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Suggested retail prices with downstream competition

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Abstract

We analyze vertical relationships between a manufacturer and competing retailers when consumers have reference-dependent preferences. Consumers adopt the manufacturer's suggested retail price as their reference price and perceive losses when purchasing above the suggested price and gains when purchasing below it. In equilibrium, retailers undercut price suggestions and the manufacturer suggests a retail price if consumers are sufficiently bargain-loving and perceive retailers as sufficiently undifferentiated. The manufacturer engages in resale price maintenance otherwise. Consumers can be worse off with suggested retail prices than with resale price maintenance, prompting a rethinking of the current legal treatment of suggested retail prices.

Keywords: suggested or recommended retail prices, resale price maintenance, reference-dependent preferences, vertical restraints, competition law and policy

JEL classification: D03, D43, K21, L42

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1 Introduction

Background This paper contributes to the growing literature on the consequences and implications of reference-dependent consumer preferences in industrial economics. There is a large body of empirical and experimental evidence that consumers' preferences are generally not as stable and context independent as classical economic theory assumes. Kahneman and Tversky's (1979, 1991) seminal work on prospect theory value functions suggests that, in many contexts, economic agents utilize reference points when assessing alternatives. Changes in value, as opposed to utility, are defined in terms of gains and losses, based on deviations from a reference point. Reference points can reflect past experiences with similar choices, or be induced by the ways in which choice situations are framed. These insights, originating from research in psychology, have inspired many studies within the disciplines of behavioral and experimental economics, as well as behavioral finance.[1]

There are a number of recent papers that specifically analyze the ways in which the findings of behavioral economics, and of reference-dependent preferences in particular, affect standard models of industrial economics and imperfect competition, see, e.g., Heidhues and Kőszegi (2008, 2010), and Zhou (2011).[2] Recently, interest has grown in explaining a widespread phenomenon in vertical business relationships, namely, manufacturers publicly announcing recommended but non-binding retail prices for their products; see Buehler and Gärtner (2012),[3] Lubensky (2011), and Olczak (2011). Relating the issue of recommended retail prices to reference-dependent preferences, Puppe and Rosenkranz (2011) proposed a model in which consumers adopt the recommended retail price as their point of reference and experience a loss when purchasing at a higher price.[4] In their model, the manufacturer

[1] See, among many others, articles by Thaler and Johnson (1990), Thaler et al. (1997), Camerer (2000), Rabin and Thaler (2001), Schmidt and Traub (2002), Kőszegi and Rabin (2006, 2007, 2009), and Munro (2009).

[2] See also the monograph by Spiegler (2011) that examines boundedly rational consumers in industrial economics more generally.

[3] In Buehler and Gärtner (2012), retail price recommendations serve as a communication device between a privately informed manufacturer and a retailer in a repeated bilateral monopoly that is indispensable for maximizing joint surplus.

[4] The notion of explaining the presence of manufacturers' recommended retail prices through reference-

can strategically use the recommended retail price to extract a larger share of the profits, and in equilibrium, the retailer complies with the recommendation.

Analytical Aims and Methodology The present paper builds on and generalizes the model developed by Puppe and Rosenkranz (2011). In contrast to their analysis, however, we model the retail sector as (imperfectly) competitive. Moreover, we allow consumers to not only experience a loss when purchasing above the recommended price but also to experience a *gain* when purchasing below the recommended price. Using a similar assumption, Armstrong and Chen (2012) analyze discount pricing in a model with bargain-loving consumers who have an intrinsic preference for paying a below-average price.[5] The assumption that consumers derive gain from purchasing below the manufacturer recommended retail price is particularly realistic in markets for relatively infrequently purchased goods, which are not sufficiently expensive for consumers to engage in extensive search for the lowest prices.[6]

In particular, we examine the extent to which an upstream manufacturer can manipulate consumer and retailer behavior by recommending retail prices with the aim of extracting higher rents than they would have obtained under alternative forms of vertical restraints and whether such retail price recommendations can harm consumers.

In our analysis, we concentrate on vertical restraints that pertain to contractual agreements, or relationships, between upstream manufacturers supplying downstream retailers. Vertical restraints are a natural starting point for proposing a behavioral approach to industrial economics for two reasons. First, manufacturers involved in vertical structures with retailers are well placed to affect (frame) the consumers' reference points by recommending retail prices.[7] Second, competition authorities throughout the world scrutinize vertical

dependent preferences was first formulated by Rosenkranz (2003).

[5]Similarly, Thaler (2008) analyzes prospect theory value functions that include a 'mental accounting' of potential gains and losses by consumers when choosing among alternatives. In his model, consumers derive 'transaction utility' from purchasing a good at a price below the reference price.

[6]Examples of such markets are clothing or luxury food items. The automobile market is not a good example: because the purchase is sufficiently large, consumers engage in search and come to expect prices below the manufacturer suggested retail price. We are grateful to Yongmin Chen for this comment.

[7]See Biswas and Blair (1991) and Mazumdar et al. (2005) for an overview of reference price research in the marketing literature.

restraints because they may lead to consumer welfare losses.[8] Thus, it seems pertinent to analyze whether recommended retail prices could also reduce consumer welfare and, if so, how their current treatment under competition laws and policies should be adapted to constrain their negative impact on consumers.

Our insights help us answer questions that standard theory cannot. Our model enables us to (a) characterize the conditions under which firms have incentives to alter consumers' reference points and how they do so; (b) estimate the impacts of such manipulations on consumer and social welfare;[9] and (c) make a first step toward rethinking current competition laws and policy to appropriately address the potential negative effects of suggested retail prices when reference points, and thereby preferences, can be manipulated.

Outcomes Based on a scenario in which manufacturers can strategically recommend retail prices to affect consumers reference points, our results suggest that retailers set higher prices than they would if they were subject to resale price maintenance practices and that this benefits both manufacturers and retailers. However, consumers only derive higher utility under suggested retail prices than resale price maintenance if they are very bargain-loving and perceive retailers as very similar. Emerging tendencies of competition authorities treating vertical relationships more leniently are likely to increase the occurrence, and the negative impacts, of such manipulations.[10]

Our results suggest that the currently *per se legal* practice of manufacturers making non-binding retail price recommendations can produce worse outcomes than the currently *illegal* practice of upstream suppliers enforcing retail price recommendations, for example, by threatening to refuse to supply retailers should they fail to comply. Consumers may be worse off if manufacturers are allowed to suggest non-binding retail prices than if they

[8]See Rey and Tirole (1986), Rey and Stiglitz (1988), Motta (2004), Jullien and Rey (2007), and Rey and Vergé (2008).

[9]In our approach, consumer welfare is directly incorporated into the structure of the (reference-dependent) demand structure. For a broader discussion and generalization of welfare concepts encompassing various nonstandard behavioral models, see Bernheim and Rangel (2009).

[10]See "*Minimum retail price accords allowed, U.S. Supreme Court rules*," in The New York Times, 28 June 2007, http://www.nytimes.com/2007/06/28/business/worldbusiness/28iht-price.4.6394812.html.

are not, which indicates that competition authorities should consider treating non-binding recommended retail prices under the *rule of reason*, rather than the *legal per se rule*.

2 Model

Let there be an upstream manufacturer that supplies its products to two horizontally differentiated and competing downstream retailers, $i \in \{1, 2\}$. Let there be consumers who decide how much to purchase from either retailer, based on their perceptions of how differentiated those retailers are, on the observed prices in the marketplace, and on their reference prices, p_r. Finally, let c be the manufacturer's unit production cost and $\alpha \in \mathbb{R}_+$ the consumers' maximum willingness to pay for the products, with $0 \leq c \leq \alpha$. We consider the following two alternative pricing strategies for the upstream manufacturer.

Resale Price Maintenance (RPM) Scenario The manufacturer sets a wholesale price, p_w,[11] and imposes resale price maintenance, setting a binding retail price, $\overline{p}$. Consumers observe the (manufacturer's *prescribed*) retail price and take it as their natural (default) reference price, p_r.[12]

Suggested Retail Price (SRP) Scenario The manufacturer sets a wholesale price, p_w, and makes a public, non-binding recommendation regarding the retail price. This could, for example, be achieved by displaying the price at which the product should be sold directly on the product as sold to retailers.[13]

Consumer Behavior Consumers adopt the manufacturer's recommended retail price as their reference price, p_r, provided that the suggested price is credible. We assume that the

[11] This wholesale price also represents the retailers' per unit input cost as long as they do not have to incur any further costs to sell the product in the market. Allowing for additional per unit costs, such as distribution costs, would not change our qualitative results. We thus abstract from them in our analysis.

[12] Note that this pricing strategy is equivalent to the setting of an enforced retail price recommendation or to the setting of a wholesale price combined with an enforced retail price ceiling.

[13] Some examples are price tags directly attached to clothes by the manufacturer, prices printed by the manufacturers directly on product packaging or the products themselves, and price recommendations publicly posted via product catalogues.

suggested price is credible as long as it does not exceed some upper bound. For expositional simplicity, we assume this upper bound to be the consumers' maximum willingness to pay for the product, α. In the presence of credible price recommendations, and in accordance with prospect theory, consumers incur losses when faced with actual retail prices above recommended levels but perceive gains when faced with actual retail prices below recommended levels.[14]

We capture the described consumer behavior by modifying the Spence-Dixit-Vives model of linear demand for differentiated varieties[15] to account for reference-dependent preferences. In our modified specification, consumers obtain aggregate net consumer surplus from consuming goods purchased at retailers i and $-i$ equal to

$$CS(q_i, q_{-i}; p_r, \mu_i, \mu_{-i}) = \alpha(q_i, q_{-i}) - \frac{1}{2}(q_i^2 + q_{-i}^2) - \gamma q_i q_{-i} - p_i q_i - p_{-i} q_{-i} + \mu_i(p_r - p_i)q_i + \mu_{-i}(p_r - p_{-i})q_{-i},$$

where q_i is the quantity consumed from retailer i, p_i is the retail price outlet i charges, and γ captures the degree of horizontal differentiation among retailers. The extremes for our differentiation parameter can be interpreted as usual; $\gamma \to 0$ implies that retailers are effectively local monopolies and $\gamma \to 1$ implies that retailers are very fierce competitors in the market, that is, they are perceived as not differentiated. Our specification differs from the standard Spence-Dixit-Vives model in that it allows for gains and losses consumers experience depending on the departures of the actual retail prices from their recommended level. The parameter μ_i captures the size of the consumers' perceived gains and losses as follows

$$\mu_i = \begin{cases} \underline{\mu} & \text{if} \quad \alpha > p_r > p_i \\ \overline{\mu} & \text{if} \quad \alpha > p_i > p_r \\ 0 & \text{if} \quad p_i = p_r \text{ or } p_r > \alpha. \end{cases}$$

If a consumer buys from outlet i, which charges a price above the manufacturer's recommended retail price, he perceives a loss from the unpleasant surprise. This loss is larger if

[14] In the present analysis, we do not attempt to answer the complex question of how consumers internalize reference points. These issues have recently been raised by Schmidt and Zank (2010).

[15] See Martin (2009) for an overview of demand models for differentiated varieties.

the retail price diverges from the recommended price to a greater extent and if the quantity bought is larger. An increase in the parameter $\overline{\mu}$ signifies increased perceived losses per unit purchased at a given retail price above the recommended price. Similarly, if a consumer buys from outlet i, which charges a price below the manufacturer's recommended retail price, he perceives a gain from the pleasant surprise associated with finding the good at a bargain. This gain is larger if the retail price diverges from the recommended price to a greater extent and if the quantity bought is larger. A larger parameter $\underline{\mu}$ signifies that consumers are more bargain-loving: they perceive larger gains per unit purchased at a given retail price below the recommended price.

In line with the asymmetric value function assumed in prospect theory, we impose $0 < \underline{\mu} < \overline{\mu}$: individuals perceive losses more strongly than gains. We further assume $\overline{\mu} < 1$: the standard impact (*direct effect*) of a price change on consumer surplus is stronger than any non-standard impact (*indirect effect*) due to perceived bargains or losses.

Maximizing aggregate net consumer surplus with respect to the quantities yields

$$\begin{aligned} p_i &= \alpha - q_i - \gamma q_{-i} + \mu_i (p_r - p_i), \\ p_{-i} &= \alpha - q_{-i} - \gamma q_i + \mu_{-i} (p_r - p_{-i}), \end{aligned}$$

and solving for the direct demand functions, we obtain

$$\begin{aligned} q_i (p_i, p_{-i}; p_r, \mu_i, \mu_{-i}) &= \frac{\alpha(1-\gamma) - (1+\mu_i)p_i + (1+\mu_{-i})\gamma p_{-i} + (\mu_i - \mu_{-i}\gamma)p_r}{1-\gamma^2} \\ q_{-i} (p_i, p_{-i}; p_r, \mu_i, \mu_{-i}) &= \frac{\alpha(1-\gamma) - (1+\mu_{-i})p_{-i} + (1+\mu_i)\gamma p_i + (\mu_{-i} - \mu_i\gamma)p_r}{1-\gamma^2}. \end{aligned}$$

Note that when consumers are neither loss-averse nor bargain-loving, that is, when $\mu_i = \mu_{-i} = 0$, this demand system collapses to the standard linear demand system for differentiated varieties

$$\begin{aligned} q_i &= \frac{(1-\gamma)\alpha - p_i + \gamma p_{-i}}{1-\gamma^2}, \\ q_{-i} &= \frac{(1-\gamma)\alpha - p_{-i} + \gamma p_i}{1-\gamma^2}. \end{aligned}$$

Timing

Stage 1 The upstream manufacturer either imposes resale price maintenance or publicly recommends a retail price for its product or service supplied to retailers;

Stage 2 The downstream retailers set their retail prices, observing the upstream manufacturer's decision regarding whether to impose resale price maintenance or to recommend retail prices;

Stage 3 Consumers make their purchase decisions, either after only observing retail prices in the RPM scenario or after observing retail prices and the manufacturer's retail price recommendation in the SRP scenario.

3 Analysis

In this section, we analyze the upstream manufacturer's and retailers' pricing strategies under resale price maintenance and suggested retail prices.

3.1 Resale Price Maintenance

Assume that the manufacturer uses resale price maintenance and does not provide a retail price recommendation.

Under resale price maintenance, the upstream manufacturer is able to maximize and fully extract the surplus of the vertical structure by setting a wholesale price, p_w, and imposing retail prices, p_i and p_{-i}, which would maximize the profit of an integrated vertical structure with two downstream retailers

$$\max_{p_i,p_{-i}} \left[(p_i - c) \frac{(1-\gamma)\,\alpha - p_i + \gamma p_{-i}}{1-\gamma^2} + (p_{-i} - c) \frac{(1-\gamma)\,\alpha - p_{-i} + \gamma p_i}{1-\gamma^2} \right].$$

Adopting resale price maintenance leads to $p_w^{RPM} = p_i^{RPM} = p_{-i}^{RPM} = \frac{\alpha+c}{2}$, yielding the quantities $q_i^{RPM} = q_{-i}^{RPM} = \frac{\alpha-c}{2(1+\gamma)}$ and a profit for the upstream manufacturer of $\Pi_U^{RPM} = \frac{(\alpha-c)^2}{2(1+\gamma)}$. As anticipated, in this scenario, downstream retailers just break even.

This conduct is equivalent to two other pricing strategies: (1) an enforced retail price recommendation and (2) setting a wholesale price combined with an enforced retail price ceiling. Competition authorities typically view this behavior with suspicion because they consider it to be harmful to consumers: it reduces competition downstream. We consider this scenario, which is a very lucrative practice for the upstream manufacturer and which competition authorities regard with suspicion, to compare it to the outcomes induced by suggesting retail prices, a practice that competition authorities so far regard without suspicion.[16]

3.2 Suggested Retail Prices

Consider now the situation in which the upstream manufacturer recommends a given retail price level that is not binding in the sense that retailers are free to decide whether to follow it. As long as this recommendation is credible, consumers adopt this recommendation as a reference price to be compared with the actual retail price charged by retailers.

Downstream retailer D_i solves

$$\max_{p_i} \left\{ (p_i - p_w)\, q_i \left(p_i, p_{-i}; p_r, \mu_i, \mu_{-i}\right) \right\},$$

that is,

$$\max_{p_i} \left\{ (p_i - p_w)\, \frac{\alpha(1-\gamma) - (1+\mu_i)p_i + (1+\mu_{-i})\gamma p_{-i} + (\mu_i - \mu_{-i}\gamma)p_r}{1-\gamma^2} \right\}$$

and retailer D_{-i} solves the equivalent problem. The solutions to these problems yield three candidate symmetric equilibria with retail prices, $p_i\left(p_w, p_r\right) = p_{-i}\left(p_w, p_r\right) = p\left(p_w, p_r\right)$, where

$$p\left(p_w, p_r\right) = \begin{cases} \frac{(1-\gamma)(\alpha+\overline{\mu}p_r)+(1+\overline{\mu})p_w}{(2-\gamma)(1+\overline{\mu})} & \text{if } p > p_r, \\ \frac{(1-\gamma)\left(\alpha+\underline{\mu}p_r\right)+(1+\underline{\mu})p_w}{(2-\gamma)(1+\underline{\mu})} & \text{if } p < p_r, \\ \frac{(1-\gamma)\alpha+p_w}{2-\gamma} & \text{otherwise,} \end{cases}$$

[16] Suggested retail prices are considered legal as long as they are not enforced by the manufacturer, for example, by threatening to refuse to supply retailers in cases of non-compliance. For additional information, see "*Minimum retail price accords allowed, U.S. Supreme Court rules*," The New York Times, June 28, 2007, http://www.nytimes.com/2007/06/28/business/worldbusiness/28iht-price.4.6394812.html.

and associated quantities of $q_i(p_w, p_r) = q_{-i}(p_w, p_r) = q(p_w, p_r)$, where

$$q(p_w, p_r) = \begin{cases} \frac{\alpha+\overline{\mu}p_r-(1+\overline{\mu})p_w}{(2-\gamma)(1+\gamma)} & \text{if } p > p_r, \\ \frac{\alpha+\underline{\mu}p_r-\left(1+\underline{\mu}\right)p_w}{(2-\gamma)(1+\gamma)} & \text{if } p < p_r, \\ \frac{\alpha-p_w}{(2-\gamma)(1+\gamma)} & \text{otherwise.} \end{cases}$$

Note that of these three candidates, only the one in which retailers undercut the manufacturer's recommendation constitutes a component of a subgame perfect Nash equilibrium for the entire game.

Retail prices set above the suggested retail price, $p(p_w, p_r) > p_r$, cannot be an equilibrium in the vertical structure. To see this, note that because for $p > p_r$, $q(p_w, p_r)$ is strictly increasing in p_r, the upstream manufacturer's profit, $\Pi_U^{SRP} = (p_w - c)(q_i(p_w, p_r) + q_{-i}(p_w, p_r))$, is also strictly increasing in p_r. In the extreme, the manufacturer's recommended retail price reaches the consumer's maximum willingness to pay, $p_r = \alpha$, and, for any retail price greater than the recommended retail price, demand is zero. Clearly, resale price maintenance is preferred by the upstream manufacturer, implying that there cannot be a subgame perfect Nash equilibrium involving the manufacturer choosing to recommend a retail price, which retailers price above in equilibrium. Note that this result is invariant to our assumption that the highest credible suggested retail price equals the maximum willingness to pay. If we altered our setup to allow for a largest credible recommended retail price below the maximum willingness to pay, retail prices set above the suggested retail price still would not be part of an equilibrium in the vertical structure. Intuitively, in this equilibrium, loss aversion leads to a demand contraction, which the manufacturer could avoid by not providing a retail price recommendation and implementing retail prices that would result in the highest credible recommended retail price by means of resale price maintenance.

Retail prices at the suggested level, $p(p_w, p_r) = p_r$, cannot be an equilibrium either. If the manufacturer recommends a retail price that is followed by the retailers, there is no demand expansion coming from the consumers' perceived gains due to finding bargains (there is no bargain). The manufacturer's sole objective is to extract as much rent as possible in the vertical structure, for which the best instrument is resale price maintenance. Hence, the

manufacturer is better off with resale price maintenance than with recommending a retail price that is followed by the retailers, implying that there cannot be a subgame perfect Nash equilibrium involving the manufacturer choosing to recommend a retail price, which retailers follow in equilibrium.

Retail prices set below the recommended level, $p(p_w, p_r) < p_r$, are part of a possible subgame perfect Nash equilibrium for the overall game. To see this, note that because for $p < p_r$, $q(p_w, p_r)$ is strictly increasing in p_r, and the upstream manufacturer's profit, $\Pi_U^{SRP} = (p_w - c)(q_i(p_w, p_r) + q_{-i}(p_w, p_r))$, is also strictly increasing in p_r. Hence the upstream firm recommends the highest credible price level, for simplicity, assumed to be α, the maximum willingness to pay. Because the recommended retail price is higher than actual retail prices, there is a demand expansion due to the consumers perceiving bargains, which leads to the generation of extra rents that the manufacturer (imperfectly) appropriates. In this scenario, maximizing the upstream manufacturer's profits over p_w yields $p_w^{SRP} = \frac{\alpha+c}{2}$, retail prices of $p^{SRP} = \alpha - \frac{\alpha-c}{4-2\gamma}$, quantities of $q_i^{SRP} = \frac{(\alpha-c)(1+\underline{\mu})}{2(2-\gamma)(1+\gamma)}$, a profit for the upstream manufacturer of

$$\Pi_U^{SRP} = \frac{(\alpha - c)^2 \left(1 + \underline{\mu}\right)}{2(2-\gamma)(1+\gamma)},$$

and, contrary to the resale price maintenance scenario, positive profits for each downstream retailer of

$$\Pi_{D_i}^{SRP} = \frac{(\alpha - c)^2 (1-\gamma) \left(1 + \underline{\mu}\right)}{4(2-\gamma)^2 (1+\gamma)}.$$

3.3 Implemented form of vertical restraint

We now verify the conditions under which the manufacturer prefers to suggest retail prices, which retailers undercut, over imposing resale price maintenance.

Comparing the upstream manufacturer's profits under the two scenarios, we find that the manufacturer employs suggested retail prices as long as

$$\Pi_U^{SRP} = \frac{(\alpha - c)^2 \left(1 + \underline{\mu}\right)}{2(2-\gamma)(1+\gamma)} > \frac{(\alpha - c)^2}{2(1+\gamma)} = \Pi_U^{RPM}.$$

This is the case as long as consumers are sufficiently bargain-loving and competition is sufficiently strong, that is, if $\underline{\mu} > 1 - \gamma$.

Proposition 1 *The upstream manufacturer prefers suggested retail prices to resale price maintenance if and only if (i) consumers are sufficiently bargain-loving or (ii) downstream retailers are perceived as sufficiently undifferentiated, or both. Specifically, the upstream manufacturer prefers suggested retail prices to resale price maintenance if and only if* $\underline{\mu} > 1 - \gamma$.

4 Welfare Analysis

In this section, we compare welfare under resale price maintenance to welfare under suggested retail prices. In the case of resale price maintenance, this exercise amounts to a standard welfare analysis. In the case of suggested retail prices, we take into account both the indirect, positive effect of bargain-loving on consumer surplus and the direct effect of the demand expansion impacting consumers via retail prices and quantities. If consumers are worse off under suggested retail prices than resale price maintenance even if we account for the indirect, positive effect of their bargain-loving, then they would also be worse off if we only took the more traditional direct effect into account.

4.1 Retail prices and quantities

Retail prices and quantities under resale price maintenance are $p^{RPM} = \frac{\alpha+c}{2}$ and $Q^{RPM} = 2q_i^{RPM} = \frac{\alpha-c}{1+\gamma}$. Under suggested retail prices, retail prices and quantities are $p^{SRP} = \frac{(3-2\gamma)\alpha+c}{2(2-\gamma)}$ and $Q^{SRP} = 2q_i^{SRP} = \frac{(1+\underline{\mu})(\alpha-c)}{(2-\gamma)(1+\gamma)}$. Therefore, we find that prices under suggested retail prices are higher than under resale price maintenance. However, suggested retail prices also lead to higher quantities as long as $\underline{\mu} > 1 - \gamma$, that is, whenever the upstream manufacturer chooses to suggest retail prices in the first place.

Lemma 1 *Suggested retail prices lead to higher retail prices than resale price maintenance. Suggested retail prices also lead to higher quantities than resale price maintenance if and only*

if consumers are sufficiently bargain-loving and perceive downstream retailers as sufficiently undifferentiated, specifically, if and only if $\underline{\mu} > 1 - \gamma$.

The impact of recommending retail prices on consumer surplus, and potentially on total social welfare, is ambiguous, given that, on the one hand, it triggers higher prices than otherwise, which is per se detrimental to consumer surplus, while on the other hand, it is also accompanied by increased quantities. Therefore, further analysis is necessary to determine its overall effect.

4.2 Total surplus

In this section, we investigate the conditions under which total surplus, the sum of the manufacturer's and retailers' profits and consumer surplus, under suggested retail prices is higher than when resale price maintenance is used. Under resale price maintenance, consumer surplus is

$$CS^{RPM} = \frac{(\alpha - c)^2}{4(1+\gamma)},$$

whereas under suggested retail prices, consumer surplus is

$$CS^{SRP} = \frac{(\alpha - c)\left((\alpha - c)\left(1 - \underline{\mu}^2\right) + 4\left(2 + \gamma - \gamma^2\right)\underline{\mu}\right)}{4(2-\gamma)^2(1+\gamma)}.$$

Hence, under resale price maintenance, total surplus equals

$$W^{RPM} = \Pi_U^{RPM} + 2\Pi_{D_i}^{RPM} + CS^{RPM} = \frac{(\alpha - c)^2}{2(1-\gamma)} + \frac{(\alpha - c)^2}{4(1-\gamma)} = \frac{3(\alpha - c)^2}{4(1-\gamma)},$$

whereas under suggested retail prices, it equals

$$\begin{aligned} W^{SRP} &= \Pi_U^{SRP} + 2\Pi_{D_i}^{SRP} + CS^{SRP} \\ &= \frac{(\alpha - c)^2\left(1 + \underline{\mu}\right)}{2(2-\gamma)(1+\gamma)} + \frac{(\alpha - c)^2(1-\gamma)\left(1 + \underline{\mu}\right)}{2(2-\gamma)^2(1+\gamma)} \\ &\qquad + \frac{(\alpha - c)\left((\alpha - c)\left(1 - \underline{\mu}^2\right) + 4\left(2 + \gamma - \gamma^2\right)\underline{\mu}\right)}{4(2-\gamma)^2(1+\gamma)}. \end{aligned}$$

When we compare total surplus under the two vertical restraints, we find that whenever the upstream manufacturer implements suggested retail prices, that is, for $\underline{\mu} > 1 - \gamma$, also total surplus is larger under suggested retail prices. However, if retailers are perceived as sufficiently differentiated (γ is low) and consumers are sufficiently bargain-loving ($\underline{\mu}$ is large), there is a conflict between the manufacturer's choice and the choice that would maximize total surplus. In this case, the upstream manufacturer implements resale price maintenance, whereas total surplus would have been higher under suggested retail prices.

Define two threshold values, $\underline{\mu}^U(\gamma)$ and $\underline{\mu}^W(\gamma)$, for the degree to which consumers are bargain-loving such that at the threshold $\underline{\mu}^U(\gamma)$, the upstream manufacturer is indifferent between SRP and RPM, and at the threshold $\underline{\mu}^W(\gamma)$, total surplus under SRP equals total surplus under RPM.

Definition 1 *Let $\underline{\mu}^W(\gamma)$ be such that $\underline{\mu} > \underline{\mu}^W(\gamma) \Leftrightarrow W^{SRP} > W^{RPM}$ and $\underline{\mu}^U(\gamma)$ be such that $\underline{\mu} > \underline{\mu}^U(\gamma) \Leftrightarrow \Pi_U^{SRP} > \Pi_U^{RPM}$.*

Using this definition, Proposition 2 summarizes our findings with respect to the impact of recommending retail prices on social welfare.

Proposition 2 *For all $\gamma \in [0,1]$, $\underline{\mu}^W(\gamma) < \underline{\mu}^U(\gamma)$.*

Proof. See Appendix A ■

4.3 Consumer surplus

In the previous subsection, we demonstrated that total surplus is enhanced when the manufacturer employs suggested retail prices. In this subsection, we investigate whether this is also always in the consumers' interest.

Consumer surplus under suggested retail prices, CS^{SRP}, is larger than consumer surplus under resale price maintenance, CS^{RPM}, if

$$\alpha - c < \frac{4\left(2 + \gamma - \gamma^2\right)\underline{\mu}}{(2-\gamma)^2 - \left(1 - \underline{\mu}^2\right)}.$$

Define a threshold value, $\underline{\mu}^{CS}(\gamma)$, for the degree to which consumers are bargain-loving such that at the threshold $\underline{\mu}^{CS}(\gamma)$, consumer surplus under suggested retail prices equals consumer surplus under resale price maintenance.

Definition 2 *Let* $\underline{\mu}^{CS}(\gamma)$ *be such that* $\underline{\mu} > \underline{\mu}^{CS}(\gamma) \Leftrightarrow CS^{SRP} > CS^{RPM}$.

Using this definition and our results showing that $\underline{\mu}^{U}(\gamma) = 1 - \gamma$, Proposition 3 summarizes our findings with respect to the impact of recommending retail prices on consumer surplus.

Proposition 3 *There* $\exists \gamma^*$ *such that* $\gamma > \gamma^* \Leftrightarrow \underline{\mu}^{CS}(\gamma) < \underline{\mu}^{U}(\gamma)$*; and*

1. *for* $\alpha - c \leq 2$, $\gamma^* = 0$, *that is, whenever the upstream manufacturer implements suggested retail prices, consumer welfare is larger than under resale price maintenance;*

2. *for* $4 \leq \alpha - c$, $\gamma^* = 1$, *that is, for all degrees of differentiation, there exists a* $\underline{\mu}$ *for which the manufacturer implements suggested retail prices and the consumers would be better off under resale price maintenance;*

3. *for* $2 < \alpha - c < 4$, $\gamma^* \in]0, 1[$, *that is, for high degrees of product differentiation (small* γ*), there exists a* $\underline{\mu}$ *for which the manufacturer implements suggested retail prices and the consumers would be better off under resale price maintenance.*

Proof. See Appendix B. ■

Figures 1-3 illustrate Proposition 3. If the highest willingness to pay, α, is relatively small compared to the degree to which consumers are bargain-loving, $\underline{\mu}$, and the marginal cost, c, as in Figure 1, a potential conflict occurs: there are instances in which the upstream manufacturer implements resale price maintenance when consumers would prefer suggested retail prices. When the maximum willingness to pay, α, increases, a second potential conflict arises: there are now also instances in which the upstream manufacturer implements suggested retail prices when consumers would have preferred resale price maintenance. Initially,

this second type of conflict appears only for strong degrees of differentiation between retailers, as in Figure 2. However, when the maximum willingness to pay, α, increases further, this conflict is present for all degrees of differentiation between retailers, as in Figure 3, while the first type of conflict vanishes.

[Figures 1 – 3 approximately here]

Therefore, our results suggest that, although the adoption of recommended retail prices benefits the upstream manufacturer and the retailers, this practice often comes at the consumers' expense, and the set of parameter values for which it comes at the consumers' expense increases in the size of the market.

5 Conclusion

Our model focuses on the vertical structure of an upstream manufacturer that supplies products to downstream retailers that are horizontally differentiated to some degree. Retailers sell to consumers who display reference-dependent preferences. We assume that by publicly announcing a recommended retail price, the manufacturer can manipulate (*ceteris paribus*) the consumers' willingness-to-pay because they adopt the price recommendation as the reference point. The upstream manufacturer chooses between announcing a recommended retail price and resale price maintenance.

We find that, in equilibrium, manufacturer-suggested retail prices are always accompanied by retail prices below the suggested level, inducing consumers to perceive bargains. The upstream manufacturer prefers to publicly recommend a retail price over reducing downstream competition through resale price maintenance as long as consumers are sufficiently bargain-loving and retailers are perceived as sufficiently undifferentiated.

The assumption that consumers adopt the manufacturer recommended retail price as their reference point is realistic in markets for relatively infrequently purchased goods, which are not sufficiently expensive for consumers to engage in extensive search for the lowest prices.

Examples of such markets are luxury food items or clothing. It is less realistic in markets for large budget-items or items that are purchased daily. In those markets, consumers are likely to come to expect retail prices below the manufacturer suggested retail price and use these expected retail prices as a reference point. This is the case in the automobile market.[17]

Our results suggest that recommended retail prices can be employed by upstream manufacturers to manipulate the behaviors of both consumers and retailers.

On the one hand, such manipulations can be anticompetitive, leading to lower consumer surplus than resale price maintenance, in the form of a manufacturer-set *binding* retail price or a *binding* recommended retail price, would have induced. By exploiting the consumers' behavioral traits, the upstream manufacturers induce retail prices and quantities that enhance its and the retailers' profits to the detriment of consumers. This conflict arises when the upstream manufacturer's incentives to induce a perception of bargains on the part of consumers is larger than its incentive to soften downstream competition through resale price maintenance.

On the other hand, there are circumstances in which the manufacturer does not choose to provide a *non-binding* retail price recommendation that would have led to higher consumer surplus than a manufacturer-set *binding* retail price or a *binding* recommended retail price would have induced. This conflict arises when upstream manufacturers' incentives to soften competition are stronger than its incentive to induce the perception of bargains among consumers.

Our results suggest that the currently *per se legal* practice of non-binding retail price recommendations by manufacturers can produce worse outcomes than the currently *illegal* practice of upstream suppliers enforcing retail price recommendations, for example, by threatening to refuse to supply retailers in cases of non-compliance. Consumers can be worse off if manufacturers are allowed to suggest non-binding retail prices than if they are not, which indicates that competition authorities should consider treating non-binding rec-

[17]We are grateful to Yongmin Chen for this comment.

ommended retail prices under the *rule of reason*, rather than the *legal per se rule*.

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A Proof of Proposition 2

Proof. For $(1-\gamma) < \underline{\mu}$, $W^{RPM} > W^{SRP}$ simplifies to $a - c > \frac{4\left(2+\gamma-\gamma^2\right)\underline{\mu}}{\left(1-\gamma-\underline{\mu}\right)\left(5-3\gamma-\underline{\mu}\right)}$, which holds as, for $(1-\gamma) < \underline{\mu}$, $\frac{4\left(2+\gamma-\gamma^2\right)\underline{\mu}}{\left(1-\gamma-\underline{\mu}\right)\left(5-3\gamma-\underline{\mu}\right)} < 0$. Hence, $\forall\gamma \in [0,1], \underline{\mu}^W(\gamma) < \underline{\mu}^U(\gamma)$. ■

B Proof of Proposition 3

Proof. Manufacturers prefer SRP over RPM if $\gamma > 1 - \underline{\mu}$. Consumers prefer SRP over RPM if $0 < \frac{4\left(2+\gamma-\gamma^2\right)\underline{\mu}}{(2-\gamma)^2-\left(1-\underline{\mu}^2\right)} - (\alpha - c)$. Part (1): Simple algebra shows that for $\alpha - c \leq 2$, $\underline{\mu} - (1-\gamma) \leq \frac{4\left(2+\gamma-\gamma^2\right)\underline{\mu}}{(2-\gamma)^2-\left(1-\underline{\mu}^2\right)} - (\alpha - c)$. Part (2) Simple algebra shows that for $4 \leq \alpha - c$, $\frac{4\left(2+\gamma-\gamma^2\right)\underline{\mu}}{(2-\gamma)^2-\left(1-\underline{\mu}^2\right)} - (\alpha - c) \leq \underline{\mu} - (1-\gamma)$. Part (3) holds for continuity reasons. ■

C Figures

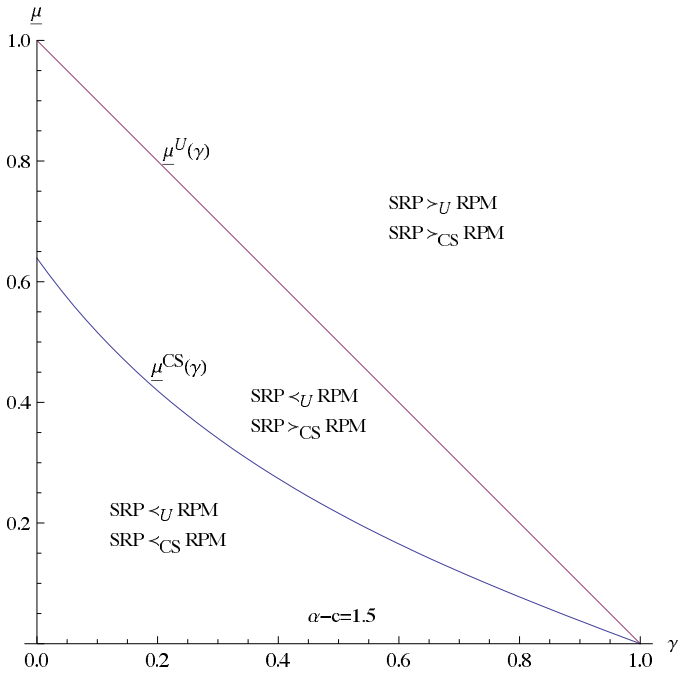

Figure 1: Upstream manufacturer and consumer preferences for a small market.

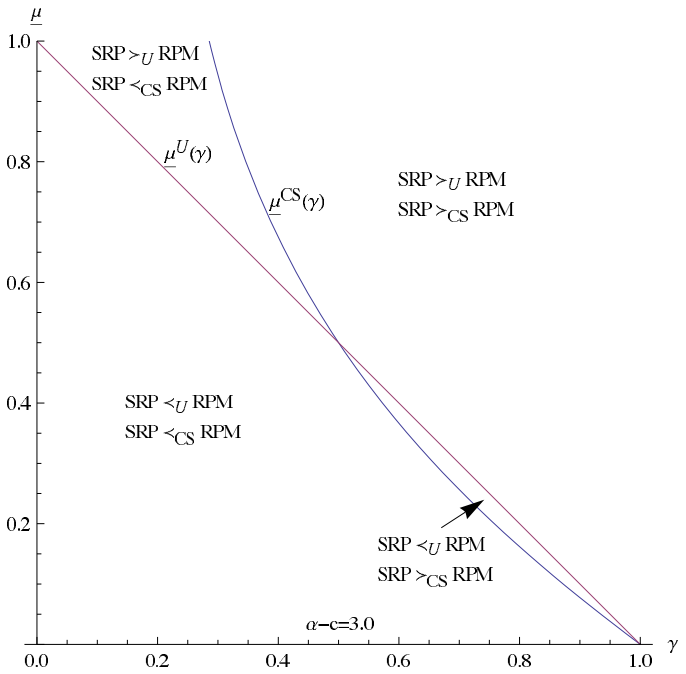

Figure 2: Upstream manufacturer and consumer preferences for an intermediately sized market.

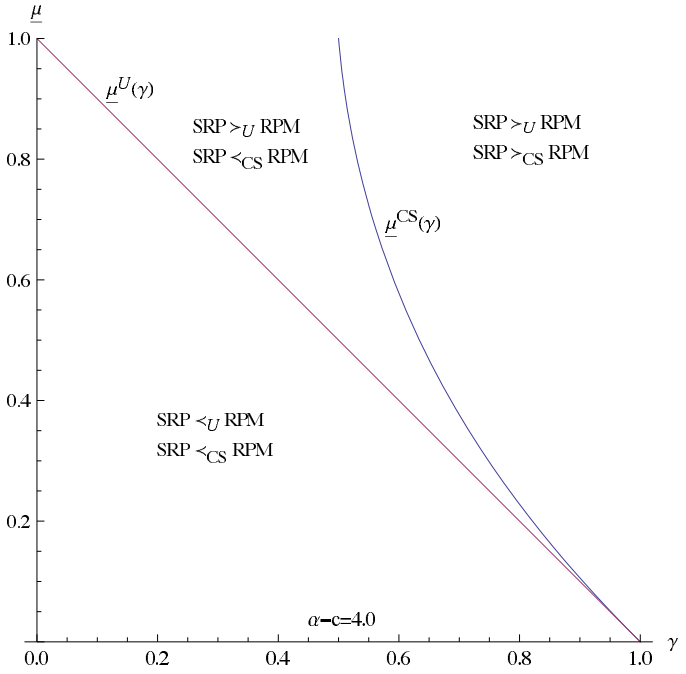

Figure 3: Upstream manufacturer and consumer preferences for a large market.