to reduce price comparability because the products are marketed exclusively by a single retailer, which can reduce retailer price competition and thus result in higher prices for both private labels and national brands (e.g., Ailawadi et al. 2008).

While market forces should clearly be the ultimate arbiter on which products are produced and by whom they are distributed and marketed, competition policy and antitrust should be concerned with two questions. The first is how competition policy antitrust law may distort this development, for example, through preventing a level playing field, as in the prohibition of retail price maintenance or even more indirect ways of how a brand manufacturer can influence final prices. As noted above, this topic is discussed in more detail elsewhere. The second question is how the increasing consolidation of the retailing industry described could lead to an inefficient shift of functions in the vertical relationship. I analyse this question next in a formal model.

4 ‘Vertical Competition’ and Innovation

4.1 Introduction and Overview of Results

4.1.1 Motivation for the Formal Analysis

As noted previously, there may be efficiency rationales for why some innovations are more likely to be undertaken by manufacturers and others more likely to be undertaken by retailers, most notably through their private label products. Experience, economies of scope and scale, and closeness to consumers could all play a role in determining whether retailers or manufacturers take on the role of innovator. Still, the following analysis identifies reasons why inefficient substitution (or ‘crowding out’) of manufacturer innovative activity could be triggered by consolidation in the retailing industry. The analysis thus identifies why the market outcome may not be efficient in the presence of buyer power. The following analysis does not, however, intend to quantify the respective (in)efficiencies. Rather, the formal analysis allows the isolation of economic forces that could be responsible for such an inefficient substitution of innovative activity.

At first, from a welfare perspective, who assumes the role of innovator in an industry may seem irrelevant. However, I isolate various rationales for why there can be a decrease in welfare when, through an increase in size (which is the main source of buyer power I consider), a large retailer uses private labels to take on a larger role in innovation. Once a retailer reaches a sufficient size that makes it worthwhile to innovate, I first show that a combination of the following two forces can inefficiently tip innovative activity towards retailers. The first force is a ‘hold-up’ problem for manufacturers, in case they still innovate and must share the proceeds, particularly when the threat of copying and imitation exists. The second force is a ‘rent appropriation’ motive for retailers, who, when their size permits, may prefer to innovate on their own, even if this approach is less efficient, since it allows them to extract a larger share of the total profits that are created by the product innovation. In the formal analysis I show that either of these two forces can be sufficiently large to inefficiently crowd out manufacturer innovation.

For these two forces (i.e., the hold-up problem and the rent appropriation motive) to be at work, it is essential that the manufacturer must rely on the retailer to have access to consumers: It is this ‘gate-keeper’ function of the retailer that is behind the hold-up problem and the rent appropriation motive,

both of which may lead to an inefficient substitution of manufacturer innovative activity. However, once the manufacturer has access to different (competing) retailers, I identify another force that may lead to an inefficient and now even potentially anti-competitive substitution of manufacturer innovative activity. I identify a type of ‘waterbed effect’ that harms smaller retailers once the activity of a large retailer crowds out manufacturer innovation. When it dampens or even replaces manufacturer innovation, a large retailer’s own innovative activity, in my model, reduces smaller retailers’ access to innovation and puts them at a competitive disadvantage.

In the next section, I first provide a more detailed, though still verbal (that is, non-formal) summary of the subsequent analysis and its results. I then will derive these results more formally, first focusing on the simplest case, where a bilateral monopoly (of a manufacturer and a retailer) precludes effects that arise from horizontal competition. In this setting, I isolate the aforementioned forces of the hold-up problem and the rent appropriation motive that arise from the retailers’ gatekeeping function. Retail competition is then dealt with separately, as are the cases where the retailer’s size together with the use of private labels increases the threat of copying and imitation for manufacturers. These forces could further dampen manufacturer innovative activity and may, in the analysed model, lead to the inefficient substitution of manufacturer innovation by that of a large retailer.

4.1.2 Summary of Key Results

The subsequent analysis proceeds stepwise. First, I consider a bilateral monopoly where a single manufacturer faces a single (and consequently large) retailer. This situation is not meant to capture the reality in a given market. The purpose of this simplification is, instead, to isolate those effects that do not depend on competition. As noted above, I isolate two effects that suggest that under some circumstances innovation activity may inefficiently switch to a large retailer when it attains sufficient size. The two effects interact such that the first effect inefficiently reduces the innovation incentives of the brand manufacturer and the second effect inefficiently boosts the innovation incentives of the large retailer. When an innovation is truly performed more efficiently by the retailer through its private label, then this, of course, does not lead to inefficiencies. In fact, in the analysed model, innovation activity can never inefficiently remain with the manufacturer. However, even when it would be more efficiently carried out by the manufacturer, it may shift to the large retailer due to these two effects.

The first effect is a standard hold-up problem for the manufacturer. As I argue below, this effect is particularly strong when there is even the threat that the retailer will copy an innovation. It is also particularly strong when the retailer enjoys high bargaining power and can thus, after the manufacturer innovates, extract a large share of the resulting net surplus. The key to this is the gatekeeping role of the large retailer in question: While the manufacturer needs the retailer to access its customers, the opposite does not hold for a retailer who can produce private labels.

The second effect is a rent appropriation motive for the retailer. The retailer may prefer to innovate on its own (and can do so if of sufficient size), even if this is less efficient, since the retailer can then extract a larger share of the total profits that are created by the product innovation. Again, this scenario relies on the retailer’s gatekeeping role, since the manufacturer cannot innovate on its own and deliver

products directly to consumers. The (gatekeeping) retailer's incentives to innovate are thus not to enhance overall efficiency, for example, since its innovation is more suited to consumers or is carried out at lower costs. Instead, the retailer's motive is, at least in this analysis, exclusively its interest to appropriate a larger share of the overall vertical profits. Both the hold-up problem and the rent appropriation motive may thus lead to an inefficient substitution of manufacturer innovative activity.

As already noted, the formal analysis also allows for the possibility of the large retailer imitating a manufacturer's product. When this is an option, I show that the manufacturer's hold-up problem becomes potentially much more severe. The threat of imitation then exacerbates an inefficient shift of innovation activity to the large retailer and may even undermine innovative activity altogether.

I stipulate in the formal analysis that the retailer can imitate the manufacturer's innovation at a cost. While these costs can capture not only practical but also legal problems that can arise from such imitation, in many sectors (most notably food retailing), protecting innovations from being copied or imitated is arguably difficult. In the process of developing and marketing an innovation, even branded goods manufacturers may have to share information with retailers that cannot be protected by traditional intellectual property rights. Once a manufacturer has, for instance, tested a new product and generated consumer awareness for it, a retailer could try to produce and market a private label look-alike on its own.⁶² Trademark protection does not often seem extensive enough to catch the use of such copycats and look-alikes.⁶³

At this point, it is also worth noting the difference in imitation incentives between a retailer and a rival manufacturer. This difference is important because it stresses why, in areas with low legal protection, imitation by retailers (or even the threat of it, as in the formal analysis) could become more relevant than the threat of imitation by rival manufacturers. Again, the key issue is that the retailer controls access to consumers and can thus always ensure that an imitated (private label) product is sold. As noted above, the retailer can also be sure to thereby appropriate all of the surplus, rather than having to share profits with the manufacturer (rent appropriation motive). This story changes completely if an-

⁶² In the economics literature, for instance, this motivated the formal analysis in Allain et al. (2011). The threat of copycats and look-alikes has also been recognised in the UK's grocery inquiry (Competition Commission 2008). The UK's Competition Commission warns that 'the exploitation by retailers of such a position could, in theory, reduce the ability of brand owners to realise a return on product innovation', which would lead to inefficiently low levels of investment in research and development in the future. Even though the Competition Commission's empirical review does not suggest any adverse effect on product innovation to date, it remains concerned that if these supply chain practices continue, investment and innovation might be negatively impacted in the future. The European Commission noted in the Kesko/Tuko merger case that 'private label development is a key element in the power wielded by retailers vis-à-vis branded daily consumer-goods producers. It enables retailers, who are inevitably privy to commercially sensitive details regarding the branded goods producers' product launches and promotional strategies, to act as competitors as well as key customers of the products. This privileged position increases the leverage enjoyed by retailers over branded goods producers' (Kesko/Tuko, Case IV/M.784, Commission Decision 97/277/EC [1997] OJ L 110/53 [152]).

⁶³ In particular, some jurisdictions, such as the United Kingdom, require proof of actual misleading. The recent EC Directive 2005/29 on Unfair Commercial Practices specifically addresses misleading packaging. However, the Competition Commission concluded that 'packaging on its own is unlikely to provide a sustained basis for the success of an own-label product when competing with a branded product' and found 'any sustained negative effect on branded goods unlikely to be the result of copycat packaging'. See also Burt and Davis (1999) on the possibility of consumer confusion and Dobson (1998) on potential distortions to competition.

other manufacturer chooses to imitate, since it would still have to compete for access to consumers. In this competition the imitating manufacturer would have to cede most of the profits to the retailer, particularly if its product is a close imitation of the original. Apart from possibly having privileged access to an innovating manufacturer's information, a retailer may thus have particularly strong incentives for imitation (i.e., compared to a rival manufacturer), of course provided the retailer is sufficiently large to make the respective fixed costs worthwhile.

The formal analysis introduces retail competition in a final step, which allows the manufacturer to at least partially sidestep a particular retailer. In practice, this may sometimes but surely not always be the case; that is, brand loyalty may occasionally (albeit most likely only in exceptional circumstances) be sufficiently strong to make consumers switch retailers in the search of their favourite brand. I show that, with competition, there can be inefficiencies when a large retailer duplicates innovative activity through its private label product. Such a situation can result in excessive investment costs. Potentially more serious from a competition perspective is the possibility of an innovation 'waterbed effect' arising when manufacturer innovative activity is crowded out by that of the large retailer. In that case, retail competition creates additional incentives for the large retailer, since, by crowding out a manufacturer's innovation activity, the large retailer gains a competitive advantage vis-à-vis smaller rivals. This suggests that the large retailer would gain from undertaking additional strategies that would essentially grant it a first-mover advantage. The strategy of developing a strong brand of private label products (or the retailer's own brand image) may serve such a purpose of committing to a 'first move' in innovative activity, which can inefficiently dampen the manufacturer's incentives, which always needs the retailer to gain access to consumers. In the analysed case this may even reduce horizontal competition with smaller retailers to the detriment of consumers.

4.2 Baseline Analysis

4.2.1 Setup

In the case currently under analysis, I consider a single manufacturer and a single retailer. In this setting, I can isolate forces that, provided a retailer is sufficiently large to undertake innovation activities on its own, may lead to an inefficient substitution of manufacturing innovation. Later, retail competition is introduced, as well as the presence of both smaller and larger retailers. There, I also formally capture the (relative) size of an individual retailer compared to the overall market size of other retailers. However, this step is not necessary at this point.

The key decision problem that I look at is an investment to improve a single product. The original characteristics (e.g., quality) are denoted by u_0 . That is, u_0 represents some measure of these characteristics, for example, how healthy the particular product is. Through investment these characteristics can be improved (e.g., the nutrition value). The respective measure can then be increased to $u_I > u_0$. This setting is certainly highly stylised, as is much of the following analysis. However, it clearly demonstrates the underlying forces that drive the results. When the manufacturer undertakes the in-

vestment, the respective investment costs are I_M . When the retailer does so, the investment costs are I_R . The respective subscripts thus denote the identity of the innovator.

I now use some formal notation. In the main text, this only serves the purpose to clarify the presentation. In the Appendix, as well as in the formal background paper of Inderst et al. (2013), the subsequent results are fully derived formally. I denote the joint profits from delivering a product with a certain quality to the market by $\Pi(u)$, which illustrates the dependency on the respective product characteristics/quality (i.e., either $u = u_0$ or $u = u_I$).⁶⁴

In what follows, my measure of efficiency is first $\Pi(u)$ (or, respectively, the difference between $\Pi(u)$ and the respective investment costs, if the investment is made). This measure equals total welfare when firms are able to extract the full consumer surplus. Even if this is not the case, my subsequent comparative observations still relate to total welfare, as long as firms are able to appropriate the difference in surplus generated by the investment in higher quality. If, however, this is not the case (as in the retail competition I analyse below), then the benefits from innovation are typically understated when I only consider joint firm profits $\Pi(u)$. In particular, whenever retailer size and the exercise of buyer power reduce total innovative activity in the following analysis, considering only profits $\Pi(u)$ will tend to underestimate the resulting loss of welfare.

I assume that

$$\Delta = \Pi(u_I) - \Pi(u_0) > I_M, \quad (1)$$

so that the innovation is always efficient, at least when it is undertaken by the manufacturer. Here, the delta, Δ , denotes the difference in the respective (industry) profits with and without the innovative activity that changes the product characteristics u (i.e., as noted above, e.g., an index of quality). In the main text, I also postulate that

$$I_R > I_M. \quad (2)$$

That is, the retailer has higher investment costs than the manufacturer to create higher quality, for example, through an ‘upgrade’ of its private label. This specification is, however, *not* made in the analysis in the Appendix. There, I allow for all possible cases, so that (e.g., due to closeness to customers) the retailer may, in some instances, be able to innovate more efficiently. While, in the present model, I show that there can be an inefficient substitution of manufacturer innovative activity, the analysis in the Appendix shows that the reverse is not the case. Hence, by focusing on cases where (2) holds, I can thus analyse whether, in this model, a shift of innovative activity from manufacturers to retailers takes place if and only if it is efficient. As I show, this is not the case.

Throughout the analysis I assume that not only the considered manufacturer, but also other manufacturers – notably those already producing private label products – are already able to produce the prod-

⁶⁴ Note that I thereby abstract from a specification of prices and quantities, which simplifies the presentation but does not affect the results. However, I need more notation below, namely, on prices and quantities, when I illustrate the possibility of a waterbed effect under retail competition.

uct with basic quality u_0 .⁶⁵ Consequently, when the innovation is made (or initiated) by the retailer (e.g., through its own private label), I envisage that the retailer can appropriate the full gains Δ .

4.2.2 Innovation Activity

4.2.2.1 Profit Sharing and Hold-Up When the Manufacturer Innovates

When the manufacturer has invested in higher quality, it still needs to contract with the (in this case monopolistic) retailer. This seems to be the most reasonable assumption for many manufacturers, in particular in food retailing. Instead, the case where the retailer could ex ante contribute to the investment outlay would be typical for private labels, which is the case that I capture when considering retailer innovation further below.⁶⁶

When only the manufacturer innovates, the net surplus that can be shared between the manufacturer and the (in this case monopolistic) retailer equals the difference in joint firm profits Δ . (At this time the initial investment I_M is already sunk.) When profits are shared equally, then, from an ex ante perspective, the manufacturer will invest only if⁶⁷

$$\frac{\Delta}{2} \geq I_M. \quad (3)$$

Consequently, when condition (3) does *not* hold, the manufacturer refrains entirely from investing, even though it would be efficient – compared to innovation by the retailer, given condition (2).

When, altogether, $I_R \leq \Delta < 2I_M$, such that the retailer's costs of innovation are not too large (though larger than those of the manufacturer), then in the case currently under consideration there will be investment by the retailer, but not by the manufacturer. That is, innovative activity will still take place, but it is inefficient because it is undertaken at higher cost by the retailer. When, instead, $\Delta < I_R$, the innovative activity will not take place at all, since the retailer's own incentives are too low, given its high costs, and the manufacturer's incentives are too low as well, given the hold-up problem due to the subsequent sharing of the surplus from the innovation. These observations give rise to the following results. (While the results are stated somewhat informally in the main text, they are rigorously derived in the Appendix.)

⁶⁵ Although not critical for what follows, I thus implicitly also assume that, apart from the single retailer, only the manufacturer considered can make the upgrade investment to u_1 , rather than any other manufacturer that can procure the basic variant with characteristics u_0 .

⁶⁶ If it were possible for suppliers and buyers to ex ante jointly contract on, say, the development and introduction of a new product, then the decision to undertake the required investments should be independent of how overall profits are shared between the manufacturer and retailers. Such 'complete contracting' is clearly not always realistic, at least outside private labels, given competition between retailers, as well as the manufacturer's preference for keeping some details on innovation and production secret.

⁶⁷ Formally, such an equal distribution of the gross surplus, Δ , would arise from so-called symmetric Nash bargaining after the investment has been undertaken. See, for example, Grossman and Hart (1986) and, more generally, Binmore et al. (1986).

Conclusion 1. *When, in the baseline case with a single manufacturer and a single (large) retailer, there is equal surplus sharing after the manufacturer makes the investment, then the innovative activity may shift to the retailer even if this reduces efficiency (compared to the case where the investment is made by the manufacturer). Or, there may be no innovation at all, even though it is efficient from the firms' perspective (since the manufacturer's costs of innovation are strictly lower than the resulting increase in joint profits).*

Conclusion 1 is due to a standard hold-up problem. It follows because in the current case, the manufacturer cannot appropriate the entire surplus when it innovates, but only half of it. The resulting inefficiencies can then be either a shift of innovative activity, albeit at higher costs, to the retailer or a lack of innovative activity. As I show in the following section, however, even when there is no such hold-up problem, since the manufacturer is in a position to extract (almost) all gains from its innovation, these inefficiencies may still arise – notably the inefficient switch of innovative activity to the retailer, albeit now due to a different rationale.

The hold-up problem will, however, clearly arise as long as the manufacturer must rely on the respective retailer to access particular groups of consumers. As discussed in Section 2 with specific reference to the wider literature on buyer power, such gatekeeping is indeed more likely when a retailer has market power in some (local) markets. However, as noted there, shopping habits, such as one-stop shopping, can also contribute to a strengthening of retailer gatekeeping power. The observation in Conclusion 1 is not novel. In the competition economics literature, as well as in policy papers, it is often suggested that it is precisely through this channel that the exercise of buyer power could stifle suppliers' incentives to invest and innovate.⁶⁸

4.2.2.2 Retailer Innovation Due to a Rent Appropriation Motive

In the previous section, I showed how surplus sharing (with the gatekeeping retailer) and the resulting hold-up problem mute the manufacturer's incentives to innovate, which works towards inefficiently shifting innovation activity to retailers. I now enrich the analysis and show that the way profits from innovation are shared can also work towards inefficiently increasing a retailer's incentives to innovate, thereby crowding out the manufacturer's innovation.

I now examine the case when the manufacturer appropriates all surpluses from an innovation, provided that it undertakes the innovation alone (so that there is no duplication through an equal innovation

⁶⁸ For instance, a report by the Federal Trade Commission (2001, p. 57) raises concerns that when, facing increasingly powerful buyers, 'suppliers respond by under-investing in innovation or production'. Likewise, a report on buyer power prepared for the European Commission (1999, p. 4) suggests that, when facing powerful buyers, suppliers may 'reduce investment in new products or product improvements, advertising and brand building'. Chen (2004) applies a hold-up problem to study the impact of a monopolist's buyer power on variety, while Battigalli et al. (2006) analyse investment in quality in the context of competing retailers. The literature has analysed various other channels through which buyer power can affect manufacturers' incentives to invest and innovate (e.g., Inderst and Wey 2004). It has been shown, in particular, that while buyer power may sometimes have a positive effect on incentives to invest, because it keeps manufacturers 'on their toes' (Inderst and Wey 2007, 2011), this is more likely to be the case for incremental improvements (or process innovation), but less so for new product development.

by the retailer).⁶⁹ While, for the manufacturer, it would then always pay to invest, given that the respective joint profits it can now extract are larger than investment costs ($\Delta > I_M$ from condition (1)), I show that innovation activity may still switch to the retailer instead. This is because the retailer now has strong incentives to use its gatekeeping function and replace the manufacturer's investment, to allow the retailer to extract a larger share of profits (albeit these are now lower, given its higher investment costs). I call this a rent appropriation motive of innovation.

Now the retailer innovates always when the incremental profits from the innovation, Δ , are sufficiently large to cover the retailer's innovation costs I_R . The retailer's incentives to then innovate regardless of whether it expects the manufacturer to innovate as well are due to a rent appropriation motive: Since the retailer expects to realise only a small share (currently exactly a zero share) of the gains from the innovation when only the manufacturer innovates, the retailer would rather duplicate the innovation, provided that its innovation costs are not too large.

Conclusion 2. *When, in the baseline case with a single manufacturer and a single (large) retailer, an innovating manufacturer can extract all gains from the innovation, then the innovation activity will, instead, shift to the retailer as long as this covers the retailer's innovation costs (regardless of the resulting inefficiency, since the retailer's costs are strictly above the manufacturer's costs).*

In this section I focus on the case where the manufacturer can extract all incremental profits from the innovation, provided that only the manufacturer and not the retailer innovates. Note, however, that the rent appropriation motive will be present as long as the manufacturer extracts a share of the incremental profits (i.e., as long as the retailer does not extract all of it). Instead, the previously analysed hold-up problem, which dampens the manufacturer's incentives to innovate, is present as long as the manufacturer does not extract all incremental profits. In the next section I combine these two forces.

4.2.2.3 Summary: Innovation Activity in Equilibrium (and Resulting Inefficiencies)

To fully analyse the outcome in the present bilateral monopoly case, I need additional specifications. That is, even the present 'semi-formal' analysis of innovation activity needs to be precise about when each party can make decisions. Still in a highly stylised way, I specify that the decision to innovate or not is made simultaneously by the retailer and the manufacturer.⁷⁰ In equilibrium, the decision whether to innovate or not must now be mutually optimal. That is, when one party (say, the manufacturer) chooses to innovate, then this must be more profitable than not innovating, given the manufacturer's expectations about what the retailer does. These expectations must, in turn, correspond to the retailer's true choice, which is, again, its optimal choice.

⁶⁹ Formally, this would arise whenever the manufacturer could confront the retailer with a take-it-or-leave-it offer. In the formal analysis in Appendix, I allow for any possible sharing of the respective profits, showing that the present insights are robust.

⁷⁰ For instance, this could be the respective decision to take up a new trend in consumer behaviour and develop and market a respective product in a particular segment. In reality, depending on the particular situation, there may be both some degree of overlap and first-movership of innovative activity.

I obtain the following results. Clearly, if the manufacturer expects the retailer to innovate for sure, then it is never optimal for the manufacturer to do the same, given the bilateral monopoly and the all-or-nothing nature of the considered innovative activity. In fact, this result hinges on the gatekeeping function of the retailer, since the retailer is essential for the manufacturer to sell to consumers. The reverse, however, does not hold. I explore this issue again below.

Recall further that I identify two rationales for the inefficient substitution of manufacturer innovation activity by retailer innovation activity: the hold-up problem and the rent appropriation motive, depending on how gains are shared if only the manufacturer innovates. The way these gains are shared could depend on many determinants and I remain agnostic about this issue. Still, irrespective of how gains are shared, the inefficiency remains.

Conclusion 3. *Take the baseline case with a single manufacturer and a single (large) retailer, where both sides can choose whether to invest in a given innovation. Then, even when the retailer's investment is less efficient, given condition (2), the outcome is biased towards the retailer's investment, which then inefficiently substitutes for an innovation by the manufacturer. This inefficiency occurs because the retailer's gatekeeping role either undermines the manufacturer's incentives to innovate due to a hold-up problem or generates additional incentives for it to appropriate rents. The following outcome is obtained:*⁷¹

i) Take the case where the manufacturer can extract all gains when only it but not the retailer invests in the innovation. Then only the retailer will invest as long as the gains cover its higher costs, with $\Delta \geq I_R$.

ii) Take the case where the gains are equally shared when only the manufacturer innovates: Then the retailer innovates when the gains are sufficiently large, $\Delta \geq 2I_R$, while otherwise the manufacturer innovates (or there is even no innovation at all, which is the case when $\Delta < 2I_M$).

Conclusion 3 sums up the two isolated forces that could inefficiently shift innovation activity to a large retailer.⁷² Since the manufacturer must rely on the gatekeeping role of the (currently monopolistic) retailer, there can be a hold-up problem, which reduces its incentives to innovate. Further, if the retailer can extract a much larger fraction of the total gains by investing itself, it has an incentive to innovate even if this can be more efficiently done by the manufacturer.

4.2.3 The Threat of Imitation

I now assume that the retailer has the chance to imitate the manufacturer's innovation. That is, it can use the innovation even if it has not previously innovated and has also not come to an agreement with

⁷¹ This result, as well as all the others, is derived formally and more generally in the Appendix. There, I also impose the following equilibrium requirement: When there are multiple equilibrium outcomes (i.e., one where only the manufacturer would invest and one where only the retailer would invest) and if one of these outcomes is preferred by both the manufacturer and the retailer, I assume that the two sides coordinate on the respective outcome.

⁷² Recall that at this point, the retailer is, by assumption, large, since as it covers the same market that the manufacturer would cover, namely, all possible consumers.

the manufacturer. To illustrate clearly the additional economic forces that the possibility of imitation (and its threat) generates, I specify that the success of such an imitation activity be complete, so that the resulting product also delivers quality u_I , but at a cost K to the retailer. Clearly, imitation will only be of interest when

$$K < \Delta, \tag{4}$$

so that the costs are lower than the maximum profits that can be extracted from the innovation. Note that at this point I consider a single (monopolistic) retailer. When I later change the retailer's size, since there are various retailers in the market, a condition such as (4) will clearly hinge on the respective size. In addition, I specify that

$$K < I_R, \tag{5}$$

so that imitation involves fewer resources for the retailer than innovating.

Before I conduct the analysis, it is worth noting the difference in imitation incentives between a retailer and, say, another manufacturer. As the analysis shows, a retailer indeed has such incentives. In fact, when the retailer fails to come to an agreement with the manufacturer on the terms and conditions of delivery of the innovated product, imitation pays, since the retailer controls access to consumers and can thus sell the copied version. This case would be entirely different if another manufacturer chooses to imitate. In the simplest case, there would be two identical versions of the product on the market. The copying manufacturer would, however, still have to compete for access to consumers, which retailers (or, in the present case, the monopolistic retailer) control. In this competition to be listed at the retailer, the imitating manufacturer would realise few (if any) gains from its investment. This short discussion is vital in that it emphasises why, apart from possibly having privileged access to an innovating manufacturer's information, a retailer may have particularly strong incentives for imitation (i.e., compared to a rival manufacturer), provided the retailer is sufficiently large to make the respective fixed costs worthwhile.

The precise analysis of innovation activity under the threat of imitation again depends on the precise specification of when the different decisions take place. I specify that the possibility to imitate can still be used after negotiations with the manufacturer. The threat of imitation restricts the profits that the manufacturer can extract from an innovation, even if it is currently the only innovator. Since the retailer can reject any proposal and imitate, the respective cost K is also the maximum that the manufacturer can realise. If I endow the manufacturer with all bargaining power, since it can make a take-it-or-leave-it offer, then its payoff from innovating is indeed always constrained by the threat of imitation and thus equal to K . Otherwise (i.e., with equal surplus sharing), it is $K/2$.⁷³

⁷³ When surplus is shared through negotiation, what matters is the retailer's outside option of imitation, which yields $\Delta - K > 0$ (while the manufacturer then ends up with zero profits, since it relies on the currently monopolistic retailer). When the net surplus (now the difference in total profits from the innovation and the outside option payoffs) is still split equally between the manufacturer and the retailer, then I find that the manufacturer realises only $K/2$ from the innovation (i.e., after subtracting initial investment costs, only $K/2 - I_M$).

What is immediately noticeable here is that the threat of imitation reduces the manufacturer's expected profits, thereby exacerbating the aforementioned hold-up problem. As I discuss more explicitly below, where retailers of different size are considered, the (credible) threat of imitation should also depend on a retailer's (critical) size. In this sense, retailer consolidation further aggravates the problem of an inefficient substitution of manufacturers' innovation activity through this channel, provided that the hold-up problem is sufficiently important. In fact, when there is equal surplus sharing, then the manufacturer now innovates only when $K > 2I_M$ (and thus no longer when $\Delta > 2I_M$, as in the case where imitation is not possible). Matters are more complicated when, instead, the rent appropriation motive dominates. While this can be somewhat reduced when the retailer can also wait and threaten to imitate, it should be noted that the threat of imitation makes it more likely that there will be no innovation at all. Failure of innovation is also more likely when the costs of imitation K decrease. The overall characterisation, which now involves more cases to distinguish, is left to the more formal material in the Appendix.

Conclusion 4. *The possibility of imitation by the (large) retailer will make it more likely that no innovation will take place at all, while – at least when there is surplus sharing from an innovation – it shifts Innovation activity (inefficiently) to the retailer, since it exacerbates the hold-up problem that the manufacturer faces.*

4.3 Retail Competition

4.3.1 Setup

I now introduce retail competition. I suppose there are N different retail markets. For simplicity, I specify that in each market there are only two competing retail outlets.⁷⁴ Throughout the analysis I restrict consideration to a single large retailer owning more than one outlet. I conduct a comparative analysis in the growth of this retailer through the acquisition of outlets in other markets (next to the still to be discussed organic growth through a waterbed effect when it can crowd out manufacturer innovative activity). I assume that the large retailer owns one outlet in n_L of the N markets.

While I provide a detailed calculation of pricing strategies and resulting profits for a well-known ('workhorse') case in the Appendix, I still describe profits in reduced form in the main text. Suppose that all retailers procure the single considered good of quality u from the same manufacturer. I denote the total profits that are realised with a single retailer by $\pi(u, u)$.⁷⁵ Note that I now use lowercase letters for profits to clarify that these are only profits in a single retail market. But I can also expand this case to that where retailers sell products of different qualities, for example, since only one procures from the innovating manufacturer or since only one innovates. The profit realised by a retailer that has

⁷⁴ The modelling setup is that of Inderst and Valletti (2011).

⁷⁵ I consider the case in which bilateral contracts are not observable to other retailers. Thereby appealing to a well-known opportunism problem, namely, that the manufacturer cannot manage to dampen intrabrand competition, the manufacturer will thus supply goods at conditions so that the marginal wholesale prices equal marginal costs. For details, see the Appendix or Inderst et al. (2013).

higher quality, namely, u_I , is then $\pi(u_I, u_0)$, while in this case the profit realised by the rival is $\pi(u_0, u_I)$. It holds that

$$\pi(u_0, u_I) < \pi(u_0, u_0) \leq \pi(u_I, u_I) < \pi(u_I, u_0). \quad (6)$$

Thus, profits at a given retailer are highest when only this retailer has the product of higher quality, while they are lowest when only the respective rival has the product of higher quality.⁷⁶ I stipulate in the main text that, from

$$K > \pi(u_I, u_I) - \pi(u_0, u_I), \quad (7)$$

a small retailer with a single outlet would never have sufficient incentives to either imitate an innovation or innovate itself (since $K < I_R$). Given this assumption, retailer size matters. Since, however,

$$I_R < N[\pi(u_I, u_I) - \pi(u_0, u_I)], \quad (8)$$

a large retailer owning an outlet in *all* markets would always have sufficient incentives to innovate; otherwise, it would be at a competitive disadvantage with respect to rivals. Again, this assumption makes it possible to focus on the case where retailer size matters, since it changes retailer behaviour (as n_I increases).

In the following, I isolate the new aspects that arise when competition is introduced. These can be the possibility of inefficient duplication of innovative activity, as well as to the possibility of a ‘waterbed effect’ arising when manufacturer innovative activity is crowded out. In the latter case, competition will then generate additional incentives for the large retailer to crowd out the manufacturer’s innovation activity.

4.3.2 Returns from Innovation

4.3.2.1 Manufacturer’s Return from Innovation

Note that at this point I do not allow for the possibility of imitation, which is introduced later. If only the manufacturer innovates, then no retailer has an alternative if it wants to stock the high-quality product. Consider first a small retailer.⁷⁷ Recall next that, in one setting I consider, the manufacturer can now make a take-it-or-leave-it offer to all retailers simultaneously. The manufacturer can now use retail competition to its advantage. The small retailer operating in a single market only can expect the rival outlet to stock the higher-quality product. Hence, if it does not agree with the manufacturer’s offer, its profits will be $\pi(u_0, u_I)$. Consequently, under a take-it-or-leave-it offer, the manufacturer can obtain the following payoff from any of the small retailers:

⁷⁶ Note, also, that when $\pi(u_0, u_0) = \pi(u_I, u_I)$ holds with equality, then in the symmetric case all benefits from the higher-quality products would be competed away, to the benefit of consumers.

⁷⁷ As already noted above, the contract offered by or negotiated with the manufacturer will specify a marginal wholesale price equal to the marginal costs of production. Hence, the manufacturer will receive its share of profits through a higher wholesale price on ‘inframarginal units’. In the literature, this scenario is typically modelled through a so-called two-part tariff contract, which – in addition to a constant per-unit wholesale price – admits a fixed transfer.

$$\pi(u_I, u_I) - \pi(u_0, u_I).$$

When there is joint surplus sharing, then the manufacturer obtains the following from a small retailer:⁷⁸

$$\frac{\pi(u_I, u_I) - \pi(u_0, u_I)}{2}.$$

Consider next the large retailer, which controls n_L outlets. If it has not innovated itself (since there is, at present, no option of imitation), then the manufacturer obtains from the large retailer just n_L times the payoff that it obtains with each of the small retailers. In other words, when the large retailer does not innovate and there is no option of imitation, then in the model currently under analysis, the size of the large retailer does *not* impact the terms of trade and thus the manufacturer's payoff. This is because I fully abstract from many other sources of size-related bargaining power and focus, instead, on the interaction of innovative activity and retailer size.⁷⁹

At this stage of the analysis the following is noteworthy. Recall that the competitive pressure in the different retail markets is not affected when the large retailer's size changes (through increasing n_L). The reason is that I allow the large retailer to own only a single outlet in each of the N separate markets. Suppose now for a moment, instead, that a large retailer owns two outlets in the same market. Then, since there are precisely two outlets for each market in my model, the large retailer would monopolise the respective market. With typical demand specifications, this would reduce the profits that the innovating manufacturer could extract from this market. In other words, when a market is monopolised by the large retailer, the retailer is again indispensable to serve this market (as in the previous case with a bilateral monopoly). There is no longer an option for the supplier to serve the market (or part of it) through another outlet, which would erode the market share and profits that an outlet earns when it does not stock the high-quality product. In this sense, retail competition benefits the manufacturer's innovation incentives.⁸⁰

If the manufacturer and the large retailer now innovate, then the manufacturer can only extract a positive payoff from the small retailers. Consequently, the respective payoff is given as follows. Evidently, since these smaller retailers control altogether $2N - n_L$ outlets (recall that there are two outlets in each of the N markets), with a take-it-or-leave-it offer the manufacturer realises profits of

$$(2N - n_L)[\pi(u_I, u_I) - \pi(u_0, u_I)] \tag{9}$$

and, under surplus sharing, profits of

⁷⁸ The net surplus in each negotiation is indeed $\pi(u_I, u_I) - \pi(u_0, u_I)$, which is shared equally under the chosen symmetric Nash bargaining.

⁷⁹ In particular, with constant marginal costs and without a better alternative for the large retailer at this stage of the game, the sources of buyer power identified in Inderst and Wey (2007, 2011) are not present.

⁸⁰ It should be noted that such an effect does not arise in many studies, since these often assume only a single, monopolistic outlet in each (local) market (e.g., Inderst and Wey 2003, 2007).

$$\frac{1}{2}(2N - n_L)[\pi(u_I, u_I) - \pi(u_0, u_I)]. \quad (10)$$

4.3.2.2 Retailer Innovation Incentives

Given condition (7) (together with $K < I_R$), I can focus on the large retailer's incentives to innovate. Suppose the manufacturer is expected to innovate. The retailer would then, as without competition, want to also innovate when the respective rent appropriation motive is sufficiently strong. For instance, when the manufacturer can make a take-it-or-leave-it offer, then

$$n_L \geq \frac{I_R}{\pi(u_I, u_I) - \pi(u_0, u_I)}. \quad (11)$$

This condition exemplifies the key role that is now played by retailer size. The higher the number of outlets the large retailer controls, the higher its incentives to innovate, since the respective costs can then be distributed over a larger volume. In the Appendix, I derive the analogous expressions for the case with surplus sharing (where the rent appropriation motive is attenuated) and the case in which the retailer expects the manufacturer not to invest. By comparing the profits and conditions for the manufacturer and the large retailer, I can then fully characterise the equilibrium outcome. I confine the following main text to isolating only the key insights from this analysis.

4.3.3 Inefficient Duplication and the Waterbed Effect

What is new compared to the case of a bilateral monopoly is the possibility that both the manufacturer and the large retailer innovate, which leads to an inefficient duplication of investment costs. Then the manufacturer offers its product only through the small retailers, while the large retailer offers its own high-quality (private label) product. This case now arises when the large retailer is sufficiently large, owns a sufficient number of outlets, and its (higher) innovation costs are not too high. As evidenced in the previous analysis, the large retailer's incentive to duplicate innovation is the rent appropriation motive.

Conclusion 5. *When the large retailer is still sufficiently small (small n_L), only the manufacturer innovates. Instead, if the large retailer is sufficiently large and both the retailer's and manufacturer's costs of innovation (I_R and I_M) are not too large, there will be an inefficient duplication of investment as both the large retailer and the manufacturer innovate.*

In the case of duplication, all retailers will have access to the innovated product, albeit with lower welfare since the respective costs are incurred twice in the economy. Such a scenario occurs when the large retailer's size becomes sufficiently large. However, if the size increases further and innovation costs are not too low, then only the large retailer may innovate. As the retailer grows larger, it can then distribute innovation costs over a larger number of units, but it will also deprive the manufacturer of the respective volume if the manufacturer invests. The fact that the manufacturer then ceases to innovate now provides additional incentives for the large retailer to innovate. This is because by crowding out the manufacturer's innovation, smaller retailers are now deprived of the respective innovation, such that the large retailer obtains a competitive advantage in markets where it competes with outlets

operated by small retailers. (To be precise, the respective gain in profits per outlet is the difference between $\pi(u_I, u_0)$ and $\pi(u_I, u_I)$.)

Conclusion 6. *With competition, when the large retailer grows sufficiently large (high n_L) and innovation costs are not too low, an equilibrium is obtained where only the large retailer but no longer the manufacturer innovates. This situation deprives smaller (competing) retailers of the respective innovation.*

With this outcome, two types of inefficiency are present. First, with $I_R > I_M$, the large retailer innovates, even though it has higher innovation costs. Second (and possibly more important from a competition policy perspective), anticipation of the large retailer's innovative activity stifles the manufacturer's activity, which deprives smaller retailers of access to high-quality products. I therefore term this a (non-price) waterbed effect: The large retailer obtains a more competitive position when smaller retailers are deprived of the innovation.⁸¹

An interesting formal observation can now be made that also has practical implications. Under some circumstances, two equilibrium outcomes are possible: one where only the large retailer innovates and one where only the manufacturer innovates. Anticipation of the manufacturer's innovation makes it no longer optimal for the large retailer to invest and vice versa. Such a situation may also arise without competition, but previously I could rule this out by appealing to coordination, given that both the manufacturer and the (monopolistic) retailer prefer the more efficient outcome where the manufacturer invests. This is now no longer the case: There is a conflict of interest. Both the manufacturer and small retailers would prefer one scenario, namely, one where the manufacturer still innovates and supplies all outlets, while the large retailer would rather crowd out the manufacturer's investment.

Hence, with retailer competition a situation arises where the large retailer would benefit from 'inducing' an outcome where its innovation basically forestalls the innovative activity of the manufacturer to the detriment of smaller retailers. What makes this outcome additionally profitable for the large retailer compared to that where the manufacturer innovates is the competitive advantage vis-à-vis its rivals. Realistically, albeit outside the present modelling environment, one should then expect the large retailer to undertake additional strategies that would essentially grant it a first-mover advantage. Without providing a further model, from this perspective the strategy of developing a strong brand of private label products may serve the purpose to commit to a first move in innovative activity, which can dampen the manufacturer's incentives.

Recall that without competition a reduction of imitation costs – or, more generally, the introduction of the possibility of such imitation – has the effect of aggravating the hold-up problem that the manufacturer faces (in the case of surplus sharing). This relation holds even more so as the retailer becomes larger. When the manufacturer but not the large retailer innovates, it is only through the threat of imitation in the present model that an increase in the number of outlets that the large retailer controls re-

⁸¹ The term *waterbed effect*, denoting how large buyers can harm smaller buyers through a deterioration of the latter's terms and conditions, is used in Inderst and Valletti (2011) and Inderst (2007).

duces the manufacturer's profit (compared to the case where these outlets are still controlled by smaller retailers, for which such imitation is not sufficiently attractive). Aggravation of the hold-up problem makes it more likely for innovative activity to shift away from the manufacturer. When innovation activity is picked up by the large retailer, the large retailer enjoys a competitive advantage. The possibility to imitate, which only pays when the retailer is already large enough, thus facilitates the crowding out of the manufacturer's innovative activity and thus makes the waterbed effect of Conclusion 6 more likely.

Taking stock, I identify the following rationales for why in the considered economy there can be a shift of innovative activity away from the manufacturer and to a large retailer, even when it is inefficient. As in the bilateral monopoly case, when a hold-up problem arises from surplus sharing, it reduces the manufacturer's incentives to innovate. Instead, incentives for retailer innovation stem from the objective of obtaining a higher share of the total surplus, even where the resulting surplus is lower due to inefficiently high investment costs (rent appropriation). With competition, this can now even give rise to the duplication of innovation costs. However, the outcome where only the large retailer innovates can, in particular, now also ensure that it gains much more when only it, but not smaller rivals, has access to the described high-quality product (waterbed effect).

4.3.4 Relation to the 'Price Waterbed Effect'

When only the large retailer innovates in the model, the value of its offering to consumers increases, but when it crowds out the innovation of the brand manufacturer, it may deprive smaller retailers of an equally competitive position. I called this the waterbed effect, since in this case the advantage of the large retailer comes at a disadvantage to smaller retailers. The causal link is the reduced innovative activity of the brand manufacturer.

I briefly digress to present the more standard waterbed effect theory of harm, since, despite the obvious difference, there are some interesting links. If a powerful retailer obtains a discount that it (at least partially) passes on to consumers, its own clientele should benefit.⁸² This effect may even result in a 'virtuous' cycle, since it leads to further growth and discounts that may then be passed on to consumers and since competitors may have to follow suit and cut prices as well. However, this argument not only rests on the presumption that smaller retailers can stay in the market instead of being squeezed out, which could result in higher concentration and prices in the long run, but also presumes that the discount given to the more powerful buyer will not have a waterbed effect⁸³ on the purchasing prices of other, less powerful retailers.⁸⁴

⁸² This assumes that the exercise of buyer power, which is necessary to obtain such a discount, leaves unchanged the variety of goods that are offered. Mergers between retailers, which give rise to buyer power through an increase in size, may lead to such a reduction in variety. Inderst and Shaffer (2007) show how, in addition, the use of delisting as a strategy to increase buyer power reduces variety.

⁸³ This term is used, for instance, in Foer (2006) when discussing the potential impact of Wal-Mart.

⁸⁴ This possibility is explicitly recognised in the European Commission's (2001, paras. 126 and 135) guidelines on horizontal agreements, here in the form of buyer groups.

The possibility of such a waterbed effect has recently achieved sound theoretical footing. If the exercise of buyer power erodes suppliers' profits, in the long run some suppliers may be forced to exit or to merge to survive, which should put upward pressure on wholesale prices. But even if the upstream market structure remains unchanged, the bargaining power of smaller and less powerful buyers may deteriorate when they face more aggressive pricing by their larger, more powerful rivals. One reason for this is straightforward: Just as a large buyer can use its size to obtain discounts, the reduction in volume reduces the outside options of less powerful retailers and, thereby, could lead to a deterioration of their own terms of trade (provided that a manufacturer does not want to counteract this tendency).⁸⁵

There is an interesting twist in this waterbed effect argument that links it closely to the discussion in the present section. Ignoring innovation for a moment, suppose that the large retailer sells a private label product while other retailers sell the respective product of a single branded goods manufacturer. The starting point of the argument is now not so much a discount that the larger buyer enjoys. Consider, instead, a merger by which a still larger fraction of the industry is controlled by the respective large retailer, so that, likewise, the market share of the respective branded product is reduced. Any fixed costs generated by the production, marketing (e.g., a national campaign), or distribution of the branded product must then be distributed over a smaller volume, which should raise costs for the respective retailers.⁸⁶ Similarly, benefits of scale can no longer be enjoyed to the same extent by the respective manufacturer(s), which should also increase the wholesale prices for these retailers.⁸⁷

Such a waterbed effect is very much akin to that analysed with respect to innovation in this section. However, in addition to the loss of volume that the large retailer's private label production implies for the manufacturer, I also identify a competitive effect, namely, that the innovative activity of the large retailer dampens that of the manufacturer of branded products, thereby reducing the competitiveness of smaller retailers.

5 Concluding Remarks

This study is motivated by the growing consolidation of retailers and the spread of private label products, both of which increase buyer power of large retailers. Over the last decade, competition policy has become increasingly concerned about the implications of these developments for competition and welfare. This report identifies additional channels through which the exercise of buyer power can lead to harm to competition and welfare. These channels focus on the allocation of functions between retailers and manufactures in a process that I call 'vertical competition'.

⁸⁵ This reasoning is formalised in Inderst (2007), where it is also shown that a waterbed effect is likely to be stronger when the affected retailer is already particularly weak.

⁸⁶ See Majumdar (2005) for a formalisation.

⁸⁷ A related argument suggests that there may be a tipping point for the economic viability of some of the supporting infrastructure on which smaller retailers jointly rely, such as buyer groups or independent wholesalers. If market shares become sufficiently low, the generated business may be too little to support this infrastructure, which would further deteriorate the purchasing conditions of small retailers. This argument is suggested in the Office of Fair Trading (2006), where it is applied to the entry of large multiples into the convenience store market.

This competition over functions between branded goods manufacturers and large retailers has been largely overlooked in the current discussion over the implications of buyer power and retailer consolidation. The results in this study suggest that these deficiencies need to be corrected so as to correctly assess the implications of buyer power and the growing importance of private labels on competition and welfare. In particular, given the chosen focus on innovation, retailer consolidation and the exercise of buyer power may cause inefficiency by crowding out innovations of branded goods manufacturers. At the heart of the various arguments is the ‘gatekeeping’ function that retailers frequently maintain.

Though the formal model focuses on innovation, the underlying argument is more broadly applicable. Retailers have often turned into powerful competitors over various functions in the vertical chain. Such functions comprise, next to product innovation, quality certification, as well as distribution and marketing. Control of a larger share of these functions, notably but not exclusively through private labels, ensures large retailers not only a larger share of the overall created value but also a better strategic position in their negotiations with brand manufacturers. To provide a background for the analysis and the thereby developed arguments, this report has documented how as retailers have grown in size, functions have increasingly shifted to large retailers, notably in European food retailing. With respect to private labels, this comprises increasingly also the function of innovation.

As already noted, some of the theories of harm developed in the formal analysis build squarely on an asymmetry between manufacturers and retailers, as the latter control access to consumers, in particular when they can act as ‘gatekeepers’. Competition law and policy may even strengthen such ‘gatekeeping’, e.g., by granting retailers unrivalled control over the final price through a strict implementation of a prohibition of retail price maintenance. This suggests the need to rethink such policies, notably how a prohibition of retail price maintenance and possible substitutes to control the retail price is enforced, in light of creating a level playing field between manufacturers and retailers for their ‘vertical competition’ over functions.

Lastly, the analysis suggests the existence of what was called an innovation ‘waterbed effect’. Besides negatively affecting overall efficiency and welfare, this distorts horizontal competition. It arises when by ‘crowding out’ the innovative activity of branded goods manufacturers, a large retailer gains a competitive advantage vis-à-vis smaller retailers. The formal analysis also shows how this can become more likely when there is a threat of imitation of manufacturers’ innovation by large retailers with private labels.

6 Technical Background to the Analysis in Chapter 4

6.1 Bilateral Monopoly

6.1.1 Setup

This section builds on Inderst et al. (2013). In fact, this report provided an opportunity to extract parts of this academic paper and to embed these into a broader discussion on buyer power, vertical competition and a shift in functions towards large retailers and private labels. The formal analysis in Inderst et al. (2013) goes beyond the material that is exhibited in this report, though. There, we also analyse first a bilateral monopoly, before introducing competition. In the material that is presented in the present section, we thus consider a bilateral monopoly. As noted above, the objective of this section is two-fold. First, the present analysis seeks to provide a baseline case for the subsequent introduction of retail competition, which enables us to isolate more clearly the effect of competition on a large retailer's decision to innovate or not. Second, this section aims to analyse the bilateral monopoly case, which is of interest in itself, since it shows that regardless of the distribution of bargaining power, there is a strong tendency for the retailer – which is essential, since it controls access to consumers (as the ‘gate-keeper’) – to ‘crowd out’ the manufacturer's innovation, even when this outcome is inefficient. Note, however, that the focus on a single retailer does not yet allow us to talk about the relevance of a (large) retailer's size. This factor is captured later, through the number of outlets that a large retailer, in contrast to small retailers, controls.

Suppose, thus, for now that a single manufacturer faces a single retailer. The focus is on the decision to improve the quality of a single product. For ease of exposition, as well as to bring out the innovative aspect of the considered investment, we suppose that the product's original (quality) characteristics u_0 can, through innovation, be increased to $u_1 > u_0$ (i.e., we consider a non-incremental change in characteristics). Further, we suppose, for simplicity, that this leaves the constant marginal cost of production unchanged at $c \geq 0$.

We abstract from the vertical relationship for a moment and suppose that the manufacturer can directly sell a product with quality u to consumers. The resulting profits are denoted $\Pi(u)$, where $u \in \{u_0, u_1\}$. For the present analysis we need not specify whether firms set prices or quantities at the final (retail) stage. For specificity only, suppose that a price p is chosen, which then gives rise to a demand $D(p; u)$. Demand is (where positive) strictly decreasing in p and strictly increasing in u . Profits are then

$$\Pi(u) = \max_p [(p - c)D(p; u)]. \quad (12)$$

The retailer can procure the basic variant of the product, with quality u_0 , from the manufacturer, as well as from one of many other manufacturers. That is, the basic variant is supposed to be produced and supplied competitively. Instead, the enhanced variant with higher quality u_1 can only be developed and produced in one of two ways: Either the manufacturer innovates or the retailer takes the initiative and innovates together with one of the competitive manufacturers. In terms of applications, the

second variant captures the case in which an innovation is undertaken through a private label product. When the manufacturer innovates, we suppose that it has to incur costs I_M . When, instead, the retailer innovates, it bears the investment costs itself, which then equal I_R . We do not rule out the possibility that both invest at the same time (see below for the precise timing). Crucially, as is realistic for the applications that we consider, we do not allow the two parties to ex ante contract on the innovative activity (including the specification of a sharing rule). Clearly, the innovative activity will only be undertaken at all, if

$$\Delta = \Pi(u_I) - \Pi(u_0) > \min \{I_M, I_R\}. \quad (13)$$

This is assumed to be the case in the following.

The timing is as follows. At $t = 1$, both the manufacturer and the retailer can decide whether to innovate. As we presently consider a bilateral monopoly, once the retailer innovates, there is no scope for the manufacturer to sell its product. When neither innovates, then only the basic and competitively provided variant is on the market, in which case only the retailer makes positive profits equal to $\Pi(u_0)$ (however, whether these are strictly positive or not does not affect our analysis)

Finally, when only the manufacturer innovates, there is then scope for mutually beneficial negotiations that would ensure that the superior quality is offered by the retailer. These negotiations take place at $t = 2$. Note that at this stage, where investment costs are already sunk, the net surplus from successful negotiations is given by Δ , provided that the two sides can rule out double marginalisation and, thereby, realise the maximum feasible industry profits. This is the case, since we allow for nonlinear contracts. To be precise, though this is without loss of generality, we take a two-part tariff wholesale contract with fixed payment F and constant marginal wholesale price w . Beyond this specification, that is, of joint profit maximising wholesale contracts, we are presently noncommittal about how Δ is shared and, therefore, suppose that a share α goes to the manufacturer and a share $(1 - \alpha)$ to the retailer, where $\alpha \in [0,1]$. Formally, we could appeal to an application of the axiomatic Nash bargaining solution with respective weights at this stage of the game. Note that we comment explicitly on the corner cases with $\alpha = 0$ and $\alpha = 1$, where the outcome corresponds to either the retailer or the manufacturer making a take-it-or-leave-it offer.

At the final stage, $t = 3$, the product (of either quality $u = u_I$ or $u = u_0$) is brought to the market, which generates total industry profits $\Pi(u)$.

6.1.2 Analysis

The following focuses on the characterisation of a pure strategy equilibrium. We start with some immediate observations. Clearly, the manufacturer has only an incentive to innovate when it expects the retailer not to innovate itself. Further, this strategy will only result in non-negative profits when

$$\alpha \geq \alpha^* = I_M/\Delta. \quad (14)$$

Consequently, when condition (2) does *not* hold, the manufacturer always refrains from innovating. This is, however, not true for the retailer. Since the retailer acts as a gatekeeper to consumers, it can appropriate the full surplus Δ when it innovates itself.

These two observations already summarise the two forces at work in the bilateral monopoly case: First, a hold-up problem exists for the manufacturer, which is greater the lower the manufacturer's share α .⁸⁸ Second, when α is higher, so is the retailer's incentive to innovate itself to fully appropriate the respective gains. In other words, as α increases, the hold-up problem is mitigated, but the rent appropriation motive for the retailer becomes stronger. Conversely, when α decreases, the hold-up problem becomes more severe, though now the rent appropriation motive for the retailer is mitigated. Taken together, these two forces ensure that, in a nutshell, the retailer will innovate even when it is inefficient to do so, given $I_R > I_M$. (When the converse holds, the retailer will always innovate.)

For the characterisation in Proposition 1, we now also apply the following refinement: Whenever a multiplicity of (pure strategy) equilibria exists, we rule out those equilibria that are weakly Pareto dominated.

Proposition 1. *In the case of a bilateral monopoly, there is generically a unique pure strategy equilibrium. Whenever it is (weakly) more efficient that the retailer innovates, that is, $I_R \leq I_M$, then only this outcome arises in equilibrium. When the converse holds, such that $I_R > I_M$, it would be more efficient for the manufacturer to innovate, but this, however, need not be the case, since then either the retailer may innovate instead or no innovation may take place at all. Specifically, when $I_R > I_M$, we have the following case distinction:*

- i) When, in addition, $I_R \geq \Delta$, then the manufacturer innovates if $\alpha \geq \alpha^*$, while for $\alpha < \alpha^*$ there is no innovation at all (with the exception of $I_R = \Delta$, where the outcome with retailer innovation is also supported).*
- ii) When, instead, $I_R < \Delta$, then the manufacturer innovates only if $\alpha^* \leq \alpha < \alpha^{**} = I_R/\Delta$, while for both $\alpha < \alpha^*$ and $\alpha \geq \alpha^{**}$ the retailer innovates.*

Proof. See Section 6.3.

When the innovation would be more efficiently undertaken by the manufacturer, then two types of inefficiencies can arise, according to Proposition 1: Either the innovative activity (inefficiently) shifts to the retailer or no innovation is undertaken at all. Clearly, the latter case only applies when innovation is too expensive for the retailer, because $I_R \geq \Delta$ (case i) in Proposition 1. In this case, the source of inefficiency is solely a hold-up problem. Instead, in case ii) of Proposition 1, which applies for $I_M < I_R < \Delta$, both the hold-problem and the rent appropriation incentives of the retailer cause inefficiencies. Though both effects are always present, that is, unless either $\alpha = 0$ or $\alpha = 1$, somewhat informally speaking, the hold-up problem is the stronger force for low α and the rent appropriation incentive is the stronger force for high α . (When $\alpha = 0$, only the hold-up problem is present, while for

⁸⁸ For a foundation of the hold-up problem see, for example, Klein et al. (1978), Williamson (1979), and Grossman and Hart (1986).

$\alpha = 1$, there is no longer a hold-up problem, since now the rent appropriation incentives are strongest.) Corollary 1 summarises the inefficiencies.

Corollary 1. *When, in the bilateral monopoly case, retailer innovation is less efficient, given $I_R > I_M$, two types of inefficiencies can arise:*

- i) The hold-up problem leads to a failure of innovation when $\Delta \leq I_R$ and $\alpha < \alpha^*$.*
- ii) The combination of the hold-up problem and the rent appropriation incentives of the retailer inefficiently shift innovative activity to the retailer when $\Delta > I_R$ and either $\alpha < \alpha^*$ or $\alpha \geq \alpha^{**}$.*

6.1.3 Imitation

Maintaining the framework of a bilateral monopoly, we now introduce the following variation. As noted above, large retailers (with a well-established line of private labels at their disposal) are sometimes accused by brand manufacturers of imitating their innovations and bringing them to market themselves. As discussed previously, for instance, in food retailing, there may indeed be very limited legal protection against such copying and imitation. In this section, we now allow for such imitation.

Note that we presently consider a single monopolistic retailer of fixed size. Later, we allow for the possibility that a retailer only has incentives to imitate when it grows sufficiently large in size. For now, however, we simply stipulate that the retailer would have to incur costs K to imitate the manufacturer's innovation. For convenience only, we assume that such imitation is complete, that is, it delivers quality u_I . Obviously, imitation must occur after $t = 1$. We suppose that it is at the retailer's disposal right until the final period, $t = 3$. In particular, this implies that the retailer still has the option to imitate if negotiations with the manufacturer fail.⁸⁹

Clearly, imitation will only be of interest when

$$K < \Delta, \tag{15}$$

so that the costs fall short of the surplus that can be fully extracted from the innovation. Moreover, we specify that

$$K \leq I_R, \tag{16}$$

so that imitation involves (weakly) fewer resources for the retailer than innovation.

Obviously, the possibility to imitate is of relevance when only the manufacturer has innovated. Taking the retailer's outside option to imitate into account, the net surplus that the manufacturer and the retailer could jointly realise from an agreement is then reduced to K . This surplus is again shared according to the respective fractions α for the manufacturer and $(1 - \alpha)$ for the retailer, so that the manufac-

⁸⁹ In fact, as noted above, it may be precisely in the course of these negotiations that the retailer gathers sufficient information that then enables it to successfully imitate the innovation.

turer will innovate only if $\alpha \geq I_M/K = \alpha_K^*$. Proposition 2 characterises the equilibrium when imitation is possible.⁹⁰

Proposition 2. *In the case of a bilateral monopoly, there is a unique pure strategy equilibrium when imitation is possible. Whenever it is (weakly) more efficient for the retailer to innovate, given $I_R \leq I_M$, then only this outcome arises in equilibrium. When the converse holds, we have the following case distinction:*

i) *When, in addition, $I_R \geq \Delta$, then the manufacturer innovates if $\alpha \geq \alpha_K^*$, while for $\alpha < \alpha_K^*$ there is no innovation at all (with the exception of $I_R = \Delta$, where the outcome with retailer innovation is also supported).*

ii) *When, instead, $I_R < \Delta$, then the manufacturer innovates only if $\alpha \geq \alpha_K^*$, while for $\alpha < \alpha_K^*$ the innovative activity shifts to the retailer.*

Proof. See Section 6.3.

As is immediate, the possibility of imitation makes the hold-up problem that the manufacturer faces more severe. It is further aggravated when imitation becomes less expensive for lower values of K . In this case, welfare will be reduced either through a shift of the innovative activity to the retailer or when both parties refrain from innovation altogether. Interestingly, however, the possibility of imitation reduces the retailer's incentives to innovate solely because of a rent appropriation motive.

Corollary 2. *When, in the bilateral monopoly case, retailer innovation is less efficient, that is, $I_R > I_M$, the possibility of imitation has the following impact. It aggravates the hold-up problem if $\alpha^* < \alpha_K^*$, so that for a larger range of values α there is now either an inefficient shift of the innovative activity to the retailer (whenever $\Delta \geq I_R$) or no innovation takes place at all (whenever $\Delta < I_R$). On the other hand, since the rent appropriation motive disappears, the manufacturer will efficiently innovate for all higher values of α , where its bargaining power is sufficiently large.*

6.2 Small versus Large Retailers and Retail Competition

6.2.1 Setup and Auxiliary Results

Suppose that there are now $N \geq 2$ independent local markets indexed by $n = 1, \dots, N$. In each market, two retail outlets compete for final consumers. Further, suppose that there is one large retailer that owns n_L outlets, while the remaining $2N - n_L$ outlets are owned by small retailers. We restrict the latter to each owning exactly one outlet. We consider, in particular, a comparative analysis of n_L .

To abstract fully from horizontal effects, that is, monopolisation issues, we suppose that each of the large retailer's n_L outlets is located in a different market. Note that this implies the restriction $1 <$

⁹⁰ In our framework, imitation does not occur in equilibrium, as in, for example, Gallini (1992), where the optimal patent length is analysed without, however, considering a vertical structure. Imitation, instead, constrains the manufacturer's rents and thus affects its innovative activity, which is, though based on a different setting, in line with, for example, Tandon (1982) and Gilbert and Shapiro (1990).

$n_L \leq N$. That is, even at its maximum size, the large retailer only controls one-half of all outlets. This implies that even when the large retailer stocks private labels, that is, it decides to perform the innovative activity itself, the manufacturer can still at least sell through the same number of outlets. Note that, in contrast to the bilateral monopoly case with a single manufacturer and a single retailer, the existence of small retailers thus prevents the large retailer from acting as a gatekeeper to final consumers. We show that despite this being the case, the large retailer may still be the only one to innovate, particularly when there is strong retail competition. To illustrate this point clearly, we now stipulate that $I_M = I_R = I$. That is, both the manufacturer and the large retailer are now assumed to be equally efficient when performing the innovative activity.

The timing of the game remains unchanged: Innovation can take place at $t = 1$, when both the manufacturer and retailers can simultaneously decide to innovate or not. Provided a given retailer does not use its own product (i.e., after innovating itself), at $t = 2$ negotiations take place with the manufacturer. Finally, at $t = 3$ products are sold to the final consumers. We now flesh out the respective strategies in detail.

In the final period, albeit inconsequential for our results, we specify that firms set prices. Suppose that in a given market the two outlets set prices p_i and that the respective qualities of their products are u_i . Then, demand for outlet i in this market is given by $D(p_i, p_j; u_i, u_j)$, with $i \neq j$. When this demand is positive, it is strictly increasing with its own quality and strictly decreasing with its own price. The extent to which demand increases with the rival outlet's price p_j and decreases with the rival outlet's quality q_j depends on the intensity of competition. We proceed with an illustrative example.

Turn now to negotiations in $t = 2$. In the subsequent section, we again allow for an arbitrary sharing rule for net surplus in each bilateral negotiation. There, we also allow for differences between the large retailer's and the small retailer's shares. For this we then again combine an axiomatic (Nash) bargaining solution with our noncooperative investment game. However, to first simplify the exposition of the main results, we presently consider the simpler case where the manufacturer makes a take-it-or-leave-it offer to all the retailers that did not innovate themselves. (This corresponds exactly, as previously, to the generalised bargaining case where the manufacturer's share of net surplus is equal to one, that is, $\alpha = 1$.)

We again allow for nonlinear wholesale contracts and specify a fixed fee F and a constant marginal wholesale price w . Now with competing retailers, we make the assumption that the wholesale contracts between the manufacturer and each retailer are private information. We thus make use of the following well-known result.

Lemma 1. *With different retailers, since we consider nonobservable, nonlinear (specifically two-part tariff) wholesale contracts, the following result obtains for negotiations at $t = 2$ between an innovating manufacturer and any retailer that does not innovate. When retailers hold passive beliefs with regards to other retailers' contracts, which is what we assume, then the respective marginal wholesale price is equal to the marginal cost of production, $w = c$.*

Passive beliefs are commonly assumed in the literature and prescribe that any given retailer maintains its beliefs about other retailers' contracts when it receives, in the presently analysed take-it-or-leave-it offer game, a non-anticipated offer from the manufacturer.⁹¹ We assume that an equilibrium with passive beliefs exists.⁹² Given Lemma 1, wholesale contracting is basically restricted to the determination of the fixed part. For the presently analysed take-it-or-leave-it offer game, this will be specified in equilibrium such that the respective retailer is indifferent to acceptance or rejection.⁹³

Consequently, from Lemma 1, we can already use the fact that at $t = 3$ the two retailers in any given market will, next to observing the respective qualities u_1 and u_2 , also know the respective marginal costs (i.e., wholesale prices, abstracted from additional costs of handling). While we explicitly derive the respective equilibrium prices for the Hotelling case below, for now it is sufficient to work with equilibrium profits. Thus we only need to assume that these are uniquely determined. Then, substituting out equilibrium prices, the profits of outlet 1 and outlet 2 in a given market will depend on their own quality and their rival's quality and are denoted $\pi(u_1, u_2)$ and $\pi(u_2, u_1)$, respectively, with $u_1, u_2 \in \{u_0, u_I\}$. That is, if, in a given market n , outlet 1 has access to quality u_I , whereas its rival offers only the basic variant u_0 , then outlet 1's and outlet 2's profits become $\pi(u_I, u_0)$ and $\pi(u_0, u_I)$, respectively.

An increase in one's own product quality is profitable, while the higher quality of the rival's product (weakly) reduces an outlet's profit: $\pi_1 > 0$ and $\pi_2 \leq 0$, where the latter holds strictly in the case of competition. As is standard, we further assume $\pi_{11} > 0$ and $\pi_{12} < 0$. That is, innovations are strategic substitutes. That this holds true for most commonly used oligopoly models, including the subsequently analysed Hotelling Model, has been shown by Athey and Schmutzler (2001). For our case with a discrete choice between the basic variant and innovation, this implies⁹⁴

$$\pi(u_0, u_I) < \pi(u_0, u_0) \leq \pi(u_I, u_I) < \pi(u_I, u_0) \quad (17)$$

and

$$\pi(u_I, u_0) - \pi(u_0, u_0) \geq \pi(u_I, u_I) - \pi(u_0, u_I), \quad (18)$$

which again hold strictly with competition. We define $\Delta_h = \pi(u_I, u_0) - \pi(u_0, u_0)$ and $\Delta_l = \pi(u_I, u_I) - \pi(u_0, u_I)$, where $\Delta_h > \Delta_l$ follows immediately from (6). Note that without retailer competition Δ_h and Δ_l are identical, since there is no difference between pioneering and catching up with a

⁹¹ See Hart and Tirole (1990), McAfee and Schwartz (1994), and O'Brien and Shaffer (1994). Note, however, that, similar to our generalised approach in the following section, O'Brien and Shaffer (1994) use an axiomatic Nash bargaining approach with bilateral negotiations and wholesale contracts that are private information, rather than simultaneous offers.

⁹² For the case of Bertrand competition, the cross-elasticity of demand must be strictly smaller than half of the elasticity of demand for an equilibrium with passive beliefs to exist (Rey and Vergé, 2004, Proposition 2).

⁹³ Note also that the assumption of unobservable contracts allows us to abstract from any role that the manufacturer could play to dampen competition, that is, even without an innovation, namely, by raising rivals' marginal costs and distributing the gains from monopolisation through adjusting the fixed part.

⁹⁴ Note that when $\pi(u_0, u_0) = \pi(u_I, u_I)$, then in the symmetric case all benefits from the higher-quality products would be competed away to the benefit of final consumers. This is true for the Hotelling model, for instance.

single outlet per market n ; that is, a single outlet can only benefit from having access to the higher quality, but not from, for example, gaining a competitive advantage vis-à-vis its rival.

Assuming that

$$\Delta_h < I < N\Delta_h, \quad (19)$$

a small retailer will never want to innovate, while a large retailer may want to innovate when it becomes sufficiently large (at least if it owns an outlet in each of the N independent markets). Arguably, this allows us to restrict our attention to the interesting case where the large retailer's size can make a difference to innovation.

6.2.2 Equilibrium for the Innovation Game

We first present some immediate results on the large retailer's and the manufacturer's incentives to innovate. Recall that we presently consider the case where the manufacturer can make take-it-or-leave-it offers. Thus, when only the manufacturer innovates, it can extract the difference Δ_l from each outlet (i.e., exactly Δ_l from each small retailer and $n_L\Delta_l$ from the large retailer). At each outlet the alternative is to offer only the basic variant, while its rival offers the innovative variant.

Lemma 2. *The manufacturer will always innovate when it expects no one else to innovate. Instead, when it expects the large retailer to innovate, it will only (weakly) prefer to innovate when $n_L \leq 2N - I/\Delta_l = n_M^{**}$. Further, while small retailers will never innovate, the large retailer's incentives to innovate are as follows: It will innovate when $n_L \geq I/\Delta_h = n_R^*$ if it expects the manufacturer to not innovate and when $n_L \geq I/\Delta_l = n_R^{**} > n_R^*$ if it expects the manufacturer to innovate.*

Note that for Lemma 2 we again restrict ourselves to pure strategy equilibria, which is why we can restrict our expectations accordingly. Clearly, the manufacturer's incentives to innovate will be lower when it expects that its innovation will only be bought by $2N - n_L$ outlets, since the large retailer innovates as well. The large retailer's incentives depend on the anticipated choice of the manufacturer's strategy only when there is competition such that $\Delta_l > \Delta_h$ (otherwise $n_R^{**} = n_R^*$). With competition, the large retailer's incentives are strictly larger when it expects the manufacturer not to innovate.

Now, we are in a position to characterise the equilibrium in the case of retailer competition. Proposition 3 summarises our results.

Proposition 3. *Suppose that the large retailer owns an outlet in n_L of N markets, while in each market another outlet is owned by a small retailer. Innovation comes at cost I to either the manufacturer or a retailer. Presently, the innovating manufacturer can make take-it-or-leave-it offers to retailers. The innovation game then has the following outcome:*

- i) *When $N\Delta_l \geq I$, then both the large retailer and the manufacturer innovate if $n_L \geq n_R^{**}$ (duplication), while for $n_L < n_R^{**}$ only the manufacturer innovates.*
- ii) *When $N\Delta_l < I$, a multiplicity of equilibria exist, where either the large retailer or the manufacturer innovates, if $n_L > n_M^{**}$ and $n_L \geq n_R^*$ simultaneously hold, while, otherwise, only the manufacturer innovates.*

Proof. See Section 6.3.

Our findings in Proposition 3 are illustrated in Figure 5.

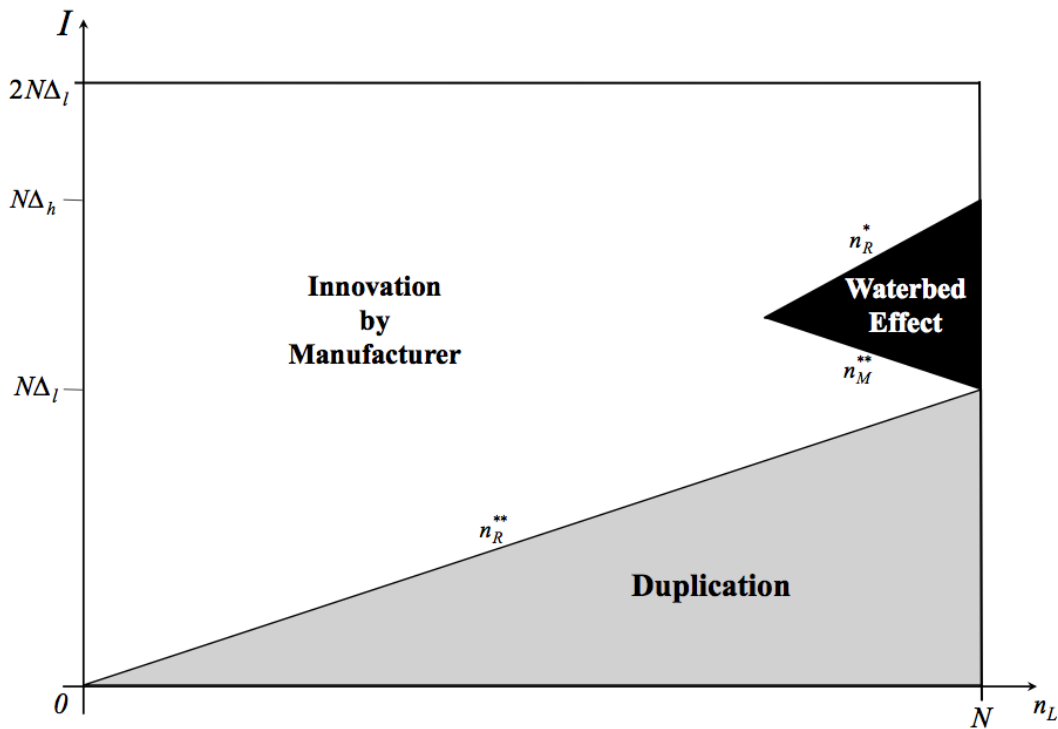


Figure 5: The waterbed effect

To disentangle the impact of retailer competition, we consider first the case where there is no retailer competition, implying $\Delta_h = \Delta_l$. In Figure 5 the black triangle, which represents multiplicity, would then disappear. There is duplication for $n_L \geq n_R^{**}$ and, otherwise, innovation by the manufacturer only. The only inefficiency thus arising is due to duplication, which relies on the large retailer's rent appropriation incentives. Further, note that duplication becomes more severe the more outlets n_L the large retailer owns, since this makes innovation more beneficial for it. Finally, notice that presently a hold-up problem does not emerge due to the assumption that the manufacturer can extract the entire net surplus when negotiating with non-innovating retailers.

With retailer competition, however, the large retailer has an additional incentive to innovate when it has exclusive access to the innovation: The retailer can realise a competitive advantage over its smaller rivals, which grants it pioneering gains $\Delta_h > \Delta_l$. Therefore, in equilibrium, the large retailer would never gain when it and the manufacturer coordinate such that the manufacturer performs the innovative activity instead.⁹⁵ It follows that, in the relevant range, there does not exist an equilibrium that is

⁹⁵ Clearly the manufacturer would never gain when it and the retailer coordinate such that the large retailer innovates alone in equilibrium. For a more detailed discussion, see the proof of Proposition 3.

not (weakly) Pareto dominated so that the multiplicity persists. Graphically, this gives rise to the black triangle in Figure 5.⁹⁶

In the previous discussion, we called this phenomenon the waterbed effect: Small retailers are hurt by the crowding out of the manufacturer's innovation decision, while the large retailer gains a competitive advantage since it is the only one that will offer consumers the high-quality product.

Corollary 3. *Suppose the innovating manufacturer can make take-it-or-leave-it offers to non-innovating retailers. Then, with retail competition, there are two possible inefficiencies that arise when the large retailer owns sufficiently many outlets (high n_L): First, there can be duplication of investment, since both the large retailer and the manufacturer innovate, in which case the high-quality product is offered as both a private label and a branded product; second, the large retailer's anticipated innovation can also crowd out the manufacturer's innovation, so that only the large retailer offers a (private label) high-quality product, whereas small retailers do not (waterbed effect).*

The welfare loss from duplication is clearly exactly equal to the respective costs I , which are incurred twice. Consider now the case of the waterbed effect. Compared to the case where only the manufacturer, instead of only the large retailer, innovates, the same investment costs are incurred, namely, exactly I . Welfare is, however, strictly decreased when only the large retailer innovates. Specifically, the respective loss in welfare is made up as follows. There is first a direct effect that arises from the crowding out of manufacturer innovation: The respective consumers at small retailers' outlets can no longer enjoy the high-quality product (and the respective small retailers will no longer be able to make higher profits from this offering). An additional effect arises, compared to the symmetric outcome, since some consumers will now no longer shop at small retailer outlets but instead switch to an outlet controlled by the large retailer. They will thus no longer shop at the outlet for which they would otherwise have the strongest horizontal preference, for example, in terms of lower transportation costs, as in the Hotelling model, which we analyse next.

Hotelling Model

We consider a Hotelling Model with linear transportation costs and uniformly distributed consumers over the unit interval. Outlets are located at both ends of the unit interval. If a consumer, whose location is x , shops at outlet 1 (2), which is located at 0 (1), then the consumer's net utility is given by $U = u_1 - p_1 - \tau x$ ($U = u_2 - p_2 - \tau(1 - x)$), where u_1 and u_2 represent the consumer's gross utility from purchasing the respective product, with $u_1, u_2 \in \{u_0; u_I\}$. This implies that a mass $x^* = 1/2 + [(p_2 - p_1) + (u_1 - u_2)]/2\tau$ shops at outlet 1.

Based on this model, we can immediately derive

$$\Delta_I \frac{(u_I - u_0)[\tau - (u_I - u_0)/6]}{3\tau} \quad (20)$$

⁹⁶ Recall again that this case (multiplicity) becomes relevant when catching up is never profitable, as for case ii) in Proposition 3, so that the large retailer needs to realise pioneering gains Δ_h to perform the innovative activity.

and

$$\Delta_h = \frac{(u_I - u_0)[\tau + (u_I - u_0)/6]}{3\tau}. \quad (21)$$

Further, note that $\partial\Delta_l/\partial\tau > 0$ and $\partial\Delta_h/\partial\tau < 0$. That is, increased competition lowers (*catch-up gains*) Δ_l , while it increases (*pioneering gains*) Δ_h . A key implication of this is that the ‘waterbed effect’ becomes more likely when competition intensifies: the respective triangle in the graphical illustration becomes larger. The Hotelling model allows also for an explicit calculation of the respective welfare losses. Details of these calculations are contained in Inderst et al. (2013).

6.3 Proofs for the Formal Analysis

Proof of Proposition 1. We start with the following auxiliary observations. It is never profitable for the manufacturer to innovate if it expects the retailer to innovate, since its payoff would be negative, that is, $-I_M < 0$. Conversely, if the manufacturer innovates, then it could be still profitable for the retailer to innovate. Precisely, whenever $I_R \leq I_M$, it follows from (1) that the retailer will always choose to innovate, since it would, even for low α values, never gain from trade with the manufacturer. This result is easily seen when noticing that $\Delta - I_R \geq (1 - \alpha)\Delta$, since the manufacturer’s rent must fulfil $\alpha\Delta \geq I_M$, which implies $\alpha\Delta \geq I_R$. Hence, not innovating and, instead, negotiating with the manufacturer (given (2)) provides the retailer with a (at least weakly) lower rent than innovating itself.

If, however, $I_R > I_M$, then we need to distinguish two cases: $\Delta \leq I_R$ and $\Delta > I_R$. If $\Delta \leq I_R$, then the retailer will only innovate if $\Delta = I_R$ and $\alpha < \alpha^*$ (if $\Delta < I_R$, the retailer will refrain from innovating, irrespective of α). The manufacturer will, however, innovate whenever (2) holds. Now suppose that $\Delta > I_R$. Note that $\Pi(u_I) - I_R \geq (1 - \alpha)\Delta + \Pi(u_0)$, since $\alpha \geq \alpha^{**} = I_R/\Delta$. It follows that in equilibrium the manufacturer innovates if $\alpha \geq \alpha^{**}$ and $\alpha < \alpha^*$. Otherwise, that is, if $\alpha \in [\alpha^*, \alpha^{**})$, then it is profitable for both the manufacturer and the retailer to innovate when the other refrains from investing. Thus, there are two (pure strategy) equilibria for $\alpha \in [\alpha^*, \alpha^{**})$. However, if the retailer innovates, then both players can (at least weakly) benefit through coordinating. In that case, the manufacturer and the retailer gain $\alpha\Delta - I_M$ and $I_R - \alpha\Delta$, respectively. Notice that from $\alpha \in [\alpha^*, \alpha^{**})$, the manufacturer’s gain is at least non-negative, while the retailer’s gain is strictly positive. Proposition 1 follows immediately. **Q.E.D.**

Proof of Proposition 2. Taking the retailer’s outside option into account, the manufacturer will now innovate if and only if $\alpha K \geq I_M$, which can be rewritten as $\alpha \geq I_M/K \equiv \alpha_K^*$. Further, note that the retailer would never prefer to innovate itself if the manufacturer chooses to innovate, since (4) implies that $\Delta - I_R \leq \Delta - \alpha K$ (strictly, for any $\alpha < 1$), where the right-hand side represents the retailer’s payoff when the manufacturer innovates and faces the threat of imitation. The rest of the argument is completely analogous to that of Proposition 1. **Q.E.D.**

Proof of Proposition 3. Recall that by Lemma 2 the manufacturer always innovates if it is the only one to do so, that is, $2N\Delta_l > I$ follows from (1). If expecting the large retailer to innovate, the manufacturer innovates only if $n_L \leq n_M^{**}$. The large retailer, however, innovates if $n_L \geq n_R^{**}$ and if $n_L \geq n_R^*$,

since it expects the manufacturer to innovate and to refrain from innovation, respectively, with $n_R^{**} > n_R^*$.

First, we characterise the equilibrium for $N\Delta_l \geq I$. It is straightforward to check that $n_R^{**} \in (1, N]$ only when $N\Delta_l \geq I$. (The large retailer would never have an incentive to innovate if $N\Delta_l < I$, given that the manufacturer also decides to innovate.) Alternatively, note that $n_R^{**} = N$ if $I = N\Delta_l$, while $n_R^{**} < N$ for all $I < N\Delta_l$, so that $n_R^{**} \in (1, N]$ for $N\Delta_l \geq I$. We have $n_M^{**} = N$ if $I = N\Delta_l$, while $n_M^{**} < N$ if $I > N\Delta_l$. In summary, for $n < n_R^{**}$ only the manufacturer innovates in equilibrium, since $n_L \leq n_M^{**}$ always holds for $N\Delta_l \geq I$.

Second, we characterise the equilibrium when $n_M^{**} \in (1, N]$ from $N\Delta_l < I$. It follows that by Lemma 2 the manufacturer innovates when $n_L \leq n_M^{**}$. If, however, $n_L > n_M^{**}$, then the manufacturer will never innovate if the large retailer also innovates. Nevertheless, by assumption (1), the manufacturer always prefers to innovate for $n_L > n_M^{**}$ when it expects the large retailer not to innovate. Recall also that $n_R^{**} > n_R^*$. Multiple equilibria, in which either the manufacturer or the large retailer innovates, can thus arise when $n_L > n_M^{**}$ and $n_L \geq n_R^*$. Otherwise, that is, either $n_L \leq n_M^{**}$, while $n_L \geq n_R^*$, or $n_L > n_M^{**}$, while $n_L > n_R^*$, or $n_L \leq n_M^{**}$ and $n_L > n_R^*$, only the manufacturer innovates in equilibrium.

Finally, we demonstrate that multiplicity cannot be eliminated by only selecting those equilibria that are not (weakly) Pareto dominated. Suppose that only the large retailer innovates in equilibrium. In that case, it obtains $n_l \pi(u_l, u_0) - I$, while the manufacturer obtains zero. If, instead, the manufacturer innovates instead of the large retailer, then the manufacturer obtains $2N\Delta_l - I > 0$, whereas the large retailer obtains $-n_l \Delta_H + I$, where $\Delta_H = \pi(u_l, u_0) - \pi(u_0, u_l) > \Delta_h > \Delta_l$. Recall that for $n_L \geq n_R^*$ together with $n_L > n_M^{**}$, both the large retailer and the manufacturer would innovate if they expect the other not to innovate (multiplicity). Then, it is immediately checked that the large retailer always loses, since $n_L \leq I/\Delta_H$ can never hold because $I/\Delta_H < I/\Delta_h = n_R^*$. Corresponding reasoning applies for the case in which the manufacturer innovates alone. We conclude that multiplicity cannot be eliminated by selecting equilibria that are not Pareto dominated. **Q.E.D.**

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