

An Economic Analysis of  
'Price Ownership'  
by Branded Goods Manufacturers

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**R C S.**

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## **Executive Summary (English)**

For manufacturers of branded goods the retail price is a key strategic variable in the overall “marketing mix”, notably as it is associated with consumers’ quality perception. This is widely acknowledged by business scholars, in particular in the field of marketing. Instead, competition economics, which provides the foundation for much of the thinking of today’s scholars as well as practitioners of competition law and policy, has largely ignored both the role of “brands” and, more specifically, the wider role of prices (other than being a transfer between consumers and firms and, thereby, only a cost to the former). This study, which was conducted for the German Markenverband (Association of Brand Manufacturers), shows that this limitation can have serious negative consequences, as it prevents acknowledging possible inefficiencies that can arise from a narrow enforcement of the prohibition of retail price maintenance of of other instruments through which manufacturers can influence retail prices. The rationales put forward in this study apply in particular to branded products, for which quality and quality perception are key variables both for competition in the market and for what is termed “vertical competition” between retailers and manufacturers.

With the help of a formal model, the present study first establishes why there can be a strong link between price and quality perception (as well as true quality choice). Then, it is shown why under “price ownership” by retailers, the quality perception of the manufacturer’s brand image may not be adequately maintained, which can undermine efficiency and overall welfare. One rationale for this is that individual retailers have an incentive to free-ride on the overall quality perception and prefer to choose a lower price at their outlet, even though this will ultimately result in lower true quality as well as lower quality perceptions by consumers. Even when this results in a lower price, efficiency can decline, precisely because price plays a wider role. The formal economic analysis also shows how differences in retailers’ and manufacturers’ preferred retail prices may arise from the competition which runs between them. While a manufacturer relies on a strong quality perception, a retailer may benefit when it can credibly threaten to delist a manufacturer’s product, thus having less incentive to uphold high brand perception. Again, also through this channel, “price ownership” by retailers can erode quality and quality perception.

Economists largely agree about the pro-competitive and efficiency-enhancing role that retail price maintenance can play. This study emphasizes the particular role of the price (and the control over it) for branded products. Retailers’ incentives to free-ride on quality and quality perception as well as their own strategic considerations vis-à-vis manufacturers generate a conflict of interest between them and manufacturers. In particular, retailers’ preferred price may then not reflect the interests of consumers. Prohibiting manufacturers from influencing retail prices may thereby lead to lower welfare and it also risks distorting what this study terms “vertical competition” between manufacturers and retailers. As retailing has become increasingly consolidated and as retailers have heavily invested in their private labels, which this study also documents, they gain in buyer power and take over more functions. As is explored in the companion report (Inderst 2013), this shift may however not always be efficient but it may result in particular from retailers’ “gatekeeping” function with respect to consumers. The question whether, and to what extent, antitrust law and practice should interfere with firms’ control over retail prices must thus also be answered with the view to ensuring a level playing field between manufacturers and powerful retailers.

## Executive Summary (Deutsch)

Für Hersteller von Markengütern ist der Preis eine wichtige strategische Variable in ihrem gesamten "Marketing Mix". Während die Rolle des Preises für das Markenimage nicht nur bei Praktikern sondern auch in der Betriebswirtschaftslehre, so insbesondere im Marketing, unumstritten ist, wird in der Industrieökonomie, die zunehmend die Entwicklung im europäischen Wettbewerbsrecht beeinflusst, der Preis oft nur als Transfer von Konsumenten zu Unternehmen betrachtet. Wie diese Studie, die für den Markenverband erstellt wurde, zeigt, blendet dies insbesondere mögliche Ineffizienzen aus, die aus einem Verbot der Preisbindung zweiter Hand und insbesondere aus einer engen Auslegung dessen resultieren. Auf der Basis einer formalen ökonomischen Analyse ergibt sich, dass gerade bei Markenartikeln, bei denen Qualität und Qualitätsimage wesentlich sind, solch eine verordnete Preissetzungshoheit („price ownership“) des Handels zu Qualitätseinbußen und letztlich auch zu Ineffizienzen führen kann.

Durch den Eingriff des Wettbewerbsrechts wird – vor allem bei einer engen Auslegung – die Kontrolle über dem Preis in die Hände der Händler gelegt. Die moderne Wettbewerbsökonomie hat bereits gezeigt, dass durch diesen Eingriff Ineffizienzen entstehen können. Der Ansatz in dieser Studie erweitert dies auf Markengüter dahingehend, dass explizit die Rolle des Preises für die Wahrnehmung der Qualität als Teil des gesamten Markenimage betrachtet wird. In einer formalen ökonomischen Analyse wird gezeigt, wie es im Falle einer Kontrolle des Preises durch Händler zwar zu niedrigeren Preisen kommen kann, allerdings sowohl die wahrgenommene als auch die tatsächliche Qualität der angebotenen Produkte dabei sinken kann. Eine Beschränkung der Einflussnahme des Herstellers auf den Endpreis kann dadurch zu Wohlfahrtsverlusten führen.

Grundlegend hierfür sind zwei Mechanismen. Herausgearbeitet wird zunächst, warum es einen engen Zusammenhang zwischen dem Preis und sowohl der wahrgenommenen als auch letztlich der tatsächlichen Qualität geben kann. Zudem wird analysiert, wie es hinsichtlich der über den Preis induzierten Qualitätswahrnehmung zu einem Interessenskonflikt zwischen Herstellern und Händlern kommen kann, wobei die Präferenzen des Handels nicht den Präferenzen der Kunden entsprechen oder gar die Wohlfahrt maximieren müssen. Dies hat mehrere Gründe, von denen zwei in dieser Studie formal analysiert werden. Zum einen kommt es zu einem „Trittbrettfahrerproblem“ unter den Händlern, da jeder Händler zwar von einem hohen Markenimage profitiert, aber andererseits durch eine Preissenkung in seinen Läden einen höheren Umsatz erzielen will. Ein Hersteller internalisiert stattdessen weit mehr den gesamten Einfluss der Preispolitik auf die wahrgenommene und tatsächliche Qualität der Produkte. Ein weiterer Mechanismus, durch den es zu einer Interessensdivergenz zwischen Händlern und Herstellern kommt, ist der folgende. Während eine gestiegene Qualitätswahrnehmung die zukünftige Verhandlungsposition des Herstellers erhöht, da sein Produkt aufgrund des gestiegenen Markenimage und letztlich aufgrund der höheren Qualität schwerer zu ersetzen ist, verschlechtert sich dadurch die Verhandlungsposition der Händler.

Damit stellt sich auch unmittelbar die weitergehende Frage, in wieweit wettbewerbsrechtliche Beschränkungen, wie sie sich aus dem Verbot der Preisbindung und seiner engen Auslegung ergeben, in den „vertikalen Wettbewerb“ zwischen Händlern und Herstellern eingreifen und dadurch für Ineffizienzen sorgen. Die Gefährdung eines „level playing field“, vor allem angesichts zunehmender Konsolidierung und Nachfragemacht im Handel, worauf diese Studie nur am Rande eingeht, wird detaillierter in der komplementären Studie Inderst (2013) dargestellt.

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# 1 Introduction

Price is a key strategic variable for manufacturers of branded products. It can convey to consumers information about the product, notably information about the product's quality. The prohibition of retail price maintenance and its strict enforcement, together with increasing retailer buyer power, effectively puts the decision of the retail price into the hands of retailers, thus taking it out of the hands of those whose decision primarily affects quality: the manufacturers. The aim of this study, which was conducted for the German Markenverband (Association of Brand Manufacturers) is to analyse when this can lead to inefficiencies.

I will argue that current thinking on retail price maintenance, which already acknowledges its possible merits, needs also to grasp the potential relationship between price and quality, as well as quality image, which can speak in favour of manufacturers' "price ownership". It also needs to acknowledge that "ownership" of the retail price matters in the distribution of (bargaining) power in the vertical relationship between retailers and manufacturers. In the light of increasing retailer buyer power in various sectors, which has received the attention of antitrust authorities and competition policy, the allocation of "price ownership" is not innocuous and should thus also be seen in the light of creating a level playing field for what I term "vertical competition".<sup>1</sup>

In the economic profession, it is a widespread (if not the majority) view that a *per se* prohibition of retail price maintenance (RPM) should be abandoned in favour of a rule-of-reason approach. Section 2 reviews the respective arguments. However, these arguments in favour of a rule-of-reason approach still miss the important role that price plays in communicating brand image to consumers or, more narrowly, brand quality. Based on a formal economic model, I show how "price ownership" by manufacturers can lead to higher quality and increased efficiency, whereas price-setting by retailers would, in these cases, lead to lower quality. At the core of this argument is the notion of an underlying conflict of interest between retailers and manufacturers. Although both sides share an interest in providing consumers with the products and services that they desire, as this is the basis for generating profits, their interests are not always aligned – and, as I will show in a formal economic analysis, particularly not so in terms of the retail price that they individually prefer.

In some circumstances, retailers may prefer a higher price than manufacturers, in particular if they want to direct consumers to their own private label goods. This argument has already received

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<sup>1</sup> Here, I use the term "price ownership" as it more broadly captures the influence that the respective party, i.e. the manufacturer or the retailer, has on the final price. As noted below, in some jurisdictions manufacturers may preserve such "price ownership" to a large extent even when retail price maintenance is prohibited, as they find a functional equivalent (e.g. a recommended retail price combined with a refusal to sell). In other jurisdictions, notably Germany, cartel authorities also enforce the ban on retail price maintenance against these and other more indirect ways in which a manufacturer may influence a retailer's pricing decision.

attention among practitioners of competition law and among economists and it is therefore not the focus of this study. Instead, I intend to focus on cases where retailers prefer a strictly lower price than manufacturers, albeit this may not maximize efficiency or even consumer welfare.

It may at first seem odd that manufacturers should find reason to complain when a retailer lowers the price of their product and thereby boost sales in the short term, possibly at the expense of the retailer's own margin. The established literature on RPM, as reviewed in Section 2, has however already singled out circumstances where this would be harmful for both the manufacturer and efficiency, most notably when retailers could free-ride on services such as advice to consumers or the initial promotional activity that new products require. I will show however, that even in the absence of such services and even for established products, quality and efficiency can suffer when retailers make use of their "price ownership" and reduce the price below the level that the manufacturer would prefer. While this is certainly not always the case, the formal analysis identifies reasonable circumstances for when it is. The analysis thereby addresses another efficiency rationale for RPM or, more generally, for why manufacturers should be able to influence final prices. This argument applies in particular to branded goods, for which quality and quality perceptions are crucial.

The arguments put forward in this report starts out by acknowledging a causal link between price and quality, i.e. both consumers' perceived quality and the true quality chosen by manufacturers. In the economics literature dealing with vertical relationships between manufacturers and retailers, which forms the basis for current thinking in competition law and policy, such a link is rarely acknowledged. This stands however in sharp contrast to literature published in the field of marketing and the view of business practitioners. Both strands of literature will be reviewed in Section 3 of this report.

Based on my own contemporaneous research, which forms the core of Section 4, I will also provide a simple and robust theoretical foundation for such a link between price and quality. The thereby developed model establishes this in a transparent yet rigorous way and may clarify also for practitioners of competition law and policy why and when the existence of such a link should be of particular importance. According to this model, rational consumers anticipate a link between the price and a manufacturer's incentives to continuously provide high quality, for instance through the procurement and use of high-quality inputs, by satisfying strict hygienic and food-safety standards, or, more generally, in exercising care while producing, handling or distributing the product. This theory, as put forward in Section 4, provides an immediate link between higher prices and both higher true, as well as higher perceived, quality (as not all consumers can directly and immediately detect true quality). Further, when prices "signal" quality in this way, I then show that the interests of retailers and of the respective manufacturer may no longer coincide. It then matters where the "price ownership" resides – or, put differently, whether manufactures still have ways to influence the final retail price.

The first reason that the formal economic analysis isolates is a potential free-riding problem among retailers, albeit in contrast to much of the established literature that acknowledges an efficiency rationale for RPM, in that they do not have to provide a service (such as advice to consumers) for this argument to hold. With branded goods such free-riding through a lower price takes place with respect to quality perception. A retailer setting a strictly lower price essentially free-rides on the positive quality image that is induced by the higher prices set by other retailers. This builds on the derived link between higher prices (here at other retailers) and a higher quality perception of consumers as well as ultimately a higher true quality. An individual retailer however will want to free-ride and boost sales at its own outlets through setting a lower price. Instead, the manufacturer fully internalizes the effect that price choice has on quality and quality perception across all outlets and all sales, in particular also for the longer term. This explains also why the price that the manufacturer would want to induce at the retail level can be more efficient. If in these circumstances the manufacturer can then not sufficiently control the retail price due to the strict application of a ban of RPM by the respective antitrust authority, this will reduce welfare.

The second formally analysed reason why retailers may prefer a different, namely here a strictly lower, albeit potentially inefficient price level than the respective manufacturer, relates to a much broader theme, namely that of “vertical competition”. This term captures the notion that, as already mentioned above, retailers’ and manufacturers’ interests are not always aligned, and that these interests are in conflict even beyond the question of how to distribute a given level of channel profits through the respective wholesale and retail margins. In the model that I analyse in this report, retailers may prefer a particular level of retail price precisely because it influences the way future profits are shared in the vertical relationship. The choice of the retail price is thus also made strategically to influence bargaining power in the vertical relationship, which in particular has no direct relation to consumers’ preferences. Again, the precise mechanism for this builds on the link between price and quality image, as I shall summarise next.

Retailers have fewer incentives than the manufacturer to uphold the quality image of the manufacturer’s product, as this would shift future bargaining power away from the retailer and towards the manufacturer. When the retailer subsequently decides to delist the manufacturer’s product, e.g. in order to sell a private label product instead, in cases where the manufacturer’s product is of higher quality and enjoys a higher quality image, the respective retailer is at a greater competitive disadvantage vis-à-vis retailers that still stock the respective product. In contrast, the manufacturer relies on a high brand image to uphold his bargaining position vis-à-vis retailers. This part of my formal economic analysis thus directly brings out the strategic role that the price plays as a key marketing variable, far beyond specifying “only” what consumers have to pay when purchasing the respective product. When retailers are given “price ownership”, brand manufacturers are no longer able to use price as an additional instrument to control brand image (or, as is formally analysed in the model, quality perceptions and thereby ultimately true quality choice). This not only deteriorates their



bargaining position vis-à-vis retailers, but – as is shown in the analysis – leads to lower quality perception and quality precisely as through this strategic channel retailers will want to choose a price level that induces a lower quality and quality perception than the price choice preferred by the manufacturer.

Also this aspect of the strategic role of the retail price (and the control over it) in the vertical relationship has not been sufficiently acknowledged by scholars and practitioners of competition law and policy, notably in the discussion on RPM. More broadly, what has not been acknowledged sufficiently is the role that control over the retail price plays in “vertical competition” between retailers and manufacturers. This is surprising as the increasing buying power of retailers in various sectors of the economy has itself become a concern for competition policy and antitrust authorities. A shift of power between retailers and manufacturers, as it arises for instance from increasing consolidation in retailing, should however warrant a discussion of how current antitrust law and practice may conflict with the creation of a level playing field. To stress this broader perspective, as part of the concluding remarks Section 5 provides some background on the shift of power between retailers and manufacturers, most notably, but not exclusively, in grocery retailing. The broader theme of “vertical competition” is further explored in detail in an accompanying report (Inderst 2013).

## **2 Efficiency Rationale of Retail Price Maintenance and Similar Instruments in the Economics Literature**

### **2.1 Background and Objective**

Resale Price Maintenance agreements are treated as vertical restraints by both scholars and practitioners of antitrust law and economics. The most contentious RPMs prescribe that dealers must sell at, or at least not below, a fixed price. This is also called a “minimum RPM”.<sup>2</sup> In this section, I will review some of the key arguments put forward by economists that show the pro-competitive and efficiency-enhancing role of this practice. The basic arguments also pertain to other instruments through which manufacturers can exert control over retail prices. In the following sections of this report, I will therefore talk a broader sense about manufacturer “price ownership” (versus retailer “price ownership”). The economic model in Section 4 gives this a precise meaning insofar as that, under manufacturer “price ownership”, in the model it is indeed the manufacturer who can set the retail price. If the manufacturer cannot (sufficiently) use other means, such as the combination of a recommended retail price with incentives for retailers to achieve the same objective, then RPM

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<sup>2</sup> In the following, I will not largely deal with the case of a “maximum RPM“, which leaves retailers free to set any price below a pre-specified level.

effectively precludes such manufacturer “price ownership”. I will further discuss below the legal treatment of direct and indirect means by which manufacturers influence the retail price.

As will be argued, the current discussion among scholars and practitioners of competition law and policy, even though already stressing various rationales for a rule-of-reason approach towards RPM, misses two related issues: The role of price as, firstly, a core attribute of branded products and, secondly, a core strategy variable in the “vertical competition” between retailers and manufacturers. Taken together, through these roles that prices play for branded products a restriction of manufacturers’ control over the retail price can lead to inefficiencies.

It should be noted that the following review of the literature in the main part of this report pays only limited attention to the anti-competitive effects attributed to RPM under particular circumstances.<sup>3</sup> This choice seems justified since the main purpose of this section is both to show that arguments in favour of manufacturer “price ownership” are well placed in the current discussion, as well as to point out any potential shortcomings of current thinking, in particular in relation to branded products and the respective role prices play there. For the purpose of completeness also, the anticompetitive effects that have been attributed to RPM in literature will be reviewed in the Appendix.<sup>4</sup>

## 2.2 RPM as an Efficient and Pro-Competitive Contractual Choice

### 2.2.1 Service Provision, Non-Price Competition and Free-Riding

RPM agreements are different from horizontal agreements, i.e. agreements between enterprises that are in direct rivalry. While the latter may also give rise to efficiency gains, amongst economists there is clearly a stronger presumption that such horizontal agreements are likely to dampen competition to the detriment of consumers. Instead, over the last few decades a fair share of economists have argued that vertical restraints, including RPM, should receive a more benign treatment by antitrust law. In particular, it seems fair to claim that a majority of commentators from the economics profession have argued against a *per se* prohibition of RPM, advocating instead treatment under a rule-of-reason approach.

As I stress the case of a “minimum resale price”,<sup>5</sup> probably the most prominent argument in favour of RPM, at least among economists, is that it can induce beneficial non-price competition among

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<sup>3</sup> A broader discussion of this literature is also contained in Inderst et al. (2013).

<sup>4</sup> It is certainly the case that a well-informed rule-of-reason approach would have to draw on both the identified pro-competitive and likewise the identified anti-competitive effects.

<sup>5</sup> For a specific efficiency rationale for a “maximum resale price” rather than a “minimum resale price” see e.g. Posner (1976), building on the double-marginalization problem (cf. Spengler 1950).

retailers.<sup>6</sup> When the downstream market is competitive, then even a high retail price will not lead to high retailer profits if retailers can also compete on non-price attributes, such as services. To the extent that these services risk being underprovided, most notably through a free-riding problem among retailers, RPM can increase welfare.<sup>7</sup> While exclusive arrangements could serve the same purpose, in many markets this is not feasible as manufacturers need sufficient scope and scale of distribution. Also, depending on jurisdiction, antitrust law may considerably restrict a firm's scope to deny access to its products to the extent that this is explicitly or implicitly linked to the maintenance of a particular retail price (recommendation). As reviewed below, this is certainly the case in Europe.

In many markets, most notably fast-moving consumer goods and groceries, services such as advice may have limited relevance. There, however, an efficiency rationale for RPM may be that in maintaining retailers' margins, a broad range of retailers can be induced to carry sufficient inventory. Higher inventories are then chosen for two reasons: Firstly, lost sales from running out-of-stock also become more costly to retailers; secondly, RPM protects inventory holders against a melt-down of the value of their stock.<sup>8</sup>

A free-riding argument among retailers, however, may also be applied more broadly. For instance, retailers that must invest to help in promoting a product may expect to be compensated through future sales at a higher price. The margin generated through RPM can allow for such compensation, while otherwise late-followers who offer discounts would erode the profits of the "pioneering" retailers. More generally, the margins protected by RPM can allow manufacturers to induce sales-enhancing behaviour. In particular, in repeated interaction RPM can provide a rent stream that can be revoked for unsatisfactory performance. The margin ensured through RPM then allows a manufacturer to compete with rivals for special services and preferential treatment by a retailer, for instance.<sup>9</sup>

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<sup>6</sup> Cf. Telser (1960), Matthewson and Winter (1984, 1998).

<sup>7</sup> Cf. Winter (1993) and Motta (2004, in particular pp. 313-332).

<sup>8</sup> Cf. Deneckere et al. (1996).

<sup>9</sup> For completeness, it should be noted that many of these contributions focus on showing how RPM can have the respective efficiency-enhancing or pro-competitive effects. In order to show that RPM performs better than other (contractual) means (or that it is even necessary to achieve these effects at all), often additional restrictions need to be imposed. In fact, in the simplest models it could often be argued that a judicious use of so-called "non-linear tariffs" may serve the same purpose. Such contracts could prescribe a different incremental wholesale price for each (additionally) supplied unit, for instance not only in the form of a quantity discount but also a "quantity premium". When final demand is certain, this would allow, at least in the simplest cases, the channel to be "aligned", i.e. to induce a particular retail price, while providing the scope to allocate channel profits differently between the manufacturer and retailers. However, in practice (as well as in more elaborate formal models) there can be many obstacles to such "fine-tuning" of contracts, such as, to name only two, uncertain demand or repercussions of current adjustments to (headline) unit prices for a firm's future bargaining position. Finally, antitrust law may also prohibit such indirect ways of influencing the retail price (notably, a combination of a recommended retail price and the respective "incentives" that induce the retailer accordingly; see the subsequent discussion in this section).

## 2.2.2 Price, Branding and Quality

For some branded products the aforementioned pro-competitive effects or efficiency rationales for RPM may be less applicable, for instance as high turnover reduces the need for large inventory holding or as they require little retailer advice or alternative services. These services can also be contracted explicitly and thus need not be incentivised through higher margins. In contrast, marketing literature has, in particular, recognised that in order to establish and keep the value of a brand, it is not sufficient to develop a product of given characteristics as described in much of economic theory. Instead, the different instruments of marketing must work together to develop and sustain such a recognisable brand image. Price is recognised to be a key instrument in this respect.

But why should a low price, in particular, indicate low quality and destroy “brand value”? Why are retailers’ and manufacturers’ incentives not aligned in this respect? According to one existing theory, quality certification is provided only indirectly through a high price, as it is associated with the decision of certain retailers to stock the product.<sup>10</sup> These retailers may have invested heavily in their own image and may uphold this through the extensive screening of the products they carry. When they have higher costs compared to discounters that do not provide these services and when a manufacturer can set wholesale prices only uniformly, they may end up with too low a market share and margin. They are then unwilling or unable to provide this “certification service”, from which both other retailers and the manufacturer would benefit. RPM levels the playing field between retailers and ensures a sufficiently high margin to widen the distribution to retailers providing this service.

This established argument is also interesting in light of the following discussion. There, manufacturers must continuously invest to maintain high quality and I shall argue that equilibrium quality (as well as quality perception by those consumers who do not directly recognise quality choice) is higher when the retail price is set in the interest of the manufacturer. Control of the price by the manufacturer would then ensure quality certification by the respective retailers, as noted above, and also higher incentives to provide high quality in the first place.

As noted, a high price may also provide incentives for the manufacturer to ensure a continuing high level of quality. This concerns both the essential features of a product and the way it is handled in production and distribution. To illustrate this, consider first a monopolist that sells directly to consumers. There are many reasons as to why the choice of a targeted price level often represents a long-term strategy, for instance as it must be consistently communicated to consumers using all marketing channels. Once a price level is set, the theory in Section 4 shows that there is then a robust relationship between a higher price and higher incentives for the manufacturer to sustain high quality. I will leave the details to the discussion there. The link between prices, quality perception, and true

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<sup>10</sup> Cf. Marvel and McCafferty (1984).

quality is, however, also more broadly rooted in the economics and, in particular, the business literature, as discussed in Section 3.

In the formal analysis of Section 4, I think, in a very simplified way, of a world with RPM as one where the manufacturer can keep “ownership” of the final retail price. Instead, without RPM it is the retailer that determines how to position a product in terms of its price, for instance, to use it as a loss-leader or to charge a premium. Retailers and manufacturers may now have quite different interests in setting high versus low prices and thus raising or lowering incentives to provide high quality and the respective brand image.

Note that I focus my arguments entirely on quality and quality perceptions, as these have been more fundamentally studied in the economics profession, especially as they can be given a straightforward formalization. Brand image must, however, clearly be seen more widely. As also noted in Section 3, albeit there the focus is again on quality, consumers may also care about exclusivity or status that comes with consumption of certain (high-priced) goods.<sup>11</sup>

When a high price communicates high quality, thereby raising the product’s “brand value”, this raises the outside option of the manufacturer and decreases that of the retailer. In other words, the manufacturer and its product become harder to substitute. In addition, when consumers use different retailers (e.g. on different shopping trip, say close to home or close to work), the price perception at one retailer can provide a brand image that also boosts sales at other retailers. This spill-over is in the interest of the manufacturer. A retailer would prefer rather to free-ride on the quality image sustained by the price choices made by other retailers.

Thus, in light of the current discussion on RPM in the field of economics and among practitioners of competition law and economics, my arguments first extend the principle notion of a free-riding problem that RPM can help to overcome. However, in contrast to much of the existing discussion, such free-riding need not be restricted to the services that retailers provide, such as free advice to consumers, but should also extend more generally to the brand’s image, in case it is affected by its retail price. This link between price, as a key feature of branded products, and quality perception gives rise to the free-riding problem as analysed. In addition, my arguments also suggest that the discussion about (more widely) “price ownership” should also take into account a different perspective, namely that of the distribution of power between retailers and manufacturers. To be precise, I show how the choice of the retail price may be made in view of how it affects the bargaining power of retailers and manufacturers. Control over the retail price can thus have not only direct efficiency implications

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<sup>11</sup> This can, however, again be given a formal underpinning (cf. the references in footnote 26). Already very early on Taussig (1916) has suggested the role of high prices for “articles of prestige” as a key motivation for RPM. Orbach (2008, 2010) builds a legal defence of RPM on such an “image theory”.

through the resulting quality (and quality perceptions), but also affect the overall distribution of power in the vertical relationship.

### 2.3 Treatment of RPM by Competition Law and Practice

The aim of this report is *not* to summarize the literature on RPM and, based on this, to argue in detail why its legal treatment should be one way or another. That said, as already noted above arguably the majority view of economists is that RPM can have pro-competitive and efficiency-enhancing effects. Or, put differently: “In theoretical literature, it is essentially undisputed that minimum RPM can have pro-competitive effects and that under a variety of market conditions it is unlikely to have anticompetitive effects.”<sup>12</sup> However, a full consideration must also weigh up the different arguments according to their relevance as, for instance, supported by empirical studies. Unfortunately, empirical evidence is very scant here and, more importantly, the fact that pro- and anti-competitive effects may be very much dependent on the details of the individual cases makes it generally difficult to draw conclusions based on such studies.<sup>13</sup>

Furthermore, an overall evaluation of RPM and the merits of a rule of reason approach must naturally take into account the inefficient use of substitutes that a *per se* rule would encourage. Such a substitute may be the granting of exclusive territories to retailers, as long as this is not itself prohibited, the refusal to deal with individual retailers (based on their past performance), forward integration or sale by consignments. Such possibly inefficient use of substitutes should be more likely and of greater concern in case the prohibition of RPM is enforced more narrowly. In fact, there seem to be considerable differences in this respect between various jurisdictions, as I now finally explore (also in the light of the modelling assumptions that are made in the subsequent sections).

Though this does not intend to provide a legal assessment, let alone a comprehensive discussion of the enforcement of a prohibition of RPM in different jurisdictions, the following broadly describes the key aspects. In the EU, market power is usually a requisite to render restraints in agreements concerning supply and distribution unlawful. This is recognized in the block exemption for vertical cooperation agreements. It applies a market share screen that exempts most agreements from Article 101 as long as

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<sup>12</sup> Baumol et al. (2006, p. 16).

<sup>13</sup> See the short discussion in OECD (2008, pp. 37-38) and the literature that is cited there, as well as Inderst et al. (2013). Notable published contributions are Ippolito (1991), Overstreet (1983), and Ornstein (1985). What the available evidence suggests, however, is the following. Firstly, it suggests that those theories of harm that rely on co-ordination (i.e., the collusive use of RPM) may be less important in practice. (See Section 6 for the details of these and other theories of harm.) Secondly, it documents various incidences where RPM was used to achieve efficiencies. To the extent that individual studies suggest a higher price in industries where RPM was adopted (or for individual manufacturers), it must be noted that it is hard, if not impossible, to check for all differences between products, most notably brand image (or, as used in this report, quality and quality perception). In fact, the arguments in this report suggest that while RPM may increase prices for branded goods, this may not reduce efficiencies.

the respective supplier has a market share under 30 percent. When the supplier has a share over 30 percent, there is still no presumption that the agreement is a violation of Article 101. Instead, a rule of reason standard applies. RPM is, however, a practice that effectively remains prohibited regardless of the supplier's market share.<sup>14</sup> In effect, at least with respect to minimum prices, RPM is treated as a *per se* infringement.<sup>15</sup>

For those potentially anticompetitive vertical restraints where no such *per se* prohibition effectively applies and where the supplier has market power (according to the 30 percent screen), a key prerequisite to make them legal is to show that they are objectively necessary, that is whether or not a less restrictive agreement would have served the purpose of achieving the respective efficiencies equally well. At least in the economic discussion of RPM, as surveyed in Section 2.2, a key question is often whether those same effects, as achieved by RPM, could not have been achieved by a combination of the judicious use of wholesale prices and other transfers between retailers and manufacturers. Also, could not a manufacturer withhold supply of the product if the retailer did not adhere to a recommended retail price? To what extent manufacturers indeed have these substitutes at their disposal now represents a crucial difference between jurisdictions. While, as I discuss shortly, such substitutes are indeed at manufacturers' disposal in the US, this seems much more restricted in Europe (and notably in Germany). From this perspective, one should indeed more broadly discuss the "price ownership" of manufacturers - that is the extent to which they can influence the retailer by various means rather than limiting discussion only to the particular practice of RPM requirements.

For instance, in the US, firms have basically found a functional substitute for the imposition of a (minimum) RPM in the form of the "Colgate doctrine"<sup>16</sup>. This essentially allows manufacturers to

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<sup>14</sup> Agreements that cause a restriction of the buyer's ability to determine its sale price are excluded. Consequently, such agreements remain vulnerable to Article 101, according to which all agreements are prohibited that directly or indirectly fix purchase or selling prices. As I focus throughout mainly on a minimum resale price, I need not discuss in more depth the treatment of maximum resale prices. The stance there is much more lenient, provided that they are not used in combination with other clauses (or pressure and incentives from the supplier) that are then deemed to result in a fixed resale price (see footnote 70 in DAF/COMP 2008).

<sup>15</sup> It is sometimes argued that the European approach to RPM differs from that in the US (before the Leegin judgement) as technically there is no *per se* prohibition. However, European courts have never ruled in favour of RPM (Kneeepekens (2007)).

<sup>16</sup> See *United States v. Colgate & Co.*, 250 U.S. 300 (1919). ("In the absence of any purpose to create or maintain a monopoly, the [Sherman Act] does not restrict the long recognized right of [a seller]... to exercise his own independent discretion as to parties with whom he will deal."). This decision was the beginning of the end for the *per se* rule's applicability to RPM in the US. In *Leegin Creative Leather Products, Inc. v. PSKS, Inc.*, 551 U.S. 877 (2007) the United States Supreme Court finally reversed the old doctrine that RPM was illegal *per se* under Section 1 of the Sherman Act (see *Dr. Miles Medical Co. v. John D. Park & Sons Co.*, 220 U.S. 373 (1911)), replacing the *per se* rule with the rule of reason.

refuse to deal with resellers that do not follow resale price suggestions.<sup>17</sup> Such indirect means for achieving RPM are not permitted in the EU.<sup>18</sup> Recently, the German competition authority (Bundeskartellamt) has issued guidance relating, in particular, to the determination of retail prices of branded products.<sup>19</sup> In particular, while handing over a list of recommended retail prices is deemed permissible, further discussions about the retail price that could be interpreted as coming to a mutual agreement are not permitted. Even the use of “incentives” to achieve a particular retail price level seems to be heavily restricted. Naturally, this puts a retailer in a very strong position as it can, thereby, easily resist any attempt by manufacturers, including pressure and “incentives”, aimed at achieving a particular retail price. In this perspective, in the EU, and notably in Germany, “price ownership” in a very wide sense can be said to reside with retailers.

### 3 Brands and Prices

#### 3.1 Overview

In standard economic theory, a good can be described as a bundle of characteristics such as its quality or the time and place of its availability. Price however, is traditionally not seen as one of a product’s or a brand’s “characteristics”.<sup>20</sup> Based on this view, broadly speaking, economic theory has primarily considered the allocative role of prices. This is the role of prices that competition economics has almost exclusively focused on.

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<sup>17</sup> The Colgate doctrine allows the manufacturer to announce a take-it-or-leave-it policy of selling only to retailers whose retail price adheres to the manufacturer’s suggested resale price. Colgate allows the manufacturer to propose a resale price and to refuse to deal with retailers who undercut that price, as long as the manufacturer and its retailers do not “agree” on the price the retailer will charge. See Elzinga and Mills (2008), Henry and Zelek (2002) or Mathewson and Winter (1998). Such practices by manufacturers do not violate Section 1 of the Sherman Act, the statute in the United States that governs RPM, since Section 1 applies only to “contracts,” “combinations,” and “conspiracies.” However, Section 1 does not prohibit unilateral actions. Hence, the manufacturers may implement RPM unilaterally due to the reason that such a policy does not comprise an agreement between the manufacturer and its retailers, or the retailers among themselves (see Elzinga and Mills (2008). Hence, US manufactures may employ refusals to deal as a means of implementing RPM policies in different contexts without violating the Sherman Act (see for examples Kusske (1982, footnote 6)).

<sup>18</sup> For instance, Waelbroeck (2006) writes: “[...]it is clear that there is no equivalent of the Colgate doctrine in EC Competition law”. See also the longer discussion in OECD (2008), with particular reference to the EU Guidelines on Vertical Restraints. Such prohibited indirect methods of achieving RPM include, in particular, fixing the distribution margin, fixing the maximum level of discount the distributor can grant from a prescribed price level, making the grant of rebates or reimbursement of promotional costs by the supplier subject to the observance of a given price level, linking the prescribed resale price to the resale prices of competitors, threats, intimidation, warnings, penalties, delay or suspension of deliveries or contract terminations in relation to observance of a given price level.

<sup>19</sup> Bundeskartellamt (2010).

<sup>20</sup> This characteristics-based approach goes back to Lancaster (1966).



However, even in economics there exists a sizable volume of literature that sees prices as more than just a “transfer/means of exchange” between firms and consumers (or, likewise, a cost to consumers), as it is shown there how prices can be informative, most notably about the quality of the product or service. This literature is reviewed below. Together with the theory that is being developed in this report (and put to work to discuss the implications of “price ownership” by retailers or manufacturers), this body of work should also provide a solid foundation for scholars and practitioners of competition law and policy to consider the wider role that prices can play (and therefore the implications of interfering with the price setting mechanism).

To business scholars (let alone business practitioners) however, the “wider role” of prices is not novel or surprising. Marketing literature, the second strand of academic literature being more extensively reviewed in this section, considers price not only as a “means of exchange” between buyer and seller, so that a higher price is merely a higher sacrifice for the consumer. Instead, it recognises the key role of prices in the context of a firm’s optimal marketing mix.<sup>21</sup> In this context, prices serve, in particular, the role of a “cue” for the quality of a product.<sup>22</sup>

More generally, the marketing literature typically embeds the role of prices in a wider framework. So-called extrinsic quality cues like price, brand name or store name are not directly related to the physical attributes of a product and can be changed without changing the product itself. By contrast, cues that can only be changed by changing the product itself – like the nutritional content of a breakfast cereal – are called intrinsic quality *cues*.<sup>23</sup> It is thus an almost “conventional wisdom” in marketing that prices serve as such a quality cue – and notably in the sense that consumers often view high prices as more indicative of a product’s or brand’s high quality.<sup>24</sup> This is also a key message that marketing scholars communicate to business practitioners.<sup>25</sup>

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<sup>21</sup> The term marketing mix usually refers to the “4 Ps of marketing”, which stand for **P**roduct (quality, design, functions, etc.), **P**rice (unit price, discounts, credit policy, etc.), **P**romotion (advertisement, etc.), and **P**lace (sources of selling, inventory control, etc.). See, for instance, McCarthy (1964).

<sup>22</sup> For instance, Erickson and Johansson (1985) acknowledge that “...the role price plays in a consumer’s evaluation of product alternatives is very possibly not a unidimensional one...”, and stress both that price determines (for the consumer) the reduction in wealth necessary to purchase a product (“price as a constraint”), and that it at the same time conveys information about the product quality (“price as a product attribute”). According to Rao (1984), this dual role of prices makes them the most immediate and easiest to communicate marketing-mix variable.

<sup>23</sup> Cf. Rao and Monroe (1989).

<sup>24</sup> Cf. Völckner (2008).

<sup>25</sup> For instance, Völckner and Hofmann (2007) warn that “managers must be aware that price-quality inferences remain important aspects of consumers’ behavior and consider them when setting prices. For example, setting a low selling price or lowering a price with a discount not only lowers consumer costs but also threatens to lower their perceptions of product quality through negative signaling effects. Managers should therefore be cautious when using discounts or pure penetration

Here, it should be noted that what is of interest is not *per se* a link between quality and price (or, more formally, a positive correlation between the two), as this could simply arise from higher costs to produce higher-quality products or a shift of demand that arises from higher quality. Of interest instead is the role that price plays as a cue of higher quality, which presumes that at the time of purchase the actual quality of the product is not always recognised by all consumers to the same degree.

While the discussion of literature in this section thus focuses on the relationship between price and quality (perception), it should again be noted that, apart from being a transfer between firms and consumers, price could play a much wider role. At least, such a wider role has also been recognized in the marketing and economics literature, albeit it is not the focus of most formal papers and also not the focus of the contribution in this report. This refers, for instance, to Veblen's and Leibenstein's theory of "conspicuous consumption" as well as willingness to pay a price "above the intrinsic value" to achieve exclusivity.<sup>26</sup>

### 3.2 Price, Quality and Quality Perceptions: Theoretical Background in the Literature

The link between price and quality perception was introduced at an early stage into the academic literature, both in economics and marketing. Take the example of Scitovszky's article in 1944 in a leading economics journal,<sup>27</sup> where he already expresses very lucidly one important link between price and quality. Specifically he argued that price is informative precisely for those consumers who do not directly observe quality. Then, for an uninformed consumer to judge the quality of a product by its price "implies a belief that price is determined by the competitive interplay of the rational forces of supply and demand". That is, if enough other consumer "experts" are able to directly observe a brand's quality, this belief is in fact justified since the "differences in price can be trusted to reflect differences in quality as appraised by experts". In this case, the uninformed consumer "can assume that the prices facing him are what they are because others found them reasonable and justified". That is to say, according to his informal reasoning, a high price reflects high quality because if quality was not sufficiently high, informed consumers would refuse to buy the brand at that price.

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pricing to induce consumers to try new products or switch to less familiar brands and retailers. In these cases, consumers likely make negative price-quality inferences and begin to doubt the quality of the promoted product".

<sup>26</sup> Cf. Veblen (1899) and Leibenstein (1950) or, more recently, Bagwell and Bernheim (1996). It is noteworthy that at least one legal scholar has based a defence of RPM on these theories. Orbach (2008, 2010) calls this the "image theory".

<sup>27</sup> In his original article Scitovszky (1944) discusses the phenomenon mostly based on anecdotal evidence and notes *inter alia* that "in the United States 'expensive' is in the process of losing its original meaning and becoming a synonym for superior quality. Worse still, one of the largest American breweries uses the advertising slogan: 'Michelob, America's highest-priced beer!'"

In order to distinguish between products where quality is known to consumers prior to purchase and products where this is not the case, the economics literature refers to the concepts of “search goods” and “experience goods”. While in the case of a search good, consumers can assess its quality before a purchase (for instance the style of a dress), the quality of an experience good can only be assessed afterwards by using the good (like the taste of canned food).<sup>28</sup> If the quality of a product cannot be evaluated before purchasing and there is no way for the seller to credibly signal the quality of his product, then this may well lead to a situation where only sellers of goods with poor quality remain in the market, at least when products are relatively indistinguishable.<sup>29</sup> This is, however, no longer the case when the manufacturer can credibly and convincingly use the aforementioned cues to communicate, in particular, superior quality. How such a “separation” between high-quality and low-quality products can be achieved through prices is discussed below.

Potential buyers of an experience good might still fear that the manufacturer could cut quality in order to reduce costs of production. Since in this case consumers cannot assess the quality of a product before purchase, they may well end up with an expensive low-quality product and thus reduce their willingness to pay accordingly. Again, without any mechanism to credibly convey a high-quality image, high quality may not be provided in the market. The presence of some consumers who are well-informed about quality provides such a mechanism, as discussed below. In fact, this will also be at the heart of the formal discussion in Section 4.2, where I can precisely identify the various reasons why, depending on the information that consumers have, a high price will be associated both with higher quality and higher quality perception.<sup>30</sup>

In the case of goods where quality can change quickly in production and distribution, e.g. where it depends critically on care and hygienic standards, past experience may, however, provide little information about present (or future) quality of a product. The manufacturer can, however, still be incentivised to maintain high quality, and higher prices can still serve to further increase these

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<sup>28</sup> Cf. Nelson (1970).

<sup>29</sup> This is called a “lemons problem” in economics. A “classical” example is the market for used cars. Someone who considers selling his car which he knows to be in good shape will find it very hard to convince a potential buyer that he in fact never had an accident with the car. Hence, the potential buyer will take into account the risk of ending up with a “lemon” and is therefore only willing to pay a price that is less than the value of a car in good shape. At such a low price, however, the owner of a car in good shape would not be willing to sell. Hence, only someone who knows that his car is a “lemon” would be willing to sell at this price, so that the fact that a particular car is up for sale in such a “lemons market” indicates that it must have poor quality. Cf. Akerlof (1970).

<sup>30</sup> Related arguments have been made, for instance, by Wolinsky (1983) or Riordan (1986), who notes that better informed consumers may either have personal experience (from recent or frequent purchases) or rely on other sources, such as consumer reports. In fact, for the model introduced subsequently, one example will be that where the manufacturer must have continuous incentives to keep up quality through procuring the respective (more costly) inputs and upholding high (hygienic) standards in production and distribution. Failure to do so may then result in faulty or non-consumable products. This is more likely to be observed by frequent purchasers, for instance.

incentives. If a manufacturer, for instance, does not take sufficient care to continuously maintain the high quality of its products (e.g. by ensuring the necessary hygienic standards in processing dairy products), reputation may be seriously and permanently damaged if such a quality cut becomes public (for instance in the case of safety or health hazards – e.g. food scandals). In this case, consumers often shun the manufacturer’s products although his quality issues may be long gone. This is once again more expensive for the manufacturer when the margin lost thereby is higher, given a higher price.<sup>31</sup>

While there is the need to preserve incentives for the manufacturer to ensure high quality (and a corresponding high perception of quality) also for already established products, with new products the issue of quality perceptions is arguably particularly relevant. This may be so as even when some aspects of quality are relatively persistent, early in the lifetime of a product, only very few consumers will be able to evaluate its true quality. Here, in particular, it seems that the “right” choice of the price, as a means of communicating information about quality to those consumers who have not had – or have had only rarely – experience of the product, is of particular importance.<sup>32</sup>

### 3.3 Some Empirical Findings

The link between prices and perceived quality has already been put to empirical testing very early on in the marketing literature.<sup>33</sup> I just single out some of the respective findings.<sup>34</sup> Possibly of particular relevance for food retailing (or, for that matter, any other retailing that involves purchases of bundles, sometimes under time pressure) is the following. While evaluating and comparing the positive and negative attributes of different products represents a difficult task for consumers, price by contrast is relatively easy to compare. This would suggest, as has been documented in the literature, that price is of particular relevance also as a cue for quality when consumers have to make quick decisions.<sup>35</sup> Further, an individual quality cue (here: the price) should be more relevant if consumers have few

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<sup>31</sup> Cf. Klein and Leffler (1981) or Shapiro (1983). Adjusting the price over time, depending on perceived quality, may not be feasible as this not only confuses consumers or involves high costs for manufacturers and retailers, but also because a reduction in the price may itself be seen as an indication of low quality provision in the future.

<sup>32</sup> When high quality is more costly to produce than low quality, a low-quality firm’s profit margin is higher, so that the immediate reduction in demand that is induced by a price increase is more costly for a low-quality firm than for a high-quality firm. This channel, which links price to quality perception, is present here as well as when products are more mature but quality must be continuously upheld, as discussed above. Cf. Bagwell and Riordan (1986, 1991), Bagwell (1992) or Janssen and Roy (2010). Focusing, in particular, on pricing over time, see Curry and Riesz (1988) or Lichtenstein and Burton (1989) in the marketing literature.

<sup>33</sup> Cf. Leavitt (1954).

<sup>34</sup> Rao and Monroe (1989) and Völckner and Hofmann (2007) do not find that the relationship between price and perceived quality in their respective meta-studies differs in a statistically significant way depending on the number of quality cues.

<sup>35</sup> Cf. Suri and Monroe (2003).

alternative cues to infer a product's quality. This can be the case for new products or brands that are still little known. But there can also be a complementary role of price and other quality cues in the optimal marketing mix (cf. Section 3.1). Also the theoretical model in Section 4 suggests that quality perception matters differently depending on the circumstances, such as the costs of maintaining quality or consumers' information.<sup>36</sup>

For the purpose of this report, the focus is on the link between price and quality perception (as an additional role that prices play, notably for branded products). As already mentioned above, however, especially in economics the idea of an equilibrium-outcome is pervasive, so that consumers' perceptions of quality must ultimately reflect the true quality choice. Empirical studies about the relationship between "objective" quality and price are however notoriously plagued by problems, in particular relating to the measurement of quality.<sup>37</sup> Studies still repeatedly find a positive relationship between price and such quality measures.<sup>38</sup> Finally, while ultimately consumers' perceptions should reflect true quality choices, occasionally this may not hold true. For instance, this can be the case in the short term, in particular when consumers apply a broad heuristic across products. However, in the presence of such a heuristic, from the perspective of an individual firm, the role of the price should become even more important, precisely because consumers may not always (or at least not instantaneously) take into account the specifics of a particular case.<sup>39</sup> Taken together, one can conclude that the role of price as an important signal of quality (or, more generally, an important part of "brand image") is well established in the academic literature (and even more so among practitioners).

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<sup>36</sup> In the marketing literature there have been numerous meta-studies, which systematically analyse the results from other studies. For instance, despite differences in the respective findings, and Völckner and Hofmann (2007) conclude that consumers seem to apply simple heuristics, such as "you get what you pay for", which underpins such a link between price and quality perception. (Cf. also, for instance, Zeithaml (1988) or Rao and Monroe (1989)).

<sup>37</sup> Cf. Gijsbrechts (1993). Quality has often to be inferred indirectly from third-party evaluations like performance scales or quality levels published in Consumer Reports (e.g. Zeithaml (1988)).

<sup>38</sup> Cf. the meta-study of Tellis and Wernerfelt (1987). In particular, they find a strong positive correlation between price and a normalised quality measure based on Consumer Reports. As noted above, however, this does not allow the role of perceptions to be directly isolated, in contrast to truly experienced quality (in particular, when this is persistent and consumers have long experience with the product). Cf. also Sproles (1977) or Hjorth-Andersen (1991) on how this relationship can vary between products and product categories.

<sup>39</sup> The problem of measuring quality (and, in particular, abstract or integrate the subjective component) becomes particularly apparent in studies that relate price to both perceptions as well as (true) quality. For instance, Boyle and Lathrop (2009) conducted a survey asking consumers about their subjective perceptions of the relationship between price and quality for various familiar products. While they report that consumers find it difficult to assess the objective quality for non-durable products, Lichtenstein and Burton (1989) came to the opposite conclusion.

## 4 Why “Price Ownership” Matters when Price Signals Quality

### 4.1 Introduction and Overview

#### 4.1.1 Plan of Analysis and its Wider Implications

This section provides a detailed description of the formal economic foundation that I will provide for the two core arguments in this report. I shall first formally establish a robust relationship between price, on the one hand, and quality - as well as perceived quality ("quality image") - on the other. This framework will then, in a second step, be used to analyse how "price ownership" matters for efficiency, in particular in the light of a conflict of interest between retailers and manufacturers.

As mentioned in the introduction, in the formal analysis I will only focus on two rationales for such a conflict of interest: i) a free-riding problem that relates to the creation of a positive "quality image", albeit in the model this will ultimately coincide with the respective true choice of quality and; ii) the strategic use of prices to influence bargaining power, again through the impact that this has on quality and quality perception. As noted in Section 2.2.2, the focus on quality and quality perception is the most novel aspect of this discussion. It should widen the discussion of the efficiency-enhancing and pro-competitive effects of RPM (or of any other means that manufacturers have of influencing their retail price), in particular in relation to branded products.

The plan of analysis is thus as follows: In the next section, the link between price and quality will be described in detail. The respective formal background can be found in the Appendix (Section 6), for the purpose of making the main text also fully understandable to readers without a background in formal economic analysis. Nevertheless, some formal notation is used, which should be fully comprehensible even without a background in Economics. Such a background is, however, necessary to fully digest the formal analysis in the Appendix. The analysis there puts the following arguments on a sound analytical footing.

Subsequently, vertical contracting between retailers and a manufacturer will be introduced in Section 4.3. There I shall also relate the set-up more closely to the literature on RPM, as discussed in Section 2 of this report. It needs to be stressed again, that the argument will be made as intuitive as possible, though a full formal basis is given in the Appendix. In addition to focusing on the main aspects, the analysis will remain somewhat restrictive, e.g. by considering only the case of two competing retailers in the formal model (instead of dealing with a general market framework). A generalisation of the analysis is available in Inderst and Pfeil (2012).

As noted in the introduction, the argument that retailers and manufacturers do not always have common interests in the choice of the retail price is more general than the analysis in this section

would suggest. Here I focus on a conflict of interest, where retailers prefer a strictly lower price than manufacturers.<sup>40</sup>

More generally, the various rationales as to why the preferences of retailers and manufacturers may differ in respect of the retail price point to a wider conflict of interest - i.e. a conflict of interest beyond the distribution of surplus in the vertical chain. In Section 5 of this report, I am going to relate this to the broader discussion of buyer power in the literature and among antitrust practitioners. Taken together, a key implication from the discussion, as well as from the formal foundation that is provided in this section, is the need to rethink the rationale for prohibiting RPM or other means through which manufacturers can influence prices.

#### 4.1.2 Summary of Key Results

This section provides a theoretical analysis. As such its purpose is not to weigh up the importance of one effect versus another. Instead, based on a formal economic analysis, the purpose is to show that different arguments, which will be briefly reviewed next, can be made in a consistent way. As noted in the introduction to this report, these arguments should also contribute to the current discussion on the implications of retail price maintenance and its enforcement. More generally, they should help to broaden the perspective of scholars and antitrust practitioners alike on the role of retail prices, in particular for branded products: i) their role as an essential part of a firm's marketing mix from a business perspective, ii) their role in credibly signalling to consumers features of the product such as quality (which implies that firms are thereby also incentivized to provide, for instance, the anticipated level of quality) as well as iii) their role in the "vertical competition" between retailers and manufacturers since they may have different interests and preferences also in this respect.

More precisely, the formal analysis underpins the following arguments. Firstly, it identifies three different channels robustly supporting the conclusion that a higher price leads to higher quality and higher quality perception. These are briefly reviewed next. When a higher price is chosen, there is more to be gained by sustaining demand through upholding higher quality. Conversely, when true and perceived quality drop off, e.g. as a consequence of a lowering of hygienic standards, the resulting loss in demand proves to be more costly when the margin that would otherwise be earned on a higher volume is itself higher. I term this, therefore, the "margin effect". Next, there is also a "cost effect": Keeping first quality perceptions unchanged, a higher price would in itself reduce demand. Then, an increase in the per-unit costs, when this is associated with higher quality, has a smaller negative impact on overall firm profits. Finally, I identify an "elasticity effect". This effect arises, in particular,

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<sup>40</sup> The lower price may reduce efficiency and even consumer surplus, given the identified link between price and quality (perception). Under different circumstances however, retailers may prefer a higher price than manufacturers, for instance if this preserves market share for an own-brand product that they stock additionally.

when not all consumers have the same marginal valuation for quality but when, instead, those consumers who value the product more also have a higher valuation for quality. As the price increases, the "critical consumer type", i.e. the type of consumer who is just indifferent to purchasing or not purchasing, now values quality more and, consequently, reacts more strongly to a perceived change in quality. In other words, as the price increases in this case, this makes the firm's demand more responsive to changes in quality, which then increases the firm's incentives to indeed provide high quality.

Based on this link between price and quality (perception), I then show how even in the absence of retail competition, in this model, manufacturer "price ownership" leads to higher quality and quality perception than retailer "price ownership". This is the case because only the manufacturer fully takes into account the implications that individual retail prices have on the product's overall quality perception. Instead individual retailers place, from the manufacturer's perspective, too much emphasis on the sales in their individual store, which ultimately results in "free-riding" on consumers' quality perception. In the model, consumers' quality perception has real implications as, with rational consumers, perceived quality and true quality will ultimately coincide.

When there is retail competition, what matters in negotiations between the manufacturer and individual retailers is how easily they can substitute for the counterparty, i.e. by stocking another product or relying solely on other outlets. When one retailer decides not to stock the respective product any longer, then the manufacturer will be able to attract more consumers and sales at other outlets when the product's quality perception is higher. In turn, the share of consumers that the retailer that delists this product attracts, and the respective profits, are then strictly lower. In essence, a higher quality perception, as sustained (credibly) through a higher price thus puts the manufacturer in a better - and the retailer in a worse - position when the two parties do not come to an agreement. This effect, which works thus through the "outside options" in negotiations, is absent when there is no competition. It brings out most clearly how, now, prices are chosen strategically by the party that has "price ownership" so as to affect negotiations in the longer term, here through the effect that they have on quality and quality perception of the manufacturer's product.

Taken together the formal analysis thus isolates two rationales for why control over the price matters for branded products in light of the established link between price and quality as well as quality perception. Both rationales derive from a conflict of interest between retailers and manufacturers: first, typically manufacturers but not retailers fully internalize the implications that prices have on consumers' overall perception of quality, whereas individual retailers will tend to free-ride; second, as consumers' perception of high quality enhances a manufacturer's bargaining power but may decrease that of retailers, the latter have less incentives to uphold high quality perception through the corresponding choice of the retail price. In both instances it is immediate that the retailers' preferred price may not coincide with the price level that maximizes efficiency and welfare. Competition law



and policy that allocates control over the retail price rigidly to retailers may thus cause a reduction of welfare.

## 4.2 The Link between Price and Quality (and Quality Perception)

### 4.2.1 Set-up for the Analysis

As a first part of the analysis, I consider an auxiliary modelling set-up. In this set-up, there is a monopolistic manufacturer that sells a single product directly to final consumers. In other words, I currently fully exclude the presence of retailers. The framework and analysis that I obtain in this auxiliary setting is later used also in the presence of retailers. The purpose of this section is solely to introduce the basic relationship between price and quality (quality perception).

Demand depends on the product's price  $p$  and quality. For simplicity, I assume that quality can be described by some variable/measure  $q \geq 0$ . A higher value of this measure is meant to capture higher quality. Demand for the product, which I denote by  $x$ , depends on its price as well as on quality:  $x(p, q)$ , so that the dependency on price and quality is made explicit. Demand is strictly decreasing in price  $p$  and strictly increasing in quality  $q$ .

The manufacturer's costs depend on quality and quantity. In the background paper of Inderst and Pfeil (2012), as well as in the formal derivation in the Appendix, I allow for a general relationship, so that costs can be written as a function of quantity  $x$  and quality  $q$ . For the argument it is helpful to be more specific. There is a constant per-unit cost that depends on quality  $k(q)$ , and I assume that the respective function  $k(q)$  is strictly increasing in  $q$ : A choice of higher quality increases per-unit costs of production, e.g. as the manufacturer then procures a higher-quality input used for production or ensures a higher hygienic standard in production.

For the present auxiliary analysis, I now consider the following precise sequence of strategy choice for the manufacturer (or, in the language of modern economic game theory, the following sequence of moves). Firstly, at some initial stage that is referred to as  $t = 1$ , the firm chooses a price  $p$ . Then, in the next stage  $t = 2$ , the firm chooses a quality  $q$ . Finally, in  $t = 3$ , consumers decide whether to purchase or not. I discuss the specific choice of timing in  $t = 1$  and  $t = 2$  below. While I argue there that my subsequent analysis is more general, it is important to be specific so as to ensure that the assumptions that also underpin the formal analysis are clearly spelled out.

Before purchasing, I assume that any given consumer only observes with probability  $\gamma$  the true quality. With the remaining probability  $1 - \gamma$  the particular consumer, instead, does not observe quality before making a purchase. When there are many consumers in the market, as is typically the case, the variable  $\gamma$  also denotes the fraction of informed consumers. Note that if all consumers were informed, which is the case when  $\gamma = 1$ , there would be no role for quality perceptions. An alternative

interpretation of this setting is that where, at a given time, all consumers share the same information, but where from an ex-ante perspective it is not certain whether a particular choice of quality will in fact be observed or not. For instance, if the manufacturer decides to cut corners and implements a lower standard of food safety or procures a cheaper input from a new supplier, then this may or may not materialise in a hygiene problem and the perception of low quality.

In cases where consumers do not receive new information - or for consumers that are less informed than others - a purchase is based less on directly observed and experienced quality than on the perception of quality (i.e. the respective beliefs). I denote these perceptions of quality by  $\hat{q}$ . These beliefs will, however, not be arbitrary. Instead, they will be rational, which implies that in equilibrium, where the firm's strategies are optimally chosen, beliefs are fully borne out by the actual choice of quality. They will, however, be informed and thus conditioned on the choice of the price. It is this link between price and quality perception that is established in the present section. As I argue, such a link can be robustly supported by means of standard economic analysis, based on optimal firm behaviour and rational consumers.<sup>41</sup>

Before analysing the auxiliary model, I comment on the choice of the sequence of timing in  $t = 1$  and  $t = 2$ . This specification is made to focus the analysis on the more long-term choice of price strategy ("price image"). As such it is part of the overall positioning of the product, i.e. its branding (cf. Section 3). The price decision is then complementary to other marketing choices such as the scope and content of the advertising campaign. That said, some key (quality) features of the product are certainly chosen for the long term. Yet to be specific, I now consider decisions that must be constantly made by the manufacturer so as to maintain high quality, particularly with a view to fast moving consumer goods. As noted previously, this concerns, for instance, the procurement of high-quality inputs or the overall conditions of production and handling of the product (e.g., with regard to food safety). Here, the firm could be tempted to save costs by reducing care or, more particularly, selecting cheaper inputs. This is one motivation for assuming at this point in the model that the firm sets the price and then chooses which quality level it (still) wishes to maintain.<sup>42</sup>

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<sup>41</sup> The present analysis should, however, not suggest that this is the only possible way to establish a clear and intuitive relationship between price (and ultimately demand) that goes beyond the role of the price as merely a cost to consumers (cf. the discussion in Section 3). For instance, as also discussed previously, a higher price could make a product more appealing to particular consumers as it ensures that it is only consumed by people with a certain (strong) preference or income. Also, such a hypothesis could be supported formally based on fully rational consumers.

<sup>42</sup> That said, as I argue in the Appendix, the currently-analysed link between price and quality does, however, not depend on this sequence. Instead, the results would extend also when this choice was reversed, albeit some additional technical analysis would then be needed.

#### 4.2.2 How Higher Prices Induce Higher Quality and Higher Quality Perception

Demand now comprises two parts: that generated by consumers who directly observe the true quality choice  $q$ , and that generated by consumers who purchase (mainly) based on perceived quality  $\hat{q}$ .<sup>43</sup> Somewhat more formally, these two parts of demand are then  $x(p, q)$ , when  $q$  is the true quality, and  $x(p, \hat{q})$ , where  $\hat{q}$  is the respective perception. As these two parts of demand have the respective weights  $\gamma$  and  $1 - \gamma$ , demand equals

$$\gamma x(p, q) + (1 - \gamma)x(p, \hat{q}). \quad (1)$$

When, at time  $t = 2$ , the firm chooses the respective true quality  $q$ , note that this only affects demand when the choice or change in quality is observed. Instead, with the price now fixed, consumers who purchase based only on brand image will, at this stage, not be affected by the choice of  $q$  but, instead, only by the respective beliefs  $\hat{q}$  (i.e. quality perceptions) As I note below, this gives rise to a "commitment problem" by the manufacturer, given that consumers are not fooled in equilibrium: They rationally anticipate that any firm will maximise profits and, for that purpose, will save on costs (here: related to quality) when this pays to do so, notably when some consumers fail to notice at the time of purchase. It is then the role of the price to "signal" to consumers the firm's commitment to truly uphold a high level of quality.

More formally, to repeat this, when choosing the quality level  $q$  the firm only takes into account how this changes the first part of demand in equation (1). In equilibrium, rational consumers anticipate the firm's choice of quality: They form rational expectations, so that, still for a given price  $p$ , their beliefs must match the truly chosen quality. Put differently, the true quality choice and beliefs must together form an equilibrium, so that, in particular, for these beliefs  $\hat{q}$  it is indeed optimal for the firm to choose a quality level that matches the beliefs:  $q = \hat{q}$ . In the formal analysis in the Appendix, I denote this equilibrium level, still for a given price, with a star:  $\hat{q}^*$ . This thus denotes *both* the true (optimal) choice of quality *and* the corresponding beliefs that are held by those consumers who do not directly observe (adjusted) quality.

The key question that I ask next is how this equilibrium level of quality  $\hat{q}^*$  in stage  $t = 2$  depends on the chosen price level. I identify three different channels that robustly support the conclusion that a higher price leads to higher quality. These effects are discussed next (and derived formally in the Appendix).

1. **"Margin Effect":** When the firm chooses a higher price  $p$ , so that the resulting

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<sup>43</sup> Recall, however, that the setting also applies when all consumers share the same information and beliefs, while it is only with some probability that, say, a reduction of quality or production standards materialises in some "critical event" that changes consumers' (true) perception of quality.

margin is higher as well, the firm has more to gain by sustaining demand through upholding a higher quality. Put differently, when quality drops instead, the firm loses demand in those instances (and from the respective consumers) where the consequences materialize from the fact that it shirked. The respective loss of profits is higher when the margin is higher. This is the most immediate effect that a higher price has on the supplier's incentives to maintain quality at a high level.

2. **"Cost Effect"**: As the price increases, thereby decreasing demand, an increase in the per-unit costs has a smaller negative impact on overall firm profits when this is associated with higher quality. That is, when the firm chooses a higher price and thereby reduces (*ceteris paribus*) demand, then a corresponding higher choice of quality, which reduces costs per unit, weighs less in the overall profit function.

3. **"Elasticity Effect"**: This effect arises, in particular, when not all consumers have the same marginal valuation for quality but when, instead, those consumers who value the product more also have a higher valuation for quality. The impact that a higher price has on the elasticity of demand is then as follows. As the firm increases the price, then (again *ceteris paribus*) this changes the "critical consumer type", i.e. the type of consumer who is just indifferent to purchasing or not purchasing, in such a way that now this type has not only a higher absolute valuation for the product, but also a higher marginal valuation for quality (i.e. he values any incremental increase in quality more). Then, when the firm changes quality, this now has a higher impact on demand, compared to the case where the price was lower (and with the respective new "critical type", which then has a lower valuation for quality). Put differently, by pricing the product high, demand is composed mainly of consumers who not only care more for the product, but also for quality. This makes demand more responsive to changes in quality, which then increases the firm's incentives to indeed provide high quality.

All three effects work in the same direction, so that for this auxiliary model one can make the following conclusion: When the price is higher, as set in  $t = 1$ , then quality will also be given higher priority in  $t = 2$ , so that ultimately an equilibrium with higher true and perceived quality will arise.

I conclude this section with some observations on efficiency and welfare in the auxiliary model. Recall first that the firm faces a commitment problem vis-à-vis consumers if not all of them always directly observe changes to quality. That is, when the manufacturer chooses actual quality, it only takes into account how this affects demand from consumers who are indeed informed (or, likewise, how this affects demand in case the reduction in quality becomes transparent, say as a critical event occurs). Hence when  $\gamma < 1$  equilibrium quality, at which true quality and quality perceptions are equalised, is strictly even below the level that would maximise the manufacturer's own profits from an ex-ante perspective. This observation will prove relevant in the following section, where the equilibrium price

is determined. In addition, with the price given, the manufacturer fails to fully internalise the benefits of higher quality for consumers, i.e. even for those consumers who observe whether the manufacturer has upheld quality or not.<sup>44</sup>

### 4.2.3 Analysis of Prices in Equilibrium

I turn now, still in the auxiliary model, to the optimal choice of the price  $p$  at the initial stage  $t = 1$ . Suppose first that quality was not a strategy variable in the current model, e.g., as if it was hard-wired to the particular nature of the product. Then, the optimal pricing decision would result from a standard trade-off between margin and quantity. That is, by raising the price, the margin increases, but this margin is now earned only with a smaller number of units sold. Now, however, quantity sold also depends on quality and quality image, that is for a given price on the previously derived equilibrium level  $\hat{q}^*$ . Then, firm profits are simply

$$x(p, \hat{q}^*)(p - k(\hat{q}^*)),$$

i.e. quantity times the respective margin, where both quantity and per-unit costs depend on  $\hat{q}^*$ . As the price changes, we know that this changes  $\hat{q}^*$  as well. Specifically, a higher price level now affects demand both directly (that is, negatively) and indirectly, namely through the resulting increase in quality and quality perception. For the latter effect to matter sufficiently, perceptions must matter sufficiently as well.

The precise equilibrium conditions are pinned down in the Appendix. They are also used there later to obtain some numerical illustrations. The main use I make of the equilibrium characterisation in this report, however, is to discuss on this basis two rationales for why, in the stylised model, it matters whether “price ownership” lies with retailers or manufacturers, and why in the latter case equilibrium quality and quality perception will be strictly higher. For this I introduce retailing in the next section and then, for the purpose of simplicity only, analyse first the case where I can exclude competition among retailers and then the case with retail competition.

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<sup>44</sup> This is, of course, an implication of the particular timing of price and quality that I have chosen. If the timing was fully observed and if quality changes were observed by all consumers, the manufacturer could extract a larger share of higher consumer surplus in case of a higher quality choice. In practice, it should be the case both that quality reacts to prices as well as that prices react to (at least persistent) changes in quality. Interestingly, when quality choice is not fully observed, a manufacturer could benefit from committing to a persistent price, as this credibly provides him with incentives.

## 4.3 The Free-Riding Problem

### 4.3.1 Introducing Retailers

I now introduce retailers. Specifically, the considered manufacturer will have to sell his output through one or more retailers in order to generate demand. As will become clear from the following analysis, when there is only a single retailer, then the interests of the manufacturer and of the single retailer (in respect of how the retail price is set) will be perfectly aligned. This result has the advantage that it allows the clear isolation, in what follows, of the two channels through which a conflict of interest arises: free-riding and strategic behaviour to influence negotiations. The first channel will be present even when the retailers that are supplied serve independent markets. This is why I am currently excluding retail competition. The respective demand of each retailer can then be considered to be the residual demand in the respective local market. Furthermore, for ease of exposition only, I consider the case with  $N = 2$  retailers only. The case with a general number of retailers is, however, fully analysed in the background paper Inderst and Pfeil (2012).

I still assume that at an initial stage  $t = 1$  there is a choice of retail prices  $p_n$ . This choice is made either by the  $N = 2$  retailers, in which case I speak of "price ownership" by retailers. Alternatively it is made by the manufacturer.<sup>45</sup> Again, recall that in  $t = 2$  the manufacturer chooses the quality level  $q$ , which pertains to all units supplied subsequently, regardless of which retailer these are delivered to.

In my model the first action is the manufacturer's choice of the retail price, when it has "price ownership". Price is then, in essence, a key feature of the overall "brand" of the product. In fact, the price may then be communicated as part of the overall marketing campaign. As already shown above, a higher price will be associated with higher quality (and higher perception of quality by those consumers who do not directly observe quality choice). When the manufacturer "owns" the retail price, the key insight of this group is that it will internalise the benefits from an overall higher perception of quality. This, in particular, is internalised by the manufacturer, when consumers form beliefs based on their perception of prices across all retailers and shopping trips. In contrast, when retailers have "price ownership", they tend to free-ride instead. That is, even when they are not in direct competition for an individual consumer, e.g. as the consumer simply buys the respective product at the most convenient outlet at any given time, retailers have an incentive to choose a strictly lower retail price than preferred by the manufacturer. This is the key, novel result of this section.

Now, with the introduction of retailers, I have to consider the respective negotiations between the manufacturer and these retailers. As throughout the analysis, I have to make clear specifications on

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<sup>45</sup> In the latter case of manufacturer "price ownership" it may be reasonable to postulate uniform pricing across all markets, so that  $p_n = p$ . This is discussed in detail in Inderst and Pfeil (2012).

how these negotiations proceed and at what time in the overall model they occur. While matters are surely more flexible and less clear-cut in practice, the need to make specific assumptions in a formal analysis also helps to clarify which assumptions are needed to support the respective arguments.

The model of vertical relationship and contracting that I present here adopts a different timing sequence as to how wholesale and retail prices are set compared to much of the extant literature. There, the timing is typically as follows: Firstly, wholesale contracts are determined either unilaterally by manufacturers or through bilateral negotiations with retailers; secondly, retail prices are set. This framework seems to accord well with the picture that manufacturers and retailers meet rarely, possibly even only once a year, to determine the terms and conditions of supply while, on the other hand, retail prices are adjusted frequently so as to reflect, for instance, changes in local demand. I offer a different framework that emphasises, broadly speaking, the persistence of retail pricing decisions and the respective price image thereby conveyed.

Taken literally, there are many reasons as to why there should be some persistence of retail prices, in particular when compared to wholesale prices as well. Also there may be frequent (re-)negotiations of wholesale terms and conditions, while firms may have a strong interest in maintaining a consistent "price image" with consumers.<sup>46</sup>

The choice of timing, namely that negotiations proceed in  $t = 3$  in the stylised model that is considered, in this instance clearly limits the role that wholesale contracts can play in governing firms' incentives. On the other hand, the idea of a single initial wholesale contract that can govern all (longer-term) choices and implications - as is the case in most models used in the literature - is most likely too strong. Furthermore, recall from the discussion in Section 2 that some cartel authorities also enforce the ban on RPM by targeting practices such as the combination of a recommended retail price (or, more directly, communication of such a price target to retailers) with incentives, as provided by wholesale contracts.

In the model, negotiations at stage  $t = 3$  cover both how the achieved surplus is shared between the manufacturer and retailers and whether the product will still be listed. Without providing here the full

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<sup>46</sup> Though long-term (yearly) contracts are often used in practice, the extent to which these contracts prescribe terms of delivery in detail varies considerably. Notably, to my knowledge, in the UK grocery market such yearly agreements are much less detailed than in some other European countries (such as Germany or France) and, moreover, there is continuous pressure to renegotiate on additional payments throughout or, particularly, at the end of the year. On the other hand, outside clearly specified and limited promotional activities, retailers - and even more so manufacturers - may indeed want to provide a consistent price image. There are also menu costs associated with a change of retail prices, as emphasised in the macroeconomic literature (cf. recently Nakamura and Steinsson 2008, who also document a higher frequency of relatively small rather than larger price changes). The picture of a rather consistent price - in particular, outside promotions - is also confirmed by Hosken and Reiffen (2004). For a model that derives a relative persistence of prices from consumers' preferences (given loss aversion) see Heidhues and Köszegi (2008).

formal background, generally the respective shares of the manufacturer and of retailers depend on the value of their “outside options”. At the moment, however, this will not be the key mechanism that I try to isolate as I exclude retail competition. Without loss of generality, I can thus focus for now on how the surplus in the respective markets is shared. While this does not impact on the general insights, I assume an equal sharing of this surplus. With this background, I can now proceed to an analysis of optimal retail prices under retailer or manufacturer “price ownership”.

### 4.3.2 Analysis

I introduce some additional notation to make the subsequent discussion more transparent. Consider one of the two local (retail) markets in which the manufacturer wishes to sell his product. Recall that for now I assume that the respective retailer that operates in this market is virtually a monopolist, at least from the manufacturer’s perspective, as he may sell only through this retailer. The key variables to consider are now the respective local price  $p_n$ , with  $n = 1,2$  denoting the respective markets, and the equilibrium quality  $\hat{q}^*$ . Recall that this must also equal the respective quality perceptions. Total profits in the vertical chain in market  $n$  are denoted by the symbol  $\pi(p_n, \hat{q}^*)$ , which makes transparent the dependency on these two variables. Recall that the manufacturer’s per-unit cost was denoted by  $k(\hat{q}^*)$ , depending on the respective choice of quality. If I assume constant costs of handling and distribution for the retailer and set those equal to  $h$ , then I have now for the (joint) profits in one market

$$\pi(p_n, \hat{q}^*) = x(p_n, \hat{q}^*)(p_n - k(\hat{q}^*) - h). \quad (2)$$

These profits are shared equally. Consequently, each retailer  $n = 1,2$  has profits equal to

$$\frac{1}{2}\pi(p_n, \hat{q}^*), \quad (3)$$

while the manufacturer’s profits, as summed up over both of two retailers equal

$$\frac{1}{2}[\pi(p_1, \hat{q}^*) + \pi(p_2, \hat{q}^*)]. \quad (4)$$

Now take first the case where “price ownership” lies with the manufacturer. The optimal price that the manufacturer sets is the same as in the previous case where I ignored the retailer. It is actually also independent of the number of retailers. The key is that the manufacturer, when choosing  $p_n$  for all markets, takes into account the full repercussion that this has on both quality perception and his incentives to provide and uphold quality subsequently. (Both must coincide in equilibrium as consumers are rational.) But this is not so when retailers individually choose their privately optimal retail prices  $p_n$ .



Thus turn next to the case where retailers have "price ownership" and choose  $p_n$  in  $t = 1$ . The key difference from the manufacturer's choice is that a single retailer does not take into account the positive impact that a higher price and, thereby, a higher value of the resulting (true and perceived) quality  $\hat{q}^*$  has on demand in all other markets, that is currently in the second market. Clearly, this only makes a difference in the model when  $\gamma < 1$ , so that some consumers (or consumers sometimes) purchase based on their quality perception. A retailer then prefers a strictly lower price than the manufacturer would, as he sells rather more units of the product in his market and free-rides on the overall quality perception that the product enjoys. If instead he raised his price, the retailer would help to induce higher quality (true and perceived), but the benefits of this would also be enjoyed at other markets.

Somewhat more formally, with retailer "price ownership", from inspection of the profits (3) that a given retailer  $n$  realises, we see that he only considers the following two effects. Firstly, there is the direct effect that  $p_n$  has on profits, holding quality and quality perceptions constant. That is, as  $p_n$  increases, for instance, this increases the total margin that can be realised,  $p_n - k(\hat{q}^*) - h$ , but it decreases demand,  $x(p_n, \hat{q}^*)$ . If we could ignore quality altogether, then the optimal price would optimally trade-off these two forces.<sup>47</sup> The retailer, however, takes into account a second effect, namely how his choice of the respective price  $p_n$  affects equilibrium quality perceptions. We see from equation (3) that the retailer only takes into account the effect that a higher quality perception has on demand in this local market. To stress this once more, this is the core difference in the price choice under manufacturer "price ownership". As seen from the respective profits in (4), the manufacturer takes into account how each price  $p_n$  affects demand on both markets through the respective change in perceived quality.

In summary, I find under manufacturer "price ownership" a higher perception of quality for the product in equilibrium. This is the case as the manufacturer takes into account, broadly speaking, the full implications of the fact that retail prices convey information to consumers. Instead, individual retailers place, from the manufacturer's perspective, too much emphasis on the sales in their individual store, which results in "free-riding" on consumers' quality perception. Consumers' quality perception has, in the described model, real implications as, with rational consumers, perceived quality and true quality will ultimately coincide. This is why, according to this analysis, equilibrium quality will be higher under manufacturer "price ownership" compared to retailer "price ownership". Note, however, that the present analysis also suggests that this finding hinges crucially on the role of quality perceptions, as consumers not always (or not all consumers) observe the true level of quality. But this

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<sup>47</sup> This also remains the only effect that the retailer considers when all consumers can observe quality. While then the choice of  $p_n$  has an impact on the quality subsequently chosen, the fact that in this case quality already maximises joint surplus implies that (small) adjustments of  $p_n$  have no effect on profits in this instance.

is precisely the case where brand image should matter in practice.<sup>48</sup> The identified effect should thus truly matter (more) for branded products.

#### 4.4 Strategic Use of Prices to Affect Negotiations

I still consider, albeit for convenience only, two retailers, so that their number is given by  $N = 2$ . In contrast to the previous analysis, however, the two retailers are now in competition. As I show, this generates a new dimension in the conflict of interest between the manufacturer and each of the two retailers.<sup>49</sup>

I have already noted that prices, in this model, have the effect of inducing quality and quality perception. So I ask more directly how a retailer's and the manufacturer's interests are different with respect to the desired level of quality and the desired quality perception. When the manufacturer's quality and its perception among consumers is higher and a particular retailer, say retailer  $n = 1$ , decides to no longer stock the product, then the manufacturer together with the other retailer,  $n = 2$ , will be able to attract more consumers to the respective retailer and the manufacturer's product when it has a higher quality. In turn, the share of consumers that retailer 1 attracts and the respective profits are then strictly lower, i.e. when the manufacturer's product, which this retailer no longer stocks, is of higher quality. In essence, a higher quality thus puts the manufacturer in a better - and the retailer in a worse - position when the two parties do not come to an agreement! This effect, which works thus through the "outside options" in negotiations, is absent when there is no competition. It brings out most clearly how prices are now chosen so as to affect negotiations in the longer term, here through the effect that they have on quality and quality perception of the manufacturer's product.

In more informal terms, the manufacturer's standing in negotiations with each individual retailer depends crucially on consumers' perceptions. Certainly when the retail price is higher, this has – as noted above – a direct negative effect on demand. At first, this would suggest that a manufacturer would rather fear that its product is overpriced. However, in the present analysis price is not only a

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<sup>48</sup> Otherwise, at least in his model with rational consumers and only preferences for higher quality and lower price, the offering would convey to consumers all the information they need and price would only play the role of a cost to consumers, instead of conveying additional information (or cues, in the language of marketing science; cf. Section 3).

<sup>49</sup> When I formally consider in the Appendix the profits that the manufacturer and each of the retailers generate and how this is affected by prices and quality, the following is noteworthy (cf. also the analysis in Inderst and Pfeil (2012)). Firstly, if I keep the quality fixed, so that there is no channel through which prices affect perceived and true quality, then in the model that I analyse there is *no* conflict of interest, even when there is competition between retailers. In other words, in the price setting game, where I consider retailer or manufacturer "price ownership", the same price level would arise irrespective of the choice of regime, provided that quality and its perception are not an issue (that is they are considered to be fixed and well-known to consumers, respectively). This result, though of interest, is not the focus of the present discussion, however. Nevertheless, it provides the right background to analyse precisely the difference that it makes when price affects quality and quality image. This is at the core of the present report.

cost to consumers, but it also affects quality perceptions (as it ultimately affects incentives to maintain a high quality level, so that in equilibrium true quality and quality perception are equal). Through this channel a higher price can actually make the manufacturer's product more valuable in the sense that it becomes harder for any retailer to substitute, given that some consumers would then switch to another retailer (or, at least, the bundle of products that a competing retailer could offer would become slightly more attractive to consumers). What the formal analysis says is that through this channel the manufacturer would prefer a higher price and, consequently, a higher quality and higher quality perception than any of the competing retailers.

Whether welfare is higher under manufacturer or retailer "price ownership" is generally ambiguous. What should be noted, however, is that the lower price that, in this model, the retailer sets is not necessarily an expression of consumers' interest. In fact, given the modelling choice, when quality and quality perception were fixed, then – as already noted – "price ownership" would not matter. This set-up thus allows the isolation, now with competing retailers, of the impact that prices have on negotiations through the quality and quality perception that they ultimately induce. While the manufacturer relies on higher quality perceptions to support his bargaining position, retailers benefit from making each individual manufacturer more dispensable. In what follows, I now place this discussion more broadly in the wider perspective of "vertical competition" between manufacturers and retailers.

## **5 Wider Perspective and Concluding Remarks: "Vertical Competition" and Buyer Power**

### **5.1 Outline of this Section**

In this section I first review some of the policy reports and empirical studies that document for Europe (and selected European countries, notably Germany) the growing buyer power of retailers, most notably in the area of fast-moving consumer goods. As noted above, sketching the rise of buyer power in retailing provides an important background for the overall analysis and argument in this report. The discussion and formal analysis in the previous sections suggests that "ownership" of the retail price – or, at least, sufficient means to affect the price – matter also in the light of a conflict of interest between retailers and manufacturers. To recap: In the analysis, the choice of the retail price affected a product's (quality) perception and, thereby, the bargaining positions of retailers and the respective manufacturer.

Apart from the particular model that was chosen and analysed there, the insights apply, however, more widely. As discussed in Section 3, in particular, for branded goods manufacturers the price often plays a key role in the overall positioning of the product. In fact, the pricing strategy may be closely linked

to the overall strategy and notably to brand perception (not only in terms of quality, albeit this was the focus of the formal analysis). Retailers have their own price policy and thus their own preferences. This may relate to the way they want to position the product in the respective category, notably also with respect to their private label products, or the use of it for promotions or as “loss leaders” to attract customers. The analysis also showed, however, how pricing can be instrumentalized to strategically affect the bargaining position vis-à-vis the respective manufacturer.

Current competition law and practice, at least in Europe, clearly puts the pricing decision in the hands of retailers, through the prohibition of retail price maintenance (and, depending on jurisdictions, any substitutes that are deemed to be equally coercive for retailers; see, in particular, Section 2.3). As I discuss in this section, in such an environment of “vertical competition” and with the background of increasing buyer power, control of key strategic variables must be discussed also from the perspective of preserving or establishing a level playing field.

To sketch some developments that support the picture of increasing buying power, based on a short conceptual review of buyer power, Section 5.2 briefly looks at market consolidation over the last decades in Europe and at evidence that relates to the exercise of growing buyer power. Section 5.3 also takes into account the growth of private labels products and Section 5.4 then relates this to the wider question of how the changing balance of power in “vertical competition” is reflected in a shift of functions in the vertical chain. The question of “price ownership” is thereby put into a broader perspective, which is necessary to adequately capture the greater implications for efficiency in the market.

## **5.2 Buyer Power through Retailer Concentration and Size**

Broadly speaking, buyer power refers to the bargaining strength that a particular buyer has with respect to the suppliers with whom he trades.<sup>50</sup> Further below I depict briefly the growing consolidation in European food retailing as well as the growing importance of private labels. One reason that these are key determinants of the shift in power between manufactures, including those of branded goods, and large retailers is the effect that they have on what I call the “outside options” of both manufacturers and retailers in their bilateral negotiations. To provide some background, I therefore first discuss more generally the role of retailers’ size, in particular. In the companion report

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<sup>50</sup> The ability of more powerful downstream firms to affect to their advantage the terms of trade with upstream suppliers is emphasized in OECD (2006). According to the definition in European Commission (1999), buyer power is “the ability of one or more buyers, based on their economic importance on the market in question, to obtain favourable purchasing terms from their suppliers.” For an extensive review of the (theoretical) economic literature on buyer power see Inderst and Mazzarotto (2008).

(Inderst (2013)) I provide more details, as well as a short description of a more formal conceptual framework to analyse the determinants of buyer power.<sup>51</sup>

As discussed subsequently, notably in European food retailing, retailers have grown considerably 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 option in a variety of ways. The economic literature has, in particular, pointed towards the following mechanism. If a buyer is large enough it can credibly threaten to incur even substantial costs and integrate backwards, thereby rendering the supplier redundant.<sup>52</sup> Size allows spreading the respective costs over a larger volume. In fact, to the extent that this refers to private labels, I will discuss this development in more detail below. By the same logic, size should also matter for how credibly a buyer may threaten to switch to another supplier, in particular if switching involves non-negligible one-off costs.<sup>53</sup> Even without resulting in efficiencies, this should have the effect of lowering the retailer's costs of supply by increasing its margin at the expense of that of manufacturers. The preceding observations are not meant to be fully comprehensive and just illustrate how the economic literature has identified size as one possible key determinant of buyer power.

Empirical research largely confirms the role of size as a determinant of discounts. Several studies, in particular among the earlier literature on buyer power, have found a negative relationship between buyer concentration and suppliers' profit margins.<sup>54</sup> Interesting evidence also comes from the findings of the UK's repeated inquiries into the national food retail market, which for instance, depicted a widening differential in purchasing conditions in the course of only a few years.<sup>55</sup> This is discussed in more detail further below.

Size may not only increase the value of retailers' outside options, i.e. its alternatives, but also reduce the value of the manufacturers' outside options. When a supplier has to replace a large buyer, this may severely reduce the price and thus the profit that the seller can still realize, either by locating other

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<sup>51</sup> Further details can be found in Inderst and Mazzarotto (2008). There, we also discuss various alternative perspectives on buyer power.

<sup>52</sup> This argument is formalized in Katz (1987) and Sheffman and Spiller (1992).

<sup>53</sup> Furthermore, size may also 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. The importance of "buyer sophistication", which often should grow along with size, is brought out in more detail in Nordemann (1995) and Steptoe (1993). Also, larger buyers may employ more competitive procurement methods such as auctions.

<sup>54</sup> Lustgarten (1975) and Schumacher (1991) are representative studies. Note, however, that size and market concentration are not always fully interchangeable.

<sup>55</sup> This holds also with respect to the manufacturers of strong brands. In fact, when reviewing the prices paid for the top five branded lines of twenty-six large suppliers, the five largest multiples typically bought goods more cheaply than any other party (Competition Commission (2000); see also for similar findings the negative assessment of a merger in grocery retailing, partly also based on the further strengthening of buyer power, in Competition Commission (2003)).

channels or by selling a larger volume at other outlets.<sup>56</sup> This would be aggravated when the particular retailer acted as a “gatekeeper” in a given (local) market, as then the manufacturer has no alternative channels to serve these particular consumers. Sales made through such a retailer may thus be particularly difficult to replace.<sup>57</sup>

These short general observations, in particular on the relation of size and buyer power, provide a background for an equally short description of the development in European food retailing in what follows.<sup>58</sup>

The food retailing industry has become increasingly concentrated in most European countries, particularly through a wave of mergers and acquisitions<sup>59</sup>. In this section, I do not intend to provide a comprehensive picture, which would require in particular taking into account national differences which, as is well known, are very pronounced. Instead, the figures and details that are provided next serve mainly as an illustration for trends that are already well-documented and well-recognized. Still, for an illustration it is interesting to look at the five major markets in the European Union. Overall markets show an – often pronounced – increase in retailer size and concentration, as measured for instance by the retailing market shares of the top five retailers.<sup>60</sup> From 2005 to 2010 the respective share increased, according to Europanel data, from 69 percent to 74 percent in the UK, from 57 percent to 64 percent in Spain, from 28 percent to 32 percent in Italy, from 61 percent to 75 percent in Germany and remained at 73 percent in France.<sup>61</sup> Further details, also with a spotlight on Germany in particular, are contained in the companion report Inderst (2013).

The growing concentration directly affects the role that individual retailers play for manufacturers. Even more than ten years ago, 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, for instance.<sup>62</sup> A survey of

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<sup>56</sup> Cf. Inderst and Wey (2004).

<sup>57</sup> Cf. Mazzarotto (2003), Dobson and Waterson (1997) or v. Ungern-Sternberg (1996). The immediate loss of profits may be aggravated if a supplier is “financially dependent” on a retailer (cf. Inderst and Mazzarotto (2008) for a detailed discussion).

<sup>58</sup> Note again that more details are contained in the companion report Inderst (2013).

<sup>59</sup> See Clarke (2002, p. 83 and Table 7.8). In addition, buying groups have grown in size. In 2010 food retail sales accounted for by members of the key European food buying groups amounted to an estimated €976 billion up from an estimated €702 billion in 2006. See British Brands Group (2012).

<sup>60</sup> This ratio (“CR5”) is a common concentration measure.

<sup>61</sup> Data from Europanel (Source: British Brands Group (2012)). European Commission (2011, in particular Chapter 5) and OECD (2006, in particular Chapter 1) provide more details on the growth of buyer power in European food retailing across different countries.

<sup>62</sup> See Competition Commission (2000).

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.<sup>63</sup>

Recent evidence on the actual exercise of buyer power comes, for instance, from the UK Competition Commission's Supermarkets reports<sup>64</sup>. In reviewing the prices paid by the largest retailers or as a function of the respective contractual volume, large differences were observed.<sup>65</sup> 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.<sup>66</sup> 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 (also including exclusive arrangements). Other arrangements that powerful buyers may enforce may shift the burden of risk (e.g., from returns) and the provision of liquidity (through late payments) to suppliers.<sup>67</sup>

### 5.3 Private Labels as a Lever of Buyer Power and a Driver of Conflicts of Interest

The steady rise of private label products has been documented many times in academic and policy-oriented contributions (see, for instance, the companion report Inderst (2013)). Though there are pronounced differences between countries and categories, evidence of the increasing importance of private labels is overwhelming. Across all categories and across Europe, for instance, one study estimates a 50% increase in market share between 1999 and 2010.<sup>68</sup> In countries such as Germany, this has been estimated to be much higher, with a doubling of the respective market share over a comparable period.<sup>69</sup>

Equally important and noticeable is the shift in the nature of private label products. Initially, they were part of a low-price, low-quality strategy allowing retailers to compete with discounters for the low-

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<sup>63</sup> See DIW (2010) and v. Schlippenbach and Pavel (2011). Numbers for Dutch suppliers, to provide another example, are comparable. See LEI (2009).

<sup>64</sup> See Competition Commission (2000, 2008). See also Dobson (2005) and European Commission (2011) for further discussions on the results of retailer buyer power in the British Grocery Trade.

<sup>65</sup> This includes wholesale prices for top branded products (cf. Competition Commission (2000)) and both a statistically and economically significant overall "volume discount" (cf. Competition Commission (2008)). Survey evidence to support this comes, for instance, from a German study conducted in 2009, in which 90% of respondents reported earning their lowest margin with one of their three largest customers. See DIW (2010) and v. Schlippenbach und Pavel (2011).

<sup>66</sup> See Dobson (2005) and European Commission (2011) that provide a review of the relevant non-price terms.

<sup>67</sup> Again the aforementioned reports of the UK Competition Commission provide evidence on how large retailers increasingly use such practices. The respective details from Competition Commission (2000, 2008) are reported in the companion report Inderst (2013). There, I also refer to similar survey findings from Germany.

<sup>68</sup> Cf. Rabobank (2010).

<sup>69</sup> Cf. Wey (2011) and Inderst (2013), both based on GfK and Nielsen market data.

income and price-sensitive buyer segment.<sup>70</sup> Characteristic of the early low-price, low-quality strategy in the private label industry sector were so-called “me too” products.<sup>71</sup> This has changed. With “value private labels” or “premium private labels”, which are located at the upper end of the price and quality spectrum, retailers now increasingly challenging medium and even top brands. Some retailer chains have succeeded in building up a brand image of their own, acting as certifiers of quality and also innovators. That is, they can introduce new products on the back of their own reputation.<sup>72</sup> The consequences of this are explored in Inderst (2013).

With a focus on Germany, the companion report also provides more details and illustration for this development. For instance, it is reported there that the market share of such value/premium brands has increased from 9 percent in 2007 to 12,9 percent in 2012.<sup>73</sup> In relative terms this represents a growth by one third over these six years. While it seems that up to now this growth has come mainly at the cost of middle market branded products, retailers increasingly challenge market leader and premium brands as well, in particular by developing their own lines in “new” and growing markets as that for organic or regionally produced foods. In the companion report I also argue how this goes together with an increasing role that retailers play in all other functions of the vertical chain, notably marketing and advertising. There, I also acknowledge the efficiency rationale behind the development and growth of private labels. At the same time however the presence of private labels can substantially enhance a buyer’s bargaining position vis-à-vis producers of national brands. Moreover, by stocking private labels next to manufacturers’ goods in a given category, a retailer not only makes shelf space scarcer but also enters into direct competition with its suppliers.<sup>74</sup> The development of private labels goes also often hand-in-hand with increasing concentration and the growth of large buyers. Comparing the development of private labels in different countries, the argument can be made that in countries that exhibit powerful retailers private labels are often more developed.<sup>75</sup> In fact, there appears to be a two-way relationship between retail market concentration and private label adoption. On the one hand, a high concentration ratio favours the introduction of private label products since retailers are more likely reach a critical size, both to make production of private labels profitable and to subsequently

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<sup>70</sup> Cf. Hassan and Monier-Dilhan (2006).

<sup>71</sup> These are often positioned close to established national brands. Thanks to cost savings on packaging, product development and advertising costs, retailers were able to price their private label products below the prices of national brands. See Inderst (2013) for details, as well as a formal analysis, of incentives to imitate and its consequences for innovation.

<sup>72</sup> Cf. from an academic perspective on such a “reliability umbrella” Ezzachi and Reynolds (2009).

<sup>73</sup> This compares to a market share of budget private label products of 25,7 percent in 2007 and 25 percent in 2012.

<sup>74</sup> For instance, in case the branded good was (temporarily) not stocked, some of the lost sales would be recaptured through higher sales of the private label good: the retailer’s outside option would increase.

<sup>75</sup> Cf. Herbert (2009).



invest also in building up image to move into the premium and value segment.<sup>76</sup> On the other hand, the rise of private label products itself can reinforce the process of retail market concentration, notably also through an improved bargaining position vis-à-vis suppliers and, consequently, better terms and conditions than smaller rivals.<sup>77</sup>

#### **5.4 Buyer Power and “Price Ownership” in the wider Perspective of Vertical Competition**

Notably in European food retailing, there has been a marked shift in concentration. The exercise of buyer power by large retailers has increasingly become a concern of competition policy and antitrust authorities. At the same time, the importance of private labels has likewise increased. As they have moved up-market, retailers should now be increasingly in competition with established brands, rather than only being complementary to those (and substitutes for lower-value products). Through private labels but also more generally, retailers take over a larger share of functions in the vertical relationship. In Inderst (2013) I provide for this the example of distribution.

Though a wide range of distribution models co-exist, retailers often have taken responsibility of a large part of shipment and inventory handling, through central warehousing or even direct collection at manufacturers’ factory gates. With the advent of large store formats and increasingly consolidated retail markets, such a development is clearly owed much to the realization of efficiency gains. Still, one implication of this is that over the decades manufactures have in these cases increasingly lost control over when and how their products are delivered and, in particular, positioned and displayed in the store.

In the companion paper I also formally analyse the function of innovation, for which the relationship to the growth of private labels is particularly evident. Also there a greater role of retailers in responding to consumers’ changing shopping habits and tastes may generate efficiency gains. However, as I show in the analysis, there may be strong economic forces that work towards an inefficient replacement (“crowding out”) of manufacturer innovation by retailer innovation (through private labels), provided retailers have sufficient size to make such investments profitable. These forces hinge (though not exclusively) on the role of retailers as “gatekeepers” to consumers. As

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<sup>76</sup> Notably, this short description does not take into account possible differences between various retailers and their strategies, such as in particular discounters. Cf. Herbert (2009) and also Inderst (2013).

<sup>77</sup> That this may also result in a deterioration of rivals’ terms and conditions has been recognized through the so-called waterbed effect (e.g. Dobson and Inderst 2008)). A retailer’s decision to produce private label products also directly influences the horizontal relationship towards competing retailers as well, both by possibly increasing competition as retailers now act as “brands” and by dampening competition by way of making price comparisons harder. The overall implications for prices (including those of branded products) are notoriously difficult to measure, so that there is controversy in the literature. (See for instance Mills (1995); Ward et al. (2002); Gabrielsen et al. (2002) and Bontemps et al. (2005).) In Inderst (2013) I formally analyse the potential implications for innovation.

retailers increasingly build up own “brand loyalty” through marketing and an up-market extension of their private labels, their “gatekeeping” role will become more pronounced. It enables them to extract a larger share of manufacturers’ investments in innovation (“hold up”), while on the other hand being in a position to exclude the manufacturer from customer access if they wish to introduce, instead, their own product.

In this report, instead, the question of “price ownership” was put at the forefront. More narrowly, I asked whether based on its role for the generation of a quality (brand) “image”, retailers and manufacturers’ interest could be conflicting. I identified various rationales for why this can be the case and for why then the interests of consumers are not necessarily aligned with those of retailers. Instead, the formal analysis isolated various reasons for why quality and possibly also efficiency could be higher when manufacturers can influence retail prices. The particular conflict of interest between retailers and brand manufacturers that the present formal analysis isolates and builds on must now be seen also in relation to the wider developments in the vertical relationship that were described in this section, that is increasing retailer concentration and size, the exercise of buyer power, the growth of private labels and the shift in functions towards retailers. To understand these developments and their implications for efficiency and welfare, it must therefore be asked more broadly how competition law and policy that significantly reduce manufacturers’ control over prices prevent the creation of a level playing field and thereby distort the process of “vertical competition” between manufacturers and retailers.

## 6 Appendix 1: Additional Discussion of RPM

In this Appendix, as noted in the main text, I complete the discussion of the economic literature on RPM by now turning to the various potential anti-competitive effects of RPM. As already noted in the main text, as a vertical restraint RPM is generally considered much more favourably by economists than horizontal agreements. In fact, Section 2 dealt with various pro-competitive effects that are discussed among antitrust scholars and practitioners. As a vertical restraint, however, RPM can have anti-competitive effects, as well. In fact, the purpose of a rule-of-reason approach is precisely to trade-off the various effects on a case-by-case base (or applied to broader categories).

Some early contributions in economics have argued that RPM can facilitate both explicit collusion and implicit coordination - both at the upstream and at the downstream levels. Among manufacturers, RPM can increase transparency and facilitate coordination on a higher price. This is so when wholesale prices are not easily observable. Then, cartel members will find it difficult or even impossible to distinguish between the various reasons that may have caused retail prices to vary, in particular changes in cost and demand, on the one hand, and an undercutting of an agreed wholesale price, on the other. RPM, instead, allows conditioning the collusive agreement (or the focus point of any implicit coordination) directly on the retail price. Deviations from the collusive strategy are then much easier to detect.<sup>78</sup> In many instances, however, RPM may be a very costly in terms of inefficiency, and also a very ineffective way to stabilise a manufacturer cartel, for instance as retailers may award secret discounts in many other ways, such as preferable display or promotion. Also in theory, RPM can facilitate retailer coordination. In this case, manufacturers would be pressured into RPM by the joint action of retailers, who thereby wish to prevent manufacturers from inducing sales by would-be price-cutters.<sup>79</sup> In these instances, however, we should not see retailers defending their freedom to set prices.

Vertical agreements as well as RPM may have the implication of excluding potential competitors. In particular, it has been argued that an incumbent manufacturer can use RPM to exclude potential competitors. Through RPM the incumbent supplier can, as it is argued, dampen downstream competition and then allow retailers to share in the supra-competitive profits thereby obtained. Here, RPM would be in their mutual interest. When contracting with a new, different supplier, retailers may fear this leading to fierce competition and the breakdown of RPM.<sup>80</sup> Clearly, this theory relies on significant manufacturer market power (more precisely, the theory mostly assumes a monopoly). In addition, when RPM establishes a uniform price level, this may protect inefficient retailers that would

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<sup>78</sup> Cf. Telser (1960), Mathewson and Winter (1998), Jullien and Rey (2007).

<sup>79</sup> Cf. Yamey (1954), Gammelgaard (1958), Overstreet (1983).

<sup>80</sup> This argument has recently been formalised by Asker and Bar-Isaac (2011).

otherwise leave the market. To the extent that RPM, however, fosters non-price competition, e.g., by stimulating the provision of additional services, it may enhance efficiency and may in fact lead to a pro-competitive selection of retailers in the market.

The previous theories of harm mainly rely either on repeated interactions (so as to establish coordination or to support outright collusion) or they require significant market power, as in the case of exclusion. A more recent strand of the literature has shown how vertical restraints can soften competition even without such coordination and even when no firm enjoys a particularly strong position.<sup>81</sup> According to these theories, RPM can dampen intra-brand competition when manufacturers face a so-called problem of opportunistic behaviour. This arises when a manufacturer cannot credibly communicate to all retailers the terms and conditions under which it supplies their respective rivals. Then, the manufacturer is tempted to offer a given retailer a discount, as neither the manufacturer nor this retailer internalises the profit loss of a rival. This theory seems more applicable in the absence of reputational concerns that would arise under frequent interaction between retailers and manufacturers, so that the temptation for such opportunistic behaviour is large. When there is also competition between manufacturers, vertical restraints can dampen both intra-brand and inter-brand competition. This applies to RPM as well as other restraints such as market-share contracts.<sup>82</sup> The idea is, more generally, that additional contractual instruments grant retailers and manufacturers together more scope to align prices (and price-setting incentives) so as to dampen competition.<sup>83</sup>

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<sup>81</sup>Cf. Hart and Tirole (1990), O'Brien and Shaffer (1992), Rey and Vergé (2004, 2010), Dobson and Waterson (2007).

<sup>82</sup> In addition to the literature referenced in footnote 81 see also Inderst and Shaffer (2010).

<sup>83</sup> Precisely, with RPM the argument is as follows. Suppose first that there is a monopolistic retailer that stocks substitute products from different manufacturers. Total industry profits are then maximised when each manufacturer supplies the retailer at marginal cost, while agreeing on a transfer or, more generally, on a positive profit margin on "infra-marginal" units. This scheme clearly no longer maximises industry profits when retailers compete: Retail prices would then be too low from the firms' perspective as, once again, intra-brand competition across retailers is not sufficiently dampened. A combination of RPM and suitably chosen marginal wholesale prices can, instead, allow firms to sufficiently dampen both inter- and intra-brand competition. The reason is that this ensures both a high retail margin on each product and a high retail price. The latter is not to the detriment of manufacturers when profits can be shared through other means but the marginal wholesale price. In this setting, one equilibrium outcome is now that in which each manufacturer sets its RPM price (or price floor) at the price that maximises total industry profits, anticipating that all other manufacturers do the same.

## 7 Appendix 2: Formal Background to Section 4

### 7.1 The Link between Price and Quality (Perception)

#### 7.1.1 Details of the Auxiliary Model

As noted in the main text, the first part of the analysis considers an auxiliary model. In this, there is a monopolistic manufacturer that sells a single product directly to final consumers. Recall that demand depends on the product's price  $p$  and a scalar indicator of quality  $q \geq 0$ . Now it is helpful to introduce a distinct notation for the demand function, namely  $D(p, q)$ , and to refer to a particular realisation by the variable  $x$ . Hence, the supplier's costs depend on quantity  $x = D(p, q)$  and quality  $c(x, q)$ . Costs of providing a certain quality level could be independent of the produced quantity, so that  $c(x, q) = cx + k(q)$ , or they could be proportional to quantity,  $c(x, q) = k(q)x$ . In both cases,  $k(q)$  is assumed to be a twice differentiable function with  $k'(q) > 0$  for  $q > 0$  and  $k''(q) \geq 0$ . The following arguments in this section hold for both cases, albeit in the main text only the case with proportional costs was considered.

Generally, using the original notation for costs, it is stipulated that  $c_{xq} \geq 0$  holds, which indeed holds strictly as long as higher quality increases the per-unit cost of production. Recall the manufacturer's profits

$$\Pi = D(p, q)p - c(x, q).$$

Consumer surplus equals

$$CS = \int_p^\infty D(v, q)dv.$$

Recall also that  $D_p < 0$  and  $D_q > 0$  where  $D > 0$ .

Turn now to the sequence of strategy choices that was specified in the main text, namely the choice of price in time  $t = 1$  and subsequently the choice of quality in  $t = 2$ . The main text provided some arguments for why this sequence of timing should capture an important aspect of reality. While I thus consider this timing to be particularly suitable for the purpose of the present analysis, results in this section do not necessarily depend on it.<sup>84</sup>

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<sup>84</sup> Instead, consider for a moment the case where quality was chosen *before* price. As is immediate given the subsequent analysis, when all consumers become immediately informed about quality, the equilibrium outcome would be the same, as the choice of both price and quality solves the respective optimality ("first-order") condition for the firm in either case. Suppose next that with positive probability consumers do not observe quality. Then, when the timing is reversed, we face a

### 7.1.2 Examples of Demand

**Representative Consumer with Quadratic Utility.** A representative consumer's net utility from the purchase of quantity  $x$  at price  $p$  is given by  $u(x, q) - px$ , where  $u(x, q) = \alpha x - \frac{1}{2}\beta x^2 + qx$ . This gives rise to the inverse demand function  $p = \alpha + q - \beta x$  so that, for price  $p$  and quality  $q$ , demand is given by

$$D(p, q) = \frac{\alpha + q - p}{\beta}.$$

**Continuum of Consumers.** Alternatively, suppose that demand is obtained from aggregating over the purchase decisions of a continuum of consumers, each of whom consumes one unit of either the supplier's good or an outside good. For the present illustration I fix the value of the outside good to zero. I specify that there is a mass one of consumers and that the respective cumulative distribution over these "types", indexed by  $y \in Y$ , is given by  $F(y)$ . A consumer's utility from a purchase is  $u(y, q) - p$ . When this is strictly increasing in  $y$ , this gives rise to a critical type solving  $u(\tilde{y}, q) - p = 0$ , so that demand is given by

$$D(p, q) = 1 - F(\tilde{y}).$$

For instance, if we assume that consumers are uniformly distributed over  $Y = [y_l, y_h]$  with  $0 \leq y_l < y_h$ , the respective cumulative distribution is given by  $F(y) = (y - y_l)/(y_h - y_l)$ . Assume further that all consumers place the same value on incremental quality:  $u(y, q) = y + q$ . The critical type is then given by  $\tilde{y} = p - q$ . Together with a uniform distribution, this gives rise to a linear demand function<sup>85</sup>. For an alternative (and final) specification, suppose that consumers with a higher overall value have also a higher marginal value for quality:  $u(y, q) = qy$ . In this case, the critical type is given by  $\tilde{y} = p/q$ .

### 7.1.3 Equilibrium Quality and Quality Perception in the Auxiliary Game

**Demand.** As is standard, I solve the game backwards. Consumers' decision in  $t = 3$  is already captured by the demand function. Note here, however, that a given consumer is only informed with

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(signaling) game of private information where, however, the choice of "type" (quality) is endogenous. Based on previous work, I conjecture that the qualitative results in this section would fully extend under a suitable choice of equilibrium refinement, as it is usually required to obtain clear predictions in such games of signalling. See, more generally, for an analysis of such games In and Wright (2012). For an entirely different application, Inderst and Pfeil (2012) show how the equilibrium is independent of the sequence of timing when one applies a Forward Induction Refinement for the case where the "type" is chosen first.

<sup>85</sup> Precisely, we then have  $D(p, q) = 1 - \frac{p - q - y_l}{y_h - y_l}$ .

probability  $\gamma$  about the true quality choice. With probability  $1 - \gamma$  a consumer is uninformed and has the beliefs  $\hat{q}$ . Demand is thus given by

$$\hat{x} = \gamma D(p, q) + (1 - \gamma) D(p, \hat{q}),$$

so that firm profits are

$$\Pi(p, q, \hat{q}) = \hat{x}p - c(\hat{x}, q). \quad (5)$$

**Quality Choice in  $t = 2$ .** Turn now to  $t = 2$ , where the firm must choose its optimal quality level. Note that this affects demand only when the consumer is subsequently informed about quality. For given beliefs  $\hat{q}$ , the optimal quality  $q_{BR}$  is thus determined from (5) by the following first order condition:

$$\frac{d}{dq} \Pi(p, q = q_{BR}, \hat{q}) = \gamma [p - c_x(\hat{x}_{BR}, q_{BR})] D_q(p, q_{BR}) - c_q(\hat{x}_{BR}, q_{BR}) = 0, \quad (6)$$

where I use  $\hat{x}_{BR} = \gamma D(p, q_{BR}) + (1 - \gamma) D(p, \hat{q})$ . For simplicity, I always assume that the respective problem of the firm has a unique solution, here  $q_{BR}$ .<sup>86</sup> (Here, the notation  $q_{BR}$  refers to the fact this is the "best response" to a particular choice of the price and of consumers' beliefs.)

In equilibrium, given the price  $p$  that is set initially and that is observed by all consumers, beliefs must be rational. In a slight extension of notation, it is thus required that  $\hat{q} = q_{BR}(\hat{q})$  (where it is convenient to suppress for now the dependency on the price). I denote this level, for given  $p$ , by  $\hat{q}^*$ . Using the condition for  $q_{BR}$  from (6),  $\hat{q}^*$  must solve

$$z(p, \hat{q}^*) := \gamma [p - c_x(\hat{x}^*, \hat{q}^*)] D_q(p, \hat{q}^*) - c_q(\hat{x}^*, \hat{q}^*) = 0, \quad (7)$$

where total demand is  $\hat{x}^* = \gamma D(p, \hat{q}^*) + (1 - \gamma) D(p, \hat{q}^*) = D(p, \hat{q}^*)$ . Again, I assume for convenience that this gives rise to a unique interior solution.

From implicit differentiation of (6), one then obtains finally

$$\frac{d\hat{q}^*}{dp} = \frac{1}{-z_{\hat{q}^*}} \left[ \begin{array}{c} \gamma D_q(p, \hat{q}^*) \\ -c_{qx}(\hat{x}^*, \hat{q}^*) D_p(p, \hat{q}^*) \\ + \gamma (p - c_x(\hat{x}^*, \hat{q}^*)) D_{pq}(p, \hat{q}^*) \end{array} \right], \quad (8)$$

where I have already split-up the three terms that I discuss below in turn. Note first that  $z_{\hat{q}^*} < 0$ .<sup>87</sup> Hence, the sign of  $d\hat{q}^*/dp$  is determined by the term in rectangular brackets in (8). This term

<sup>86</sup> Formally, I thus assume that  $\Pi$  is strictly quasiconcave in  $q$ .

comprises three different effects that the price level has on quality. These effects were already discussed at length in the main text:

- The first line in (8) is always strictly positive: A higher price (and thus margin) makes it profitable to choose a higher quality so as to sustain a higher level of demand.
- The second line in (8) is always positive (or at least non-negative): As the price increases and demand thereby decreases, an increase in the per-unit costs, when this is associated with higher quality, has a smaller negative impact on overall firm profits.<sup>88</sup>
- The third line in (8): Take for a more formal analysis the examples introduced above. This term is zero when the marginal utility of an increase in quality is independent of the level of a consumer's valuation. This holds, for instance, for the specification with a continuum of consumers and additive utility  $u(y) = q + y$  as well as with a representative consumer and quadratic utility. But the effect is strictly positive when, instead, there is a continuum of consumers and  $u(y) = qy$  holds. In this case, a higher price amplifies the negative impact that a lower quality has on demand. As noted in the main text, this follows, in turn, as the higher price pushes up the critical type  $y^*$ , who in this case, i.e. when  $u(y) = qy$ , has a strictly higher marginal valuation for quality. Consequently, at a higher price demand is now also more responsive to a change of quality.

In what follows, I always stipulate that  $D_{pq} \geq 0$ , so that altogether - from the three discussed effects - a higher price will strictly increase the firm's incentives to maintain high quality. I can then summarise the preceding analysis as follows:

**Conclusion 1.** *When  $D_{pq} \geq 0$  holds at least weakly, then at stage  $t = 2$  in the auxiliary model quality, as obtained in (7), quality strictly increases with price:  $d\hat{q}^*/dp > 0$ .*

**Illustration of Quality Choice.** In the following analysis, as in the main text, I choose the case with proportional costs of quality. My rationale for this is that it seems more suitable to capture the motivating cases, where costs to secure higher quality should indeed increase with the number of units that are ultimately produced and sold. For an illustration, take the constant marginal cost of production  $\frac{1}{2} \frac{1}{k} q^2$ . Now, when I stipulate a uniform distribution for consumer types  $y$  (with upper boundary  $y_h$ ), together with the additive utility  $u(y, q) = y + q$ , then after some transformations condition (7) becomes

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<sup>87</sup> Precisely, this follows from inspection of the second-order derivative of firm profits, i.e. from differentiation of the first-order condition (6), and noting that  $D_q > 0$ ,  $c_{xx} > 0$ , and  $c_{qx} \geq 0$ , i.e.  $c_{qx} = 0$  with fixed investment costs and  $c_{qx} > 0$  with proportional investment costs.

<sup>88</sup> Note, however, that the effect is equal to zero when there are only fixed costs of quality investment as, for instance,  $c(x, q) = cx + k(q)$ .



$$\gamma(2kp - (\hat{q}^*)^2) = 2\hat{q}^*(y_h + \hat{q}^* - p),$$

from which I obtain by implicit differentiation

$$\frac{d\hat{q}^*}{dp} = \frac{\gamma k + \hat{q}^*}{(2 + \gamma)\hat{q}^* + y_h - p}.$$

Note that the reaction of the resulting equilibrium quality on the price depends crucially both on the marginal cost of quality provision, which raises in  $k$ , and on the fraction of informed consumers  $\gamma$ . In fact, we have, in particular,  $\hat{q}^* = 0$  when  $\gamma = 0$ , as then the problem of opportunism of the manufacturer is complete.<sup>89</sup> In case of multiplicative utility, with  $u(y, q) = yq$ , though I can then no longer characterise  $\hat{q}^*$  explicitly, I now obtain with  $y \in [0, y_h]$

$$\frac{d\hat{q}^*}{dp} = \frac{\hat{q}^*(4\gamma kp + (2 - \gamma)\hat{q}^{*2})}{2\gamma kp^2 - (2 - \gamma)p\hat{q}^{*2} + 4y_h\hat{q}^{*3}}.$$

As is easy to see, this is indeed still strictly positive as well.

#### 7.1.4 Equilibrium Price Level

To determine the optimal price level that the manufacturer chooses in  $t = 1$ , it is instructive to first consider the case where  $\gamma = 1$ , in which case all consumers can observe quality. Note first that then  $\hat{q}^*$ , which is determined in (7), also solves the first-order condition (6). Turning to  $t = 1$ , as one already knows that subsequently quality will be chosen so as to maximise the same objective function, one can thus conclude that the optimal price  $p$  is determined simply by setting the respective partial derivative with respect to  $p$  equal to zero, i.e. by only considering the respective marginal effect.<sup>90</sup> This is, however, no longer the case when  $\gamma < 1$ , so that quality is only sometimes but not always observed. Then, for a given price,  $\hat{q}^*$  will be strictly below the value that would maximise ex-ante firm profits. The firm thus has a commitment problem vis-à-vis consumers.<sup>91</sup>

Precisely, using the expression  $\Pi(p, q_{BR}, \hat{q})$  for profits, now with  $q_{BR} = \hat{q} = \hat{q}^*$ , where  $q_{BR}$  solves the first-order condition (6), we thus have generally that the optimal price  $p$  in  $t = 1$  solves

<sup>89</sup> I can also solve explicitly for  $\hat{q}^* = \frac{p - y_h + \sqrt{(p - y_h)^2 + 2p\gamma(2 + \gamma)k}}{2 + \gamma}$ , which is useful in the numerical examples.

<sup>90</sup> More succinctly this is due to the application of the envelope theorem.

<sup>91</sup> Formally, the envelope theorem then no longer applies for the derivation of the optimal price  $p$ , which now takes into account the subsequent adjustment of quality.

$$\begin{aligned}
\frac{d\Pi(p, \hat{q}^*, \hat{q}^*)}{dp} &= [p - c_x(\hat{x}^*, \hat{q}^*)]D_p(p, \hat{q}^*) + D(p, \hat{q}^*) \\
&\quad + \frac{d\hat{q}^*}{dp} [D_q(p, \hat{q}^*)(p - c_x(\hat{x}^*, \hat{q}^*)) - c_q(\hat{x}^*, \hat{q}^*)] \\
&= 0.
\end{aligned} \tag{9}$$

When I substitute from the first-order condition for  $q_{BR}$  in (6), this can be written as

$$\begin{aligned}
\frac{d\Pi(p, \hat{q}^*, \hat{q}^*)}{dp} &= [p - c_x(\hat{x}^*, \hat{q}^*)]D_p(p, \hat{q}^*) + D(p, \hat{q}^*) \\
&\quad + \frac{d\hat{q}^*}{dp} (1 - \gamma)[p - c_x(\hat{x}^*, \hat{q}^*)]D_q(p, \hat{q}^*) \\
&= 0.
\end{aligned} \tag{10}$$

Again, I summarise these observations:

**Conclusion 2.** *In the equilibrium of the auxiliary model, the optimal price  $p$  that is chosen by the manufacturer in  $t = 1$  solves (10).*

As noted above, the second line in (10) is equal to zero when all consumers are informed so that the first-order condition is obtained from the partial derivative with respect to the price. I again suppose that there is generally a unique price equilibrium. Denote this price by  $p^*$  with corresponding quality  $\hat{q}^*(p^*) = q^*$ . I will make use of condition (9) below.

### 7.1.5 Welfare in the Auxiliary Model

For given  $p$ , the resulting quality  $\hat{q}^*$  (as obtained in Conclusion 1) is clearly inefficiently low. This was already commented on in the main text. To see this now more formally, take again first the case where  $\gamma = 1$ . When all consumers observe the quality, it is determined by the manufacturer's first-order condition, as given - now with  $\hat{q} = q_{BR}$  - by (6). This, however, ignores the impact on consumer surplus. The marginal impact of an increase in quality is, in this case, simply  $\int_p^\infty D_q(v, q_{BR})dv > 0$ .

When  $\gamma < 1$ , then for given price  $p$  the respective quality is still (inefficiently) lower.

Next, when evaluated at the equilibrium price, I have

$$\frac{dCS}{dp} = \frac{d\hat{q}^*}{dp} \Big|_{p^*} \int_{p^*}^\infty D_q(v, q^*)dv - D(p^*, q^*), \tag{11}$$

where  $\bar{p}$  is the "choke-off price" at which demand is equal to zero. The term (11) comprises two effects. First, there is the standard negative effect that price has on consumer surplus. Second, there is now a strictly positive effect as well, as represented by the first term in the integral in (11), given that a higher price induces higher quality. The latter effect can be so strong that even at the monopoly price

$p^*$ , consumers can benefit from a further increase in the price. However, for the argument that consumers may benefit when manufacturer "price ownership" leads to higher prices it will, in what follows, be sufficient to show that in some cases the overall impact is positive when one compares this price level to a (possibly much) lower price level that arises under retailer "price ownership".

## 7.2 Negotiations with Retailers

The main text discusses somewhat informally how negotiations proceed in the presence of retailers, i.e. when the manufacturer no longer sells directly to final consumers but only through  $N = 2$  retailers. As noted there, the general case with an arbitrary number of retailers is solved in Inderst and Pfeil (2012). I also refer to this background paper for a full derivation of the subsequent expressions relating to surplus sharing in the vertical relationships.

Recall now the model that is presently analysed. I still suppose that at an initial stage  $t = 1$  there is a choice of retail prices  $p_n$ . This choice is made either by the  $N$  retailers, in which case I speak of "price ownership" by retailers. Or it is made by the manufacturer. In  $t = 2$  the manufacturer chooses the quality level  $q$ , which pertains to all subsequently supplied units, regardless to which retailer these are delivered. Recall that I assume proportional investment costs with  $c(x, q) = k(q)x$ . In  $t = 3$  there are now negotiations between the manufacturer and all  $N$  retailers. Here, it is more illustrative to think in terms of (re-)negotiations over whether and at what terms an existing relationship is continued. I now specify a solution concept for this problem.

Here, I build on the "contingent contracting" approach in Inderst and Wey (2003), albeit - as is discussed in detail in Inderst and Pfeil (2012) - the respective requirements are shared with various other approaches in axiomatic bargaining theory. To describe this, I now denote for brevity's sake the manufacturer by  $M$  and each retailer by  $R_n$  with  $n = 1, \dots, N$ . (Recall that I set  $N = 2$  in this report.) In each bilateral negotiation, I suppose that the two parties achieve a "fair" (or "balanced") distribution of surplus for any possible contingency that can arise, where a contingency refers to the set of successful agreements (provided that the considered negotiation is successful as well). That is, for instance, when there are two retailers so that  $N = 2$ , then in the agreement between  $M$  and  $R_1$  one transfer is specified so as to share the surplus when also the agreement with  $R_2$  is successful and another transfer when this is not the case.<sup>92</sup> Each transfer ensures that incremental benefits from the additional agreement (here: that between  $M$  and  $R_1$ ) are shared equally.

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<sup>92</sup> Note that I can restrict consideration to such simple transfers as in this model, I consider retail prices to be set more long-term and thus, in particular, already in  $t = 1$ . That is, there is no channel management role for (marginal) wholesale prices (other than ensuring that there is agreement).

The chosen bargaining solution is not meant to literally capture particular negotiation proceedings. The main aim is to ensure that the resulting outcome is, in a transparent and intuitive way, shaped by how much surplus each of the two involved parties could generate individually or jointly in various "collations". In reality, this information jointly should determine bargaining power and, thereby, the final distribution of surplus. This is recognised in the literature on inter-firm bargaining. The various other approaches, indeed, yield similar or even the same prediction as the solution that I present here.<sup>93</sup>

## 7.3 Formal Analysis of Free-Riding

### 7.3.1 Setting

As noted in the main text, for this analysis I abstract from downstream retail competition. This is (re-)introduced in the subsequent section. Consequently, the profits that are realised at any given retailer do not depend directly on whether the manufacturer's product is also sold at other retailers (and at what price). This allows isolating the aforementioned free-riding problem on which this section focuses. However, I still suppose that consumers are aware of the prices that have been set at all other retailers. For instance, this could be through advertising, but also through other shopping trips that are, however, not considered to be substitutes (e.g., as the product is not storable and consumers only decide on the basis of convenience at any given instance).

Without downstream competition, in a slight abuse of the previous notation, I denote by  $\pi(p_n, q, \hat{q})$  the respective profits at each downstream market  $\pi(p_n, q, \hat{q}) = \hat{x}(p_n - k(q) - h)$ , where again  $\hat{x}_n = [\gamma D(p_n, q) + (1 - \gamma)D(p_n, \hat{q})]$  denotes the respective demand from informed and uninformed consumers. Demand thus depends on the true as well as the perceived quality and on the price that is set at this outlet, but not directly on which products and prices are chosen at other retailers. Without affecting results qualitatively, I set the retailer's cost (of handling) equal to  $h = 0$ .

As a starting point, I first apply to this setting the bargaining solution that was sketched above. (For details see Inderst and Pfeil (2012)). This turns out to be particularly simple now that there is no downstream competition. For this, I denote for simplicity the payoff of a retailer that does not procure from the incumbent manufacturer by  $\Pi_R^0$ . (In the main text I have set this equal to zero, for simplicity.) Recall that presently this is fully independent of the quality of the manufacturer's product as well as whether and at what prices this is stocked elsewhere. I can then derive the respective equilibrium payoffs for given prices, quality and quality perceptions:

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<sup>93</sup> Precisely, the approach closest to the one take here is that by Navarro (2007), who derives a "bargaining value" for general networks (with externalities) by extending the "fair allocation rule" of Myerson (1977a/b). As is easily checked, this requirement is equivalent to the equal sharing rule (for all contingencies) that I apply. This value is also obtained in De Fontenay and Gans (2013) from a "non-cooperative approach" (which models negotiation procedures more explicitly).

$$V_M = \frac{1}{2} [\pi(p_1, q, \hat{q}) + \pi(p_2, q, \hat{q}) - 2\Pi_R^0], \quad (12)$$

$$V_{R1} = \Pi_R^0 + \frac{1}{2} [\pi(p_1, q, \hat{q}) - \Pi_R^0],$$

$$V_{R2} = \Pi_R^0 + \frac{1}{2} [\pi(p_2, q, \hat{q}) - \Pi_R^0].$$

The expressions in (12) are very intuitive. Take first the respective payoffs for retailers, which are denoted by  $V_{R1}$  and  $V_{R2}$ . In particular, take that for the first retailer  $V_{R1}$ . His payoff is equal to the sum of his "outside option", which is  $\Pi_R^0$ , and one half the net surplus that is realised when the manufacturer's product is stocked there, which is  $\pi(p_1, q, \hat{q}) - \Pi_R^0$ . This is the implication of the "equal-sharing" requirement (or that of a "fair distribution"), which I imposed for the bargaining solution. The manufacturer's profits, which is  $V_M$ , is then equal to just the residual profits, i.e. the combined profits from the two "local markets",  $\pi(p_1, q, \hat{q}) + \pi(p_2, q, \hat{q})$ , minus the sum of the two retailers' share, which is  $V_{R1} + V_{R2}$ . The expressions in (12) are used next to analyse the equilibrium choice of quality and prices.

### 7.3.2 Equilibrium Quality and Prices

For given prices  $p_n$ , I first proceed to stage  $t = 2$ , where quality is determined. Hence, the manufacturer chooses  $q$  to maximise his payoff  $V_M$ . Note again that with independent demand at the different retailers, quality only affects the respective surplus  $\pi(p_n, q, \hat{q})$ , but not the outside options of retailers when they do not stock the manufacturer's product. Using expression (12), it then follows immediately that, for given prices  $p_n$  and quality beliefs  $\hat{q}$ , the manufacturer's optimal choice of true quality is given by<sup>94</sup>

$$q_{BR} = \arg \max_q \sum_{n=1}^N \pi(p_n, q, \hat{q})$$

or, with the first-order condition as in (6),  $q_{BR}$  solves

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<sup>94</sup> Note that between  $M$  and  $Rn$  there is common knowledge about joint profits, given that they all observe the true choice of  $q$ .

$$\begin{aligned} & \gamma \left[ \sum_{n=1}^N (p_n - k(q_{BR})) D_q(p_n, q_{BR}) \right] \\ & - k'(q_{BR}) \sum_{n=1}^N [\gamma D(p_n, q_{BR}) + (1 - \gamma) D(p_n, \hat{q})] = 0. \end{aligned} \quad (13)$$

Recall that at this stage I solve for the equilibrium where a consumer who does not observe quality holds rational beliefs, so that  $q_{BR} = \hat{q} = \hat{q}^*$ . Note again that profits in one retail market currently depend on the price in another retail market only through the effect that the other price has on the manufacturer's incentives to adjust quality - and, for  $\gamma < 1$ , on the respective beliefs of uninformed consumers. Hence, the equilibrium requirement for  $\hat{q}^*$  at  $t = 2$  is that, in analogy to condition (7),

$$\gamma \left[ \sum_{n=1}^N (p_n - k(\hat{q}^*)) D_q(p_n, \hat{q}^*) \right] - k'(\hat{q}^*) \sum_{n=1}^N D(p_n, \hat{q}^*) = 0. \quad (14)$$

Again, as for (7), one can derive from this that  $d\hat{q}^*/dp_n > 0$  for all  $n = 1, 2$ .

I abbreviate  $\pi(p_n, q = \hat{q}^*, \hat{q} = \hat{q}^*)$  by writing more simply  $\pi(p_n, \hat{q}^*)$ , where only  $p_n$  is different across markets. With this at hands, also profits in (12) can be written more simply:

$$V_M = \frac{1}{2} [\pi(p_1, \hat{q}^*) + \pi(p_2, \hat{q}^*) - 2\Pi_R^0], \quad (15)$$

$$V_{R1} = \Pi_R^0 + \frac{1}{2} [\pi(p_1, \hat{q}^*) - \Pi_R^0],$$

$$V_{R2} = \Pi_R^0 + \frac{1}{2} [\pi(p_2, \hat{q}^*) - \Pi_R^0].$$

I take now first the case where "price ownership" lies with the manufacturer. As is immediate from (12), the optimal price that the manufacturer sets is exactly the same as without retailer presence, i.e. as when the manufacturer sells directly to consumers. I denote this by  $p_M^*$ .<sup>95</sup> Note also that  $p_M^*$  and the respective resulting equilibrium quality  $q_M^*$  are both independent of the number of separate retail markets  $N$ . While presently I have chosen  $N = 2$ , this could be thus easily extended at this stage.

Turn next to the case where retailers have "price ownership" and thus choose  $p_n$  in  $t = 1$ . I solve for a symmetric equilibrium with respective price choice  $p_n = p_R^*$ . The key difference to the manufacturer's choice is that a single retailer does not take into account the positive impact that a higher price and,

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<sup>95</sup> This is most immediate under the restriction to a single price level  $p = p_n$ , as then we can divide by  $N$  all expressions (that is, condition (13) for  $q_{BR}$ , condition (14) for  $\hat{q}^*$ , and also the payoff (12)).

thereby, a higher value  $\hat{q}^*$  has on demand in all other  $N - 1$  markets. Note, however, that this only makes a difference when  $\gamma < 1$ . In fact, when the true quality is always observed, then - as we already observed previously - quality is chosen so as to maximise total industry profits, so that the marginal impact of a higher quality, as triggered by an increase in  $p_n$ , is zero in all markets. This is, however, different when from  $\gamma < 1$  quality is, for given prices, always inefficiently low also from firms' joint perspective, given that the manufacturer chooses quality in  $t = 2$  only so as to increase demand for the fraction  $\gamma$  of consumers.

**Conclusion 3.** *Consider the case with non-competing retail markets. Suppose that uninformed consumers take into account all price observations when forming beliefs about the prevailing quality. Then, the manufacturer's preferred retail price  $p_M^*$  is the same as that of retailers only when  $\gamma = 1$ , while otherwise it is strictly higher. In the latter case, quality is strictly higher when the manufacturer determines the retail price.*

The formal proof of Conclusion 3 is omitted (cf. Inderst and Pfeil (2012)). This holds also for the following conclusions.

#### 7.4 Illustration

For the following illustration I consider the case of linear demand  $D(p_n, q) = a - p_n + q$  and proportional quadratic costs of quality  $c(x, q) = x \frac{1}{2k} q^2$ . This implies that joint profits of the manufacturer together with retailer  $n$  are given by

$$\pi(p_n, q, \hat{q}) = (a - p_n + q_\gamma) \left( p_n - \frac{1}{2} \frac{1}{k} q^2 \right),$$

where again  $q_\gamma = \gamma q + (1 - \gamma)\hat{q}$ . The linear demand structure allows us to write the equilibrium condition for  $\hat{q}^*$  in terms of the average retail price  $\bar{p} = \frac{1}{N} \sum_{n=1}^N p_n$ :

$$\gamma \left( \bar{p} - \frac{1}{2} \frac{1}{k} (\hat{q}^*)^2 \right) - \frac{1}{k} \hat{q}^* (a - \bar{p} + \hat{q}^*) = 0. \quad (16)$$

Implicit differentiation shows how the implemented quality level depends on the average retail price  $\bar{p}$ :

$$\frac{d\hat{q}^*}{d\bar{p}} = \frac{k\gamma + \hat{q}^*}{a - \bar{p} + (2 + \gamma)\hat{q}^*}.$$

The respective expression for an individual retail price  $p_n$  is given by  $\frac{d\hat{q}^*}{d\bar{p}} \frac{d\bar{p}}{dp_n} = \frac{1}{N} \frac{d\hat{q}^*}{d\bar{p}}$ . Moreover, I can also solve for  $\hat{q}^*$  as a function of the average retail price:

$$\hat{q}^* = \frac{\bar{p} - a + \sqrt{(\bar{p} - a)^2 + \bar{p}2\gamma(2 + \gamma)k}}{2 + \gamma}. \quad (17)$$

Focusing again on symmetric solutions with  $p_n = p$ , the first order condition for retailer price ownership becomes

$$\left(\frac{1}{N}\right) \frac{(\gamma k + \hat{q}^*) \left(p - \frac{\hat{q}^*(2a - 2p + 3\gamma)}{2k}\right)}{a + (\gamma + 2)q - \hat{q}^*} + a + \frac{(\hat{q}^*)^2}{2k} - 2p + \hat{q}^* = 0. \quad (18)$$

Note that the respective condition for manufacturer price ownership is also given by (18) when setting  $N = 1$ .

Once I substitute for  $\hat{q}^*$ , however, one can no longer obtain an explicit solution for the optimal price. Still, I will use the above specification to illustrate how the fraction of informed consumers,  $\gamma$ , affects equilibrium price and quality differently in the case of manufacturer price ownership and in the case of retailer price ownership.

To obtain numeric solutions I specify the parameter values  $k = 3$  and  $a = 2$  and for the present analysis, next to  $N = 2$ . I then compute numerical solutions of the system (17) and (18). Figure 1 depicts the respective prices  $p_R^*$  and  $p_M^*$  when varying  $\gamma$  between zero and one, and Figure 2 the resulting quality levels  $q_R^*$  and  $q_M^*$ .

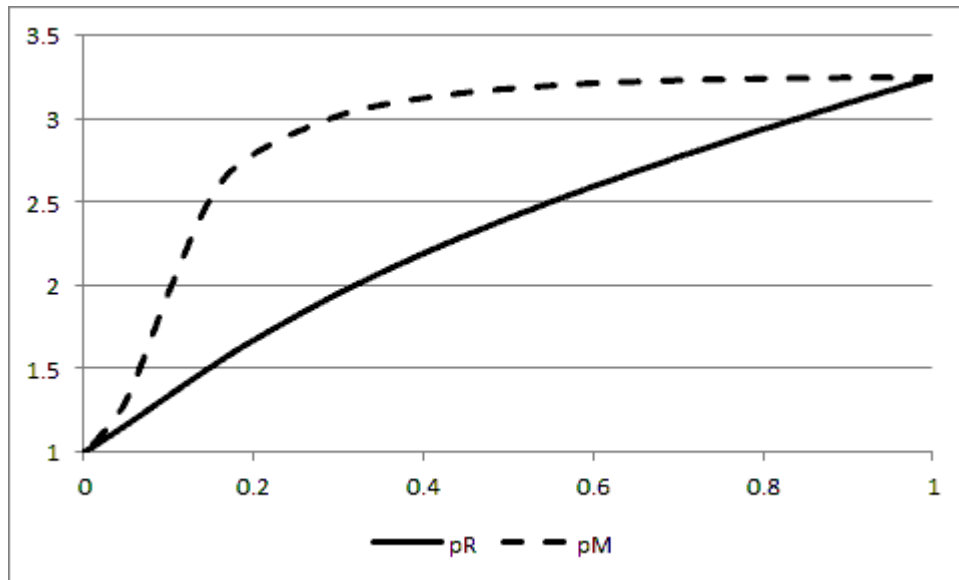


Figure 1: Comparative analysis of prices in transparency



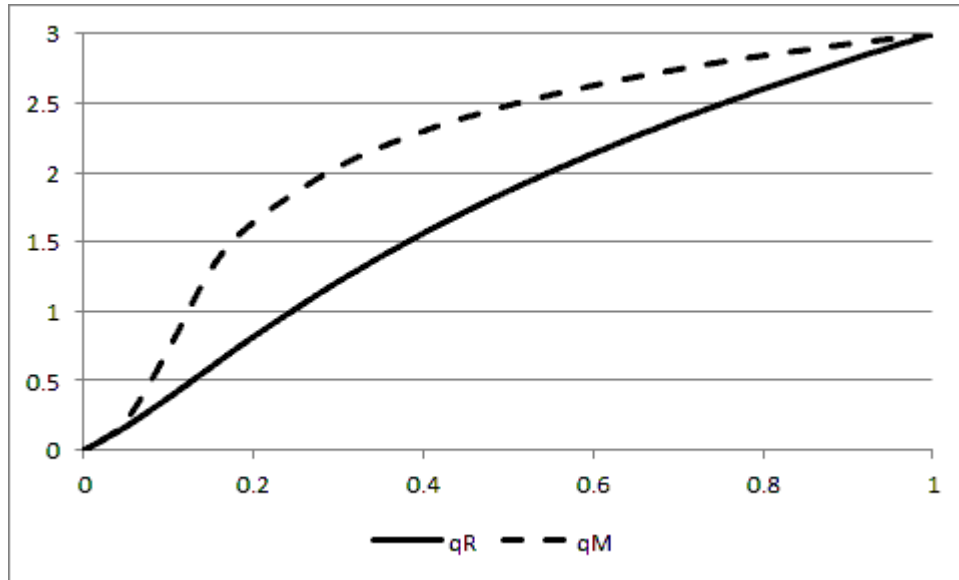


Figure 2: Comparative analysis of quantities in transparency

For  $\gamma \in (0,1)$ , the price with retailer “price ownership”  $p_R^*$  is strictly lower than the price with manufacturer “price ownership”  $p_M^*$  (and thus, it holds also for the resulting quality that  $q_R^* < q_M^*$ ). By contrast, if all consumers are always informed about quality ( $\gamma = 1$ ), the resulting price and quality will maximise joint industry profits, independent of whether prices are set by the manufacturer or by retailers.<sup>96</sup>

## 7.5 Formal Analysis of the Strategic Use of Prices to Affect Bargaining Power

To formalise the arguments in the main text, I need some more notation. In Inderst and Pfeil (2012) we derive results both for the case where  $N = 2$  and for general  $N$ , where we derive separate notations. I now take the notation for the case with two retailers only.

I consider how a change in  $p_1$  affects differently the profits of the manufacturer and of the respective retailer 1. For this, I denote the following profits. (The notation differs somewhat from that in Inderst and Pfeil (2012) as here I only wish to consider some effects, without fully deriving all comparative results.) I denote by  $\Pi_R^0$  the profit of retailer 1 when he does *no longer* stock the product of the manufacturer. Previously, this was his “outside option” and did not depend on the price and quality of the manufacturer’s product (with the remaining retailer 2), simply as previously I abstracted from retail competition. This is now no longer so, however. Next, I need an additional bit of notation: Let  $\Pi_{MR2}$  denote the joint profits that the manufacturer and the second retailer realise when retailer 1 no

<sup>96</sup> If all consumers are uninformed about quality ( $\gamma = 0$ ), the manufacturer will, from (17) always set  $q = \hat{q}^* = 0$  as quality has no direct effect on demand whatsoever. This in turn implies that  $d\hat{q}^*/dp_n = d\hat{q}^*/dp = 0$  and hence, from (18), that  $p_M^* = p_R^* = \frac{a}{2}$ .

longer stocks the product. Now, it turns out that the difference between the marginal effect that a change in  $p_1$  has on the manufacturer's profits and on the profits of retailer 1 is the following:

$$\frac{d\hat{q}^*}{dp_1} \left[ -\frac{d}{d\hat{q}^*} \Pi_R^0 + \frac{1}{2} \frac{d}{d\hat{q}^*} \Pi_{MR2} \right]. \quad (19)$$

The first term in (19) captures the effect that a higher induced quality level has on the stand-alone retailer's profits in case of disagreement with the manufacturer. Intuitively, the higher the (true and perceived) quality of the rival's product (i.e. of 2), the lower should be  $\Pi_R^0$ . Hence, through this channel the manufacturer prefers a higher level of  $p_1$  than the respective retailer 1. Or, put differently, retailer 1 prefers a strictly lower level of  $p_1$  so as to, thereby, dampen incentives of the manufacturer to choose a higher quality (together with, for  $\gamma < 1$ , a higher quality image). Note that in contrast to the effect without competition ("free-riding"), this effect works irrespective of whether  $\gamma = 1$ .

Next, take the second term in (19). It captures the impact that a higher quality has on the joint profits of the manufacturer and retailer 2, once there is disagreement with retailer 1. Note at this point also the following. With competition, clearly, the "free-riding" effect that showed up previously can no longer be isolated. Note, however, that when the two markets are no longer in rivalry, then only the second line "survives", which then is just the previously identified "free-riding" effect.

As we argue in Inderst and Pfeil (2012), while it seems at first intuitive that a higher quality should increase the joint profits of the manufacturer and the second retailer, in particular in light of competition with retailer 1, this argument ignores that quality comes with costs. Hence, what matters is how  $\frac{d}{d\hat{q}^*} \Pi_{MR2}$  is signed at the respective equilibrium level of quality. However, we have also for this effect a unique (positive) sign, so that it further amplifies the conflict of interest, when quality perception becomes sufficiently important in the following sense. Note first that the quality  $q_{BR}$  is chosen in the manufacturer's interest at  $t = 2$ . This coincides with  $\hat{q}^*$  in equilibrium (but *only* in equilibrium when some consumers are not aware of any deviation in quality). When  $\gamma$  is low, then I already observed that there is a strong commitment problem vis-à-vis consumers. As is intuitive, this ensures that the marginal effect of  $\hat{q}^*$  on  $\Pi_{MR2}$  (at the equilibrium choice) is always strictly positive when  $\gamma$  is low. In this case, I can thus unambiguously sign both effects in expression (19) and conclude again that, in the present case with two retailers and competition, manufacturer "price ownership" will lead to a strictly higher (price-induced) quality. However, even when  $\gamma$  is not low, then still the aggregate effect in (19) can be signed.

**Conclusion 4.** *Consider the case with competing retail markets. Then, the conflict of interest between the manufacturer and retailers with respect to the choice of prices is again driven by the effect that price has on quality and quality perception. Now, a higher price and thereby higher quality (and quality perception) increase the (outside option) payoff of the manufacturer when one retailer starts to*

*delist his product and decrease the (outside option) payoff of the respective retailer. Consequently, under manufacturer “price ownership” the price is set such that, in equilibrium, quality and quality perception are higher.*

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