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Do Recommended Retail Prices Really Benefit Consumers? The Role of Buyer Power

by

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Do Recommended Retail Prices Really Benefit Consumers? The Role of Buyer Power

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Abstract

We consider vertical price restrictions like Recommended Retail Prices (RRP) and Resale Price Maintenance (RPM), together with a retailer's unit discount when purchasing the good from the manufacturer. We study how retailer's buyer power affects the nature of the vertical price restriction occurring in equilibrium. A bit unexpectedly, it emerges that buyer power has got a non-monotonic relation with welfare: when it is either small or very large, welfare is at its lowest level. When buyer power is at an intermediate level, society is better off. The following trade-off explains these results: on the one hand, RPM eliminates double marginalization; on the other hand, to convince the retailer to accept it, a higher unit discount must be given. Our analysis suggests that antitrust authorities should take buyer power into account when assessing welfare effects of vertical price restrictions, and should be open to deal with its non-monotonic relation with welfare.

JEL classification: L1, L4

Keywords: Recommended retail prices, RPM, successive monopoly, buyer power.

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1 Introduction

In many industries a manufacturer recommends a retail price to his retailers and gives them, when selling the good, a unit discount computed on that retail price. The use of a Recommended Retail Price (RRP) is often inextricably linked with a retailer's remuneration scheme. For cars, gasoline, clothing and books, for example, retailers get a discount computed on the recommended retail price. This is however variable from industry to industry, and depends on retailers' buyer power in dealing with manufacturers.

Retail price restrictions imposed by manufacturers have traditionally been considered harmful for society by antitrust authorities and, consequently, forbidden. In recent years, however, the prevailing antitrust doctrine has changed, modifying its negative attitude towards some forms of price restrictions. Maximum Resale Price Maintenance (RPM),¹ for instance, is now permitted by the European Commission (EC, [2002], p. 11 and p. 27) under the belief that it prevents price-making retailers from increasing the retail price. Other weaker forms of price restrictions are also permitted by the EC: it is the case of the already mentioned RRP (EC [2002], p. 11 and p. 27).²

It is to be noted, however, that according to the prevailing antitrust doctrine it is crucial—to assess *who* should set the retail price—to understand the true nature of the retailer's activity: when the retailer is a mere agent of

¹Minimum RPM is instead still forbidden.

²However, the EC acknowledges that both Maximum RPM and RRP might harm welfare when "... such a price will work as a focal point for the distributors and may be followed by most or all of them. In addition, maximum or recommended resale prices may facilitate horizontal collusion between suppliers." For a contribution on this line see Jullien-Rey [2003].

the manufacturer, she is not entitled to set the retail price: the manufacturer should. This occurs when the retailer is not the owner of the good for sale and does not bear any entrepreneurial risk.³ On the contrary, when the retailer acts as a firm, preserving the retailer's ability to set retail prices is considered essential. Consequently, retail prices imposed by manufacturers are regarded as *per se* illegal by antitrust authorities, while recommended prices or price ceilings are permitted, as long as entrepreneurial retailers remain free to modify them.

Two interesting issues arise when these weaker forms of price restrictions are adopted. First, the manufacturer can use the retailer's discount as an instrument to "buy" her willingness to give up the control of the retail price. Secondly, the amount of the retailer's discount depends also on her buyer power. Hence it is important to investigate how the desire of the manufacturer to affect the retail price interacts with retailer's buyer power.

In principle, two different vertical price restrictions are possible: (1) a contract where the manufacturer gives to the retailer a predetermined discount based on a recommended retail price but leaves her free to change it. Let us call this RRP; (2) a contract where the retailer receives a unit discount and accepts the recommended price, committing herself not to modify

³For instance, she can turn back the unsold stocks to the manufacturer, thus not holding an inventory risk, and she does not make an important investment in distribution, thus not holding an investment risk. In the US the *General Electric Doctrine* [1926] states that an exemption to the *per se* illegality of RPM is given by the presence of an agency relationship between manufacturers and retailers. In Canada recommended prices are permitted provided that the retailer retains her ability to change them (see Mathewson–Winter [1998] for more details).

it. Let us call this second price restriction as ARPM, i.e. Accepted RPM.⁴

The literature has partially dealt with some of these issues. RPM, with other vertical restraints like franchising fees, exclusive territories, quantity forcing schemes, has been considered in mid-80s' as an instrument able to replicate vertical integration. A few studies have pursued this line of research in the context of an upstream monopolist and a downstream monopolistically competitive industry (Mathewson–Winter [1983, 1984], Dixit [1983], Perry–Groff [1985], and Perry–Porter [1990]).⁵ They point out that RPM alone is not able to achieve the vertical integration solution but it may achieve this outcome if it is adopted *together with* other vertical restraints. These contributions have made it clear that weaker forms of RPM may arise as equilibrium outcomes: either a price ceiling (maximum RPM) or a price floor (minimum RPM) can well occur. The adoption of a particular form of RPM depends on the nature of the distortions to be corrected. When a vertical externality prevails, like in a simple successive monopoly, a price ceiling should be adopted; but when a horizontal externality⁶ prevails, a price floor is called for.

A different line of research on RPM has seen it as an instrument to collude, either between manufacturers (Jullien–Rey [2003]) or among retailers (Shaffer

⁴We distinguish it from the conventional RPM where the retail price can be imposed by the manufacturer to his retailers at no cost.

⁵Perry–Besanko [1991] extend the analysis to upstream competition. Bolton–Bonanno [1988] focus on an upstream monopolist dealing with a downstream vertically differentiated duopoly.

⁶When there is a horizontal externality due to competition, an underinvestment in retailer's promotional effort arises. This is due either to an excessive number of price-cutting retailers or to a strong spillover on promotion.

[1991], Wang [2004]).

These studies do not take into consideration recommended retail prices by the manufacturer and never bring into the picture a unit discount granted to the retailer on them. They also neglect the case in which retailers have some buyer power.⁷

This paper shows that retailer's buyer power does matter in the type of price restriction arising in equilibrium and, consequently, that it has an important effect on consumers surplus, channel profit and welfare. There exists a non-monotonic relation between buyer power and welfare. If buyer power is small, the unit discount will also be small, and hence the retailer does not accept ARPM. RRP prevails and double marginalization is not eliminated. When buyer power is maximal, the unit discount is very high and, as a result, the retailer will choose ARPM. Double marginalization is eliminated, but retailer's unit discount is so high that makes retail prices very high too. Welfare is consequently very low. Welfare is instead at its maximum level when the bargaining power between the two parts is balanced. In this case the unit discount is high enough to induce the retailer to choose ARPM, but not so high to lead to very high retail prices. This result is a good example of Galbraith's countervailing power hypothesis.

⁷Klein-Murphy [1988] is a partial exception: they consider the possibility to grant a remuneration to retailers to induce them not to be engaged in a free riding activity. Retailers' free riding (opposed to consumers' free riding) occurs when the manufacturer imposes to retailers, upon the threat of contract's termination, some standards in retailing in order to keep a high quality level. If consumers cannot recognize whether these standards have been followed by a single retailer, the latter has an incentive to shirk, and hence she enjoys higher margins by cutting her costs.

Our conclusions question the current attitude of antitrust authorities on vertical price restrictions, which looks only at manufacturers' selling power according to a monotonically decreasing relationship: the higher the manufacturer's power the worse is the welfare effect of a vertical price restriction.⁸ Moreover, recommended retail prices do not represent the best vertical price restriction for society.

The paper proceeds as follows. In Section 2 we present the model. In Section 3 we study the retail price determination. In Section 4 we analyze the setting of the recommended retail price by the manufacturer, while in Section 5 we characterize the optimal vertical contract under various degrees of retailer's buyer power, looking also at its effect on profits and welfare. Concluding comments in Section 6 end the paper. Some analytical details are provided in the Appendices.

2 The model

We consider a successive monopoly where a manufacturer sells his product to a single retailer. Each unit of the good bought by the retailer is sold to consumers. The retailer does not incur in any distribution cost, so that her marginal cost is equal to the wholesale price. The manufacturer produces the good with constant unit cost, which is, without loss of generality, normalized

⁸For instance the EC antitrust authority states that "the market position of the supplier is the main factor in assessing possible anti-competitive effects of recommended or maximum resale prices. The stronger the supplier's position, the higher the risk that a recommended resale price or a maximum resale price is followed by most or all distributors" (EC [2002], p. 26).

to zero.

We define \bar{p} as the recommended retail price (RRP) set by the manufacturer and s as the unit discount granted to the retailer and computed on the recommended price. Hence the wholesale price can be defined as $w(\bar{p}, s) = \bar{p} - s$. The retail price is p , so the retailer's profit margin is $p - \bar{p} + s$. If $p = \bar{p}$ the recommended retail price is confirmed by the retailer. If instead $p > \bar{p}$, the retailer's profit margin rises and overpricing takes place. Hence the retailer has two ways to increase her profit margin: (1) overpricing, (2) an increase in s . The presence of a strictly positive unit discount s introduces then a wedge between the recommended retail price \bar{p} and the wholesale price w . Indeed, when $s = 0$, \bar{p} represents both the retail price recommended by the manufacturer and the wholesale price, but this is no longer true when $s > 0$.

The retailer, differently from the benchmark studied in the literature, has some bargaining power in determining s .⁹ Moreover, she remains free not to accept the recommended price \bar{p} and to change it, if the deal proposed by the manufacturer is not acceptable. The manufacturer, in order to see that \bar{p} is confirmed by the retailer, has to propose her an acceptable deal. She will accept to lose control on the retail price only if her unit remuneration increases. Since overpricing is indeed prevented when the retailer accepts the recommended price, she asks for a compensation through s .

We model this retailer's decision as the choice between two different con-

⁹It follows that the wholesale price is not set by the manufacturer alone, but, being it the difference between the recommended price (decided by the manufacturer) and the discount (which is subject to bargaining), it is partly decided by the retailer as well. The higher is her bargaining power the higher is s , and so the lower is w for a given \bar{p} .

tracts: (1) ARPM, in which the retailer irrevocably commits herself to accept the retail price recommended by the manufacturer; (2) RRP, where she remains free to change \bar{p} . The whole situation can be formally described as a perfect and complete information four-stage model, with the following timing:

- at $t = 1$ (the *discount* stage) the retailer's unit discount s is set;
- at $t = 2$ (the *retail price regime* stage) the retailer, knowing s , decides between RRP and ARPM;
- at $t = 3$ (the *recommended retail price* stage), the manufacturer, knowing s and the retail price regime, chooses the recommended price \bar{p} , which is equal to the “actual” retail price p only under ARPM; under RRP p remains to be set;
- at $t = 4$ (the *retail price* stage), the retailer sets the retail price p only under RRP (under ARPM, $p = \bar{p}$).

The determination of s at $t = 1$ depends crucially on buyer power in the determination of if. In order to analyze different situations on it, we study two alternatives: (1) s is determined according to an asymmetric Nash bargaining problem (Game 1); (2) we attribute a first mover advantage in setting s , respectively to the manufacturer (Game 2) and to the retailer (Game 3). We look for subgame perfect equilibria of these games, applying, as usual, backward induction.

3 Retail Price Determination

The retailer's decision at $t = 2$ clearly affects what happens in the last stage. We need then to distinguish between two possible cases: (a) the retailer chooses RRP (i.e. she keeps control on the retail price), (b) the retailer selects ARPM (i.e. she gives up the retail price control). Let us start with the former.

3.1 RRP

If the retailer keeps control on the retail price, her profit can be written as follows:

$$\pi_R^{RRP} = [p - (\bar{p} - s)]y(p) \quad (1)$$

where $y(p)$ represents the downward sloping demand function by final consumers ($y' < 0$). As it is clear from (1), the retailer has two channels to increase her profit margin: (1) an increase in s ; (2) an increase in p above the recommended price \bar{p} (what we call overpricing). If the retailer decides to reduce the retail price below the level recommended by the manufacturer (underpricing), she incurs in a unit loss, which can be compensated only by a significant sales increase.¹⁰

The retailer chooses p at $t = 4$ in order to maximize (1). The first order condition of this profit maximization can be written as follows:

$$\frac{d\pi_R^{RRP}}{dp} = y(p) + (p - \bar{p} + s)y'(p) = 0 \quad (2)$$

¹⁰Underpricing is subject to a lower bound given by the non-negativity constraint on profits, $\pi_R \geq 0$, which implies that $p \geq \bar{p} - s$.

Totally differentiating (2), we obtain:

$$y'(p)dp + y'(p)[ds + dp - d\bar{p}] + (p - \bar{p} + s)y''(p)dp = 0 \quad (3)$$

From the second order condition we know that: $G = 2y' + (p - \bar{p} + s)y'' < 0$.

Using G in (3), we have: $Gdp = y'(p)(d\bar{p} - ds)$, and so

$$dp = \frac{y'(p)}{G}d\bar{p} - \frac{y'(p)}{G}ds \quad (4)$$

which gives the following implicit function:

$$p = \phi(\bar{p}, s) \quad (5)$$

where, from (4), we have:

$$\frac{\partial \phi(\bar{p}, s)}{\partial \bar{p}} = \frac{y'}{G} > 0 \quad \text{and} \quad \frac{\partial \phi(\bar{p}, s)}{\partial s} = -\frac{y'}{G} < 0$$

It is then obvious that:

$$\frac{\partial \phi(\bar{p}, s)}{\partial \bar{p}} = -\frac{\partial \phi(\bar{p}, s)}{\partial s} \quad (6)$$

The impact of a unit variation of \bar{p} on p is exactly equal to that of a unit variation of s on p , with the opposite sign. Equation (6), by Euler's Theorem, implies also that: $\frac{\partial^2 \phi}{\partial \bar{p} \partial s} = -\frac{\partial^2 \phi}{\partial s^2}$ and $\frac{\partial^2 \phi}{\partial s \partial \bar{p}} = -\frac{\partial^2 \phi}{\partial \bar{p}^2}$; in turn, $\frac{\partial G}{\partial \bar{p}} = -\frac{\partial G}{\partial s}$ and then $\frac{\partial^2 \phi}{\partial \bar{p} \partial s} = \frac{\partial^2 \phi}{\partial s \partial \bar{p}}$, as it is shown in Appendix A. Let us now analyze what happens in stage 4 if the retailer chooses ARPM at $t = 2$.

3.2 ARPM

If the retailer has given up the control on p at $t = 2$, the manufacturer obviously finds it profitable to charge $p^{ARPM} = \bar{p}^{ARPM}$, and, consequently,

the retailer's profit is now: $\pi_R^{ARPM} = sy$, with $y(\bar{p}^{ARPM})$, as it is clear from substituting $p = \bar{p}$ in (1).

4 The retail price recommended by the manufacturer

Having solved the last subgame, we are now in a position to look at what happens at $t = 3$, where the manufacturer sets the recommended retail price. His profit can be defined as follows:

$$\pi_M = w(\bar{p}, s)y(p) = (\bar{p} - s)y(p) \quad (7)$$

From the previous Section, we know that, under RRP, $p^{RRP} = \phi(\bar{p}^{RRP}, s)$ (see equation (5)); if instead ARPM is adopted, we have that $p^{ARPM} = \bar{p}^{ARPM}$. Let us analyze the two cases separately.

4.1 RRP

In this case the manufacturer's profit is given by $\pi_M^{RRP} = (\bar{p} - s)y[\phi(\bar{p}, s)]$. He maximizes π_M^{RRP} by choosing \bar{p} . The first order condition is as follows:

$$\frac{d\pi_M^{RRP}}{d\bar{p}} = y + (\bar{p} - s)y' \frac{\partial \phi}{\partial \bar{p}} = 0 \quad (8)$$

The total differential of (8) is:

$$\begin{aligned} y' \left[\frac{\partial \phi}{\partial \bar{p}} d\bar{p} + \frac{\partial \phi}{\partial s} ds \right] + y' \frac{\partial \phi}{\partial \bar{p}} (d\bar{p} - ds) + (\bar{p} - s) \frac{\partial \phi}{\partial \bar{p}} y'' \left[\frac{\partial \phi}{\partial \bar{p}} d\bar{p} + \frac{\partial \phi}{\partial s} ds \right] + \\ + (\bar{p} - s) y' \left[\frac{\partial^2 \phi}{\partial \bar{p}^2} d\bar{p} + \frac{\partial^2 \phi}{\partial \bar{p} \partial s} ds \right] = 0 \quad (9) \end{aligned}$$

From the second order condition we know that:

$$F = 2y' \frac{\partial \phi}{\partial \bar{p}} + (\bar{p} - s) \left[y'' \left(\frac{\partial \phi}{\partial \bar{p}} \right)^2 + y' \frac{\partial^2 \phi}{\partial \bar{p}^2} \right] < 0 \quad (10)$$

Thus, using F in (9), we get:

$$F d\bar{p} + \left[y' \frac{\partial \phi}{\partial s} - y' \frac{\partial \phi}{\partial \bar{p}} + (\bar{p} - s) \frac{\partial \phi}{\partial \bar{p}} y'' \frac{\partial \phi}{\partial s} + (\bar{p} - s) y' \frac{\partial^2 \phi}{\partial \bar{p} \partial s} \right] ds = 0$$

But since $\frac{\partial \phi}{\partial s} = -\frac{\partial \phi}{\partial \bar{p}}$ and $\frac{\partial^2 \phi}{\partial \bar{p} \partial s} = \frac{\partial^2 \phi}{\partial s \partial \bar{p}} = -\frac{\partial^2 \phi}{\partial \bar{p}^2}$, then

$$F d\bar{p} + \left\{ -2y' \frac{\partial \phi}{\partial \bar{p}} - (\bar{p} - s) \left[y'' \left(\frac{\partial \phi}{\partial \bar{p}} \right)^2 + y' \frac{\partial^2 \phi}{\partial \bar{p}^2} \right] \right\} ds = 0 \quad (11)$$

Since the term in curly brackets in (11) is equal to $-F$ (as it emerges from (10)), it follows that:

$$\frac{d\bar{p}^{RRP}}{ds} = 1 \quad (12)$$

This implies that $\bar{p}^{RRP} = \kappa + s$, where κ is a strictly positive constant. Substituting (12) in (4) we have that $dp^{RRP} = 0$, i.e. p^{RRP} is independent of s . The following Lemma has therefore been proved.

Lemma 1 *Under RRP, the retail price is independent of s . Hence consumer surplus is unaffected by s .*

Lemma 1 points out that if the retailer asks for a higher s , the manufacturer compensates this loss by increasing \bar{p} of the same amount, in such a way as to keep the wholesale price constant. Consumers are therefore unaffected by any variation of s under this retail pricing regime.

4.1.1 Underpricing *vs* overpricing

Combining the two FOCs' (2) and (8), after some easy algebraic manipulations, we get an expression which identifies when there is overpricing and when instead underpricing prevails. We have the following result:

Lemma 2 *Under RRP we observe underpricing whenever $s > \kappa \frac{\partial \phi}{\partial \bar{p}}$. Overpricing occurs when $s < \kappa \frac{\partial \phi}{\partial \bar{p}}$. The retailer confirms \bar{p} if $s = \kappa \frac{\partial \phi}{\partial \bar{p}}$.*

Proof: See Appendix B.

It follows from Lemma 2 that when $s = 0$, being $\frac{\partial \phi}{\partial \bar{p}} > 0$, it must be that $p^{RRP} > \bar{p}^{RRP}$: the retailer makes overpricing to get a positive profit, giving rise to the well known double marginalization problem. But when $s > 0$, overpricing is not always the best retailer's pricing strategy. Underpricing or overpricing may both prevail according to the value of s . This implies that, while for $s = 0$ only maximum RPM can occur, for $s > 0$ both maximum and minimum RPM are possible.

4.1.2 The effect on profit and welfare

Let us now consider the effect of s on the retailer's, manufacturer's and industry's profit under RRP. As for the retailer's profit, it is easy to see that, being p^{RRP} independent of s , and since $\bar{p}^{RRP} - s = \kappa$, then from (1) it follows that π_R^{RRP} is also independent of s . For the manufacturer's profit, from (7), by the same argument, it is shown that π_M^{RRP} is independent of s . Hence, under RRP, the channel profit, defined as $\pi_M^{RRP} + \pi_R^{RRP}$, does not depend on s too. Since both consumer surplus (Lemma 1) and channel profit are not

affected by s , it follows that social welfare (defined à la Marshall as the sum of consumer surplus and channel profit) is also independent of s , as stated in the following Lemma.

Lemma 3 *Under RRP the unit discount s does not affect firms' profits, consumer surplus and social welfare. Only the recommended retail price increases with s .*

According to Lemma 3, under RRP, buyer power on s has no relevant effect.

4.2 ARPM

Now we analyze the case where the retailer gives up the control on p to the manufacturer. The latter has the following profit function:

$$\pi_M^{ARPM} = (\bar{p} - s)y(\bar{p}) \quad (13)$$

The manufacturer chooses \bar{p} with the aim of maximizing his profit. The first order condition for this problem is:

$$\frac{d\pi_M^{ARPM}}{d\bar{p}} = y(\bar{p}) + (\bar{p} - s)y'(\bar{p}) = 0 \quad (14)$$

Totally differentiating (14), we get:

$$y'd\bar{p} + (\bar{p} - s)y''d\bar{p} + y'(d\bar{p} - ds) = 0 \quad (15)$$

Since $F = 2y' + (\bar{p} - s)y'' < 0$ to meet the second order condition, we can get from (15):

$$\frac{d\bar{p}^{ARPM}}{ds} = \frac{y'}{F} > 0 \quad (16)$$

which leads to the following implicit function: $\bar{p}^{ARPM} = \varphi(s)$, with

$$\varphi' = \frac{d\bar{p}^{ARPM}}{ds} = \frac{y'}{F} > 0.$$

4.2.1 The effect on profit and welfare

As shown in (16), an increase in s leads to an increase in the retail price recommended by the manufacturer, and, hence, in the actual retail price. In this case the manufacturer internalizes the effect of s , which is for him like an increase in marginal cost. Since the consumer surplus is a monotonic inverse function of p^{ARPM} ($= \bar{p}^{ARPM}$), being \bar{p}^{ARPM} an increasing function of s , it follows that if s rises, consumer surplus shrinks.

Looking at the effect of s on the retailer's profit, we have that $\pi_R^{ARPM} = sy[\varphi(s)]$, and so, by differentiating it with respect to s , we get:

$$\frac{d\pi_R^{ARPM}}{ds} = y + sy'\varphi' \quad (17)$$

Its sign depends upon s , being $y > 0$, $y' < 0$ and $\varphi' > 0$. The manufacturer profit is: $\pi_M^{ARPM} = [\varphi(s) - s]y[\varphi(s)]$. By differentiating it with respect to s we get:

$$\frac{d\pi_M^{ARPM}}{ds} = (\varphi' - 1)y + (\bar{p}^{ARPM} - s)y'\varphi' = (\bar{p} - s)y' < 0. \quad (18)$$

The last step in (18) is obtained by substituting (14) for y . Not surprisingly, the lower is s , the higher is π_M^{ARPM} . Let us now consider the channel profit: $\pi_M^{ARPM} + \pi_R^{ARPM} = \varphi(s)y[\varphi(s)]$; differentiating it with respect to s , we get:

$$\frac{d(\pi_M^{ARPM} + \pi_R^{ARPM})}{ds} = \varphi'(y + y'\varphi) = \varphi'sy' < 0$$

The last step is again obtained by substituting (14) for y in channel profit. Thus an increase in s reduces the channel profit: the loss to the manufacturer due to an increase in s is always higher than the gain eventually obtained by the retailer. Since the consumer surplus is also decreasing in s , the following Lemma has been demonstrated.

Lemma 4 *Under ARPM both industry profit and consumer surplus decrease as s increases. Hence an increase in s is welfare reducing.*

When the retailer receives a higher unit discount, she may get more profit, but since both the manufacturer and the consumers are hurt by the consequent price increase, the overall effect on welfare is surely negative, while under RRP we have seen that s is neutral on welfare.

4.3 Comparing the two retail price regimes

Having solved the last two subgames under the two possible retail price regimes, we can compare prices, channel profit, consumer surplus and welfare under RRP and ARPM. The results are shown in the following Proposition.

Proposition 1 *If s is sufficiently high (low), consumer surplus, channel profit and welfare are lower (higher) under ARPM than under RRP, provided that they are all strictly concave.*

Proof: See Appendix B.

Proposition 1 shows that when s is sufficiently high, welfare under ARPM is lower than under RRP even if under the former the manufacturer internalizes the vertical externality and eliminates double marginalization. To see why, consider that two offsetting effects are to be balanced under ARPM: on the one hand, downstream marginalization is eliminated and this makes the vertical channel more efficient; on the other hand, to make RPM acceptable to the retailer, a higher s is to be paid to the latter. But under ARPM the higher is s the higher is p . This negative effect can well prevail on the former. When this occurs it is preferable that the retailer, not the manufacturer, chooses the retail price. ARPM can then be undesirable from a social point of view.

5 Equilibrium vertical price restrictions and buyer power

Let us now look at the first two stages of the model, where s and the retail price regime have to be determined. We want to look at the effect of buyer power on the equilibrium characteristics. As mentioned before we focus on two alternative assumptions: (1) s is determined as the solution of an asymmetric Nash bargaining problem (Game 1); (2) s is set unilaterally by a single firm, which in turn can be either the manufacturer (Game 2) or the retailer (Game 3). We look for subgame perfect equilibria of these three games. To reach this goal, however, we need to be more specific on the market demand; to obtain closed form solutions of the model, let us now restrict our attention to the linear case: $y = a - p$. Under this assumption the subgames at stages 3–4 yield the following outcomes:

(a) RRP

The recommended retail price is:

$$\bar{p}^{RRP} = \frac{a}{2} + s$$

while the actual retail price is:

$$p^{RRP} = \frac{3}{4}a$$

with $y^{RRP} = \frac{a}{4}$, and $\pi_R^{RRP} = \frac{a^2}{16}$ and $\pi_M^{RRP} = \frac{a^2}{8}$.¹¹ Consumer surplus is $CS^{RRP} = \frac{1}{32}a^2$, channel profit is $\Pi^{RRP} = \frac{3}{16}a^2$, while social welfare is $W^{RRP} = \frac{7}{32}a^2$.

(b) ARPM

The equilibrium retail price is:

$$p^{ARPM} = \bar{p}^{ARPM} = \frac{a + s}{2}$$

with $y^{ARPM} = \frac{a-s}{2}$, $\pi_R^{ARPM} = s \left(\frac{a-s}{2} \right)$ and $\pi_M^{ARPM} = \frac{(a-s)^2}{4}$. Consumer surplus is $CS^{ARPM} = \frac{(a-s)^2}{8}$, channel profit is $\Pi^{ARPM} = \frac{a^2-s^2}{4}$, while social welfare is $W^{ARPM} = \frac{1}{8}(3a + s)(a - s)$.

To highlight the role of buyer power, let us now recall the benchmark, where s is decided by the manufacturer who imposes \bar{p} to the retailer at no cost (the case with no buyer power). Only after having done so, we will turn back to the three above mentioned games.

5.1 The benchmark: no buyer power

If at $t = 1$ the manufacturer sets s and at $t = 2$ the retailer cannot refuse to charge the recommended price, then $p = \bar{p}$ and $s = 0$. This implies that

¹¹By Lemma 2 we have that underpricing will occur only if $s > \frac{a}{4}$; for $s < \frac{a}{4}$ we have overpricing, while for $s = \frac{a}{4}$ we have an endogenous RPM.

$w = \bar{p} = p$, $p = \frac{a}{2} = y$ and $\pi_R = 0$, while $\pi_M = \frac{a^2}{4} = \pi^{VI}$ (VI stands for vertical integration). Channel profit coincides with the manufacturer profit and $W = \frac{3}{8}a^2 = W^{VI}$. Under these circumstances RPM replicates vertical integration.

5.2 The effect of buyer power

We will show in this Section that if there is buyer power, i.e. if the retailer can affect the unit discount and eventually refuse to confirm the manufacturer's recommended price, the final outcome differs from that of the benchmark. We first explore Game 1, where the retailer and the manufacturer bargain over s .

5.2.1 Asymmetric Nash Bargaining on s

Suppose that at $t = 1$ the manufacturer and the retailer solve the following problem:

$$\text{MAX}_{\{s\}} \quad \left(\pi_R - \pi_R^d\right)^\beta \left(\pi_M - \pi_M^d\right)^{1-\beta} \quad (19)$$

where $0 < \beta < 1$ represents the degree of buyer power over s , while π_j^d ($j = R, M$) is firm j 's disagreement profit. If the two parts do not reach an agreement, no trade takes place and hence both firms end up with no profit: so it is plausible to have $\pi_R^d = \pi_M^d = 0$. Hence (19) can be written as:

$$\text{MAX}_{\{s\}} \quad \pi_R^\beta \pi_M^{1-\beta} \quad (20)$$

It should be clear that π_R and π_M crucially depend on the retailer's choice at $t = 2$: either RRP or ARPM. We thus need to proceed by backward induction. For the sake of clarity, it is helpful to represent in Figure 1 the whole game.

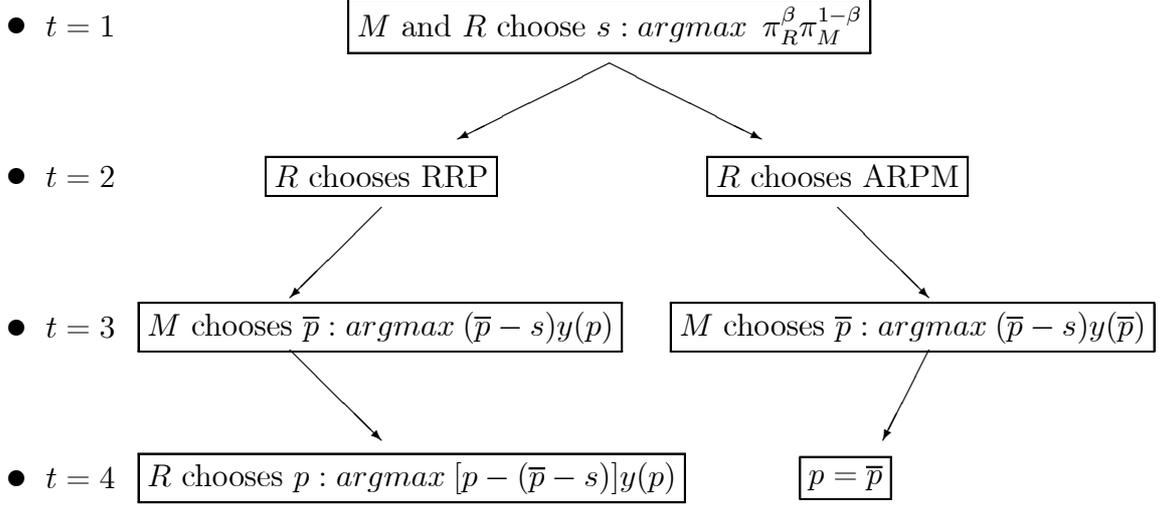


Figure 1: The extensive form of Game 1

We define I_R as an indicator variable equal to 1 if at $t = 2$ ARPM is chosen by the retailer and to 0 if RRP is selected. We can identify the retailer's best reply at $t = 2$ by comparing $\pi_R^{ARPM} = \frac{s}{2}(a - s)$ with $\pi_R^{RRP} = \frac{a^2}{16}$. We thus obtain the following optimal rule for the retailer at $t = 2$:

$$I_R = \begin{cases} 1 \text{ (ARPM)} & \text{if } s_1 \leq s \leq s_2 \\ 0 \text{ (RRP)} & \text{otherwise} \end{cases} \quad (21)$$

where

$$s_1 = \frac{a}{2} \left(1 - \frac{\sqrt{2}}{2} \right) > 0, s_2 = \frac{a}{2} \left(1 + \frac{\sqrt{2}}{2} \right) > 0, \quad \text{with } s_1 < s_2 \quad (22)$$

The retailer's profit functions under RRP ($\pi_R^{RRP} = \frac{a^2}{16}$) and ARPM ($\pi_R^{ARPM} = \frac{s(a-s)}{2}$) are drawn in Figure 2, in which it is possible to identify the threshold levels s_1 and s_2 .

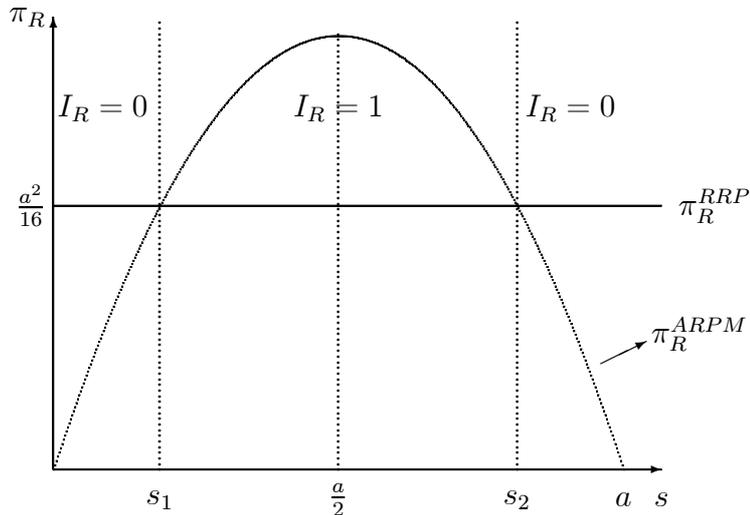


Figure 2: Retailer's profits under RRP and ARPM

We are now in a position to proceed to the analysis of the asymmetric Nash bargaining problem already described. If the retailer chooses RRP at $t = 2$ both profits are independent of s , so the bargaining over s is irrelevant. Firms stick to a profit of $\pi_R^{RRP} = \frac{a^2}{16}$ and of $\pi_M^{RRP} = \frac{a^2}{8}$. If the retailer instead selects ARPM at $t = 2$ a non trivial bargaining problem applies and gives rise to the following maximization problem:

$$\begin{aligned} \text{MAX} \quad & (\pi_R^{ARPM})^\beta (\pi_M^{ARPM})^{1-\beta} = \left[\frac{s}{2} (a-s) \right]^\beta \left[\frac{(a-s)^2}{4} \right]^{1-\beta} \\ \{s\} \end{aligned} \quad (23)$$

As it is clear from (23), under ARPM s does affect both profits. The following first order condition can be easily derived:

$$\begin{aligned} & \beta \left[\frac{s}{2} (a - s) \right]^{\beta-1} \left[\left(\frac{1}{2} \right) (a - s) - \frac{s}{2} \right] \left[\frac{(a-s)^2}{4} \right]^{1-\beta} + \\ & - \frac{1-\beta}{2} \left[\frac{s}{2} (a - s) \right]^{\beta} \left[\frac{(a-s)^2}{4} \right]^{-\beta} (a - s) = 0 \end{aligned} \quad (24)$$

Solving (24) for s we get

$$s^{ARPM*} = \frac{a\beta}{2} \quad (25)$$

which implies, since $0 < \beta < 1$, that $0 < s^{ARPM*} < \frac{a}{2}$. We can compare s^{ARPM} with s_1 and s_2 ; indeed, from Figure 2, it is easy to get that if $s^{ARPM} < s_1$ then $I_R^* = 0$, i.e. the retailer chooses RRP. If $s_1 \leq s^{ARPM} \leq \frac{a}{2}$ then ARPM is selected. This result can be stated in the following Proposition.

Proposition 2 *When buyer power over s is small, i.e. $\beta < 1 - \frac{\sqrt{2}}{2}$, then RRP is the equilibrium price restriction. Otherwise, ($\beta \geq 1 - \frac{\sqrt{2}}{2}$), ARPM arises in equilibrium.*

Proposition 2 points out that buyer power on s , measured by β , affects the nature of the vertical price restrictions arising in equilibrium. If buyer power is small, the retailer will get a small s . For this reason she chooses RRP to enjoy a higher profit by practicing overpricing. Only if buyer power is sufficiently large, ARPM can arise. The remuneration obtained through s is for the retailer satisfactory enough to accept the loss of control over p . It is so because she realizes that ARPM improves the channel efficiency and, ultimately, her surplus. Hence we have a rather counter-intuitive result: downstream marginalization will be eliminated only when buyer power is sufficiently high.

Figure 3 shows how π_R and π_M change as function of β under ARPM and RRP. Under ARPM, retailer's profit is, as expected, an increasing function of β . But being $\pi_R^{RRP} = \frac{a^2}{16}$, ARPM is preferable to RRP only if $\beta > \beta_0 = 1 - \frac{\sqrt{2}}{2}$.¹²

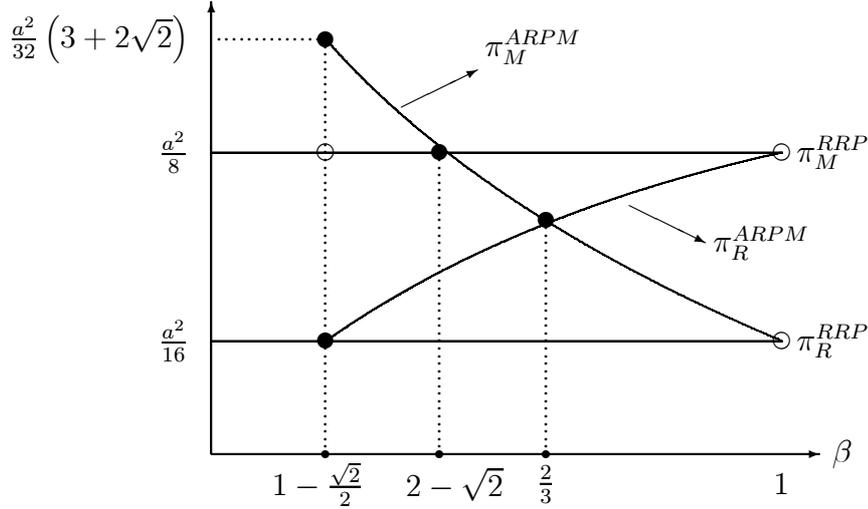


Figure 3: Retailer and manufacturer profits as function of β

As for the manufacturer, substituting (25) for s in $\pi_M^{ARPM} = \frac{(a-s)^2}{4}$ we indeed get: $\pi_M^{ARPM} = \frac{a^2}{16}(2 - \beta)^2$. At $\beta = \beta_0$ the manufacturer profit has thus an upwards jump, due to the fact that he induces the retailer to accept the recommended price and so ARPM can be implemented. For $\beta > \beta_0$ the manufacturer profit is decreasing in β . For $\beta \leq 2 - \sqrt{2}$, RRP becomes more profitable for the manufacturer than ARPM.¹³ When buyer power is maximum (i.e. $\beta \rightarrow 1$), the two firms are indifferent between RRP and ARPM, since they yield the same profit.

¹²Note that by substituting (25) for s in $\pi_R^{ARPM} = \frac{s}{2}(a-s)$ we get $\pi_R^{ARPM} = \frac{a^2\beta}{8}(2-\beta)$.

¹³Note also that for $\frac{2}{3} \leq \beta < 1$, the retailer gets a profit higher than the manufacturer.

5.2.2 Unilateral setting of s

Let us now analyze the cases where, respectively, the manufacturer (Game 2) and the retailer (Game 3) unilaterally sets s . Let us start with Game 2, the one with minimum buyer power. Since the retailer has still to accept RPM, the manufacturer may well choose s with the aim of inducing her to select ARPM in the successive stage. Of course, the manufacturer will do so only if it is profitable for him, i.e. if $\pi_M^{ARPM} = \frac{1}{4}(a - s)^2 \geq \pi_M^{RRP} = \frac{a^2}{8}$. Figure 4 displays these two profit functions in relation to s .

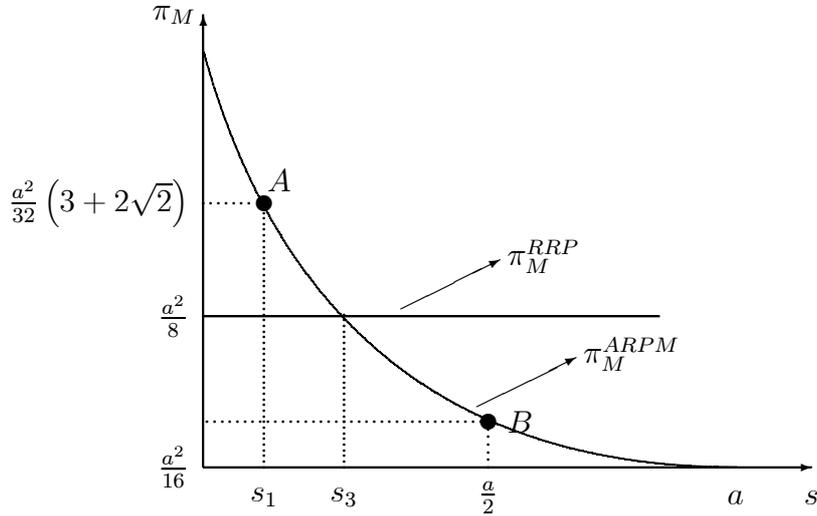


Figure 4: The manufacturer's profit under RRP and ARPM

Inducing the retailer to choose ARPM is profitable for the manufacturer only if $s \leq s_3$, where¹⁴

¹⁴The other root is $s_4 = a \left(1 + \frac{1}{\sqrt{2}}\right) > s_3$, that is ruled out because, being s too high ($s_4 \gg a$), implies no demand.

$$s_3 = a \left(1 - \frac{\sqrt{2}}{2} \right) > 0, \quad (26)$$

Hence the manufacturer will choose the minimum s ($s_1 < s_3$) able to induce the retailer to select ARPM in the successive stage. ARPM will thus prevail in equilibrium. The following Proposition has been demonstrated.

Proposition 3 *When the manufacturer sets s , ARPM prevails and $s^* = s_1$.*

While in this game the manufacturer eliminates double marginalization by inducing ARPM, with a Nash bargaining game on s double marginalization may well persist in equilibrium. Clearly, in determining s , the manufacturer would like to set $s = 0$. However he anticipates that, by doing so, the retailer's best reply at $t = 2$ will be to choose RRP (see Figure 2), a situation which gives him a lower profit than with ARPM for $s \leq s_3$ (see Figure 4). It is then preferable for him to pay a higher unit discount to the retailer to implement ARPM. Since the retailer accepts it, the manufacturer sets $p = \bar{p} = \frac{a}{8} (6 - \sqrt{2})$, which is lower than the retail price arising under RRP. Then $\pi_M^{ARPM} = \frac{a^2}{32} (3 + \sqrt{2}) > \pi_M^{RRP}$ (point A shown in Figure 4), with $\pi_M > \pi_R$.

Let us now turn to the case where the retailer unilaterally sets s (Game 3). This is the case of maximum buyer power. It is straightforward to show (see Figure 2) that the retailer under these circumstances will set $s^* = \frac{a}{2}$ at $t = 1$ and then will choose ARPM at $t = 2$, getting in this way her global maximum profit. The manufacturer would prefer RRP because the cost of ARPM is too high for him, but, given that he has no bargaining power on s ,

he has no instruments to implement it. Hence he ends up with point B in Figure 4. The following result has been demonstrated.

Proposition 4 *When the retailer sets s , ARPM arises in equilibrium and $s^* = \frac{a}{2}$.*

Proposition 4 confirms that the retailer is willing to give up the retail price control when she is compensated by a very high s . Notice that the channel profit in this case coincides with that under RRP, and it is lower than in Game 1 and in Game 2.

5.3 Welfare analysis

In this Section we compare the welfare properties of the retail price restrictions arising in the different games analyzed. Figure 5 displays welfare, as a function of β , in Game 1. Substituting (25) for s in $W^{ARPM} = \frac{1}{8}(3a+s)(a-s)$, we get $W^{ARPM} = \frac{a^2}{32}(2-\beta)(6+\beta)$. As it can be easily shown by substituting the respective solution for s (i.e. $s^* = s_1$; $s^* = \frac{a}{2}$) in (25), welfare in Game 2 and in Game 3 coincides with, respectively, point A in Figure 5, and point B .

Figure 5 shows that in Game 1, when β is very small, welfare is also small since RRP prevails. This remains true until $\beta = 1 - \frac{\sqrt{2}}{2}$. When $\beta \geq 1 - \frac{\sqrt{2}}{2}$, welfare has an upward jump to point A due to the implementation of ARPM, and becomes a decreasing function of β . It remains higher than that arising under RRP for $\beta < 1$. In Game 3, being $\beta = 1$, RRP and ARPM give the same welfare. However welfare is always lower than that of vertical

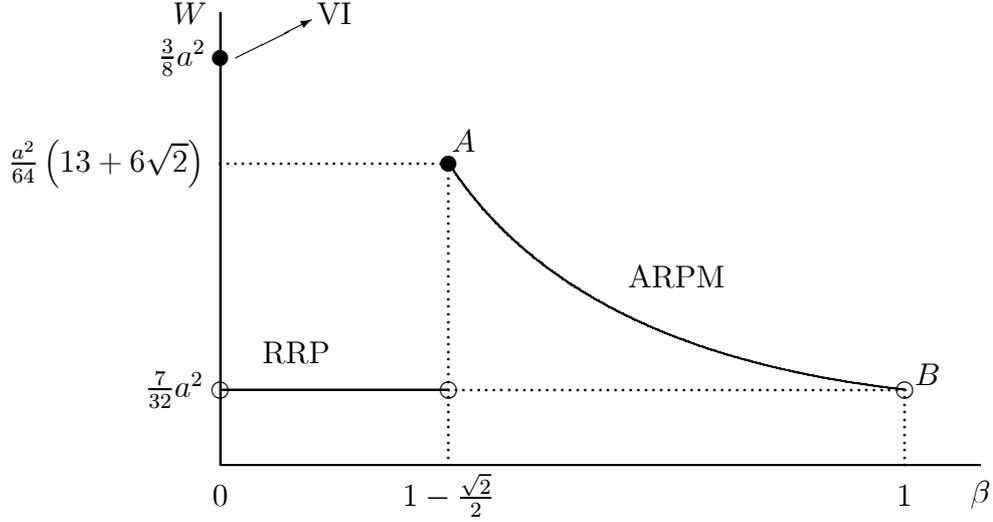


Figure 5: Welfare as function of buyer power

integration, achieved in the benchmark and given by point *VI* in Figure 5.¹⁵ We have therefore proved the following result.

Proposition 5 *Welfare crucially depends on buyer power. When β is small (i.e. $\beta < 1 - \frac{\sqrt{2}}{2}$), RRP prevails and welfare is at its lowest level. When β is high but not too much ($1 - \frac{\sqrt{2}}{2} \leq \beta < 1$), ARPM prevails and welfare is higher than before but decreasing in β . When $\beta = 1$, ARPM prevails but welfare turns back to its lowest level.*

Proposition 5 points out that there is a non-monotonic relation between welfare and buyer power. When the latter is positive but small, welfare is low; when buyer power increases sufficiently, ARPM is implemented and, consequently, welfare jumps up. But as β increases further, welfare decreases.

¹⁵Although vertical integration is the first best, it is considered as unfeasible for its prohibitively high fixed costs.

When β is at its maximum, welfare turns back to its minimum. Two factors contribute to explain this non-monotonic relation: (1) double marginalization (when RRP prevails), (2) the predetermined unit discount given to the retailer, which affects the manufacturer's marginal cost. If buyer power is very small, both these distortions arise in equilibrium: the retailer increases the retail price above the manufacturer's recommended price and gets also a positive, though small, discount. If buyer power is sufficiently high, the first distortion disappears, since the retailer gives up the retail price control, but she enjoys a higher unit discount. In this case welfare rises up given the elimination of double marginalization. However, if buyer power continues to grow, the unit discount keeps rising, making this distortion very large. Welfare is thus maximal when buyer power is at an intermediate level (point A in Figure 5).

6 Conclusions

We have considered in our analysis two sources of retailer's buyer power: (1) her ability to refuse a retail price recommended by the manufacturer and (2) her ability to influence the determination of a predetermined unit discount. The latter is given by the manufacturer to the retailer when she purchases the good. We have shown that the retailer gives up her control of retail price only in exchange for a high unit discount. This brings into the picture the importance of buyer power: when it is very small or very large, welfare is at its lowest level. In the first case the retailer, getting only a small unit discount, keeps control over the retail price and raises it above the recommended level (overpricing). This implies that double marginalization

is not eliminated. In the second case, the unit discount increases so much that, on the one hand, it induces the retailer to give up the price control; on the other hand, it is so large that leads to very high final prices. The latter distortion prevails on the elimination of double marginalization. The best situation for society is when the manufacturer and the retailer have a balanced bargaining power: in this case double marginalization is eliminated through an accepted RPM while the unit discount is not that high. Hence, in this context, the well known Galbraith's countervailing power hypothesis seems to work.

This result has a quite sharp policy implication, since it highlights that buyer power does matter. This is not quite in line with the current orientation of antitrust authorities. For instance the EC block exemptions for vertical agreements state: "The market position of the supplier is the main factor in assessing possible anti-competitive effects of recommended or maximum resale prices. The stronger the supplier's position, the higher the risk that a recommended resale price or a maximum resale price is followed by most or all distributors".¹⁶ Our analysis suggests that antitrust authorities should also evaluate buyer power when studying the effects of a vertical price restriction, and be ready to deal with its non-monotonic relation with welfare. We have shown that equilibrium recommended prices reduce welfare in comparison with an accepted RPM. This result casts some doubts about the current benevolent attitude of antitrust authorities towards recommended prices.

¹⁶EC [2002], p. 26.

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APPENDIX A

To show that $\frac{\partial^2 \phi}{\partial \bar{p} \partial s} = \frac{\partial^2 \phi}{\partial s \partial \bar{p}}$, consider that

$$G = 2y' [\phi(\bar{p}, s)] + [\phi(\bar{p}, s) - \bar{p} + s] y'' [\phi(\bar{p}, s)] \quad (\text{A.1})$$

and so

$$\frac{\partial G}{\partial \bar{p}} = 2y'' \frac{\partial \phi}{\partial \bar{p}} + \left(\frac{\partial \phi}{\partial \bar{p}} - 1 \right) y'' + (p - \bar{p} + s) y''' \frac{\partial \phi}{\partial \bar{p}} \quad (\text{A.2})$$

while

$$\frac{\partial G}{\partial s} = 2y'' \frac{\partial \phi}{\partial s} + \left(\frac{\partial \phi}{\partial s} + 1 \right) y'' + (p - \bar{p} + s) y''' \frac{\partial \phi}{\partial s} \quad (\text{A.3})$$

But since $\frac{\partial \phi}{\partial s} = -\frac{\partial \phi}{\partial \bar{p}}$, we can write the latter as

$$\frac{\partial G}{\partial s} = - \left[2y'' \frac{\partial \phi}{\partial \bar{p}} + \left(\frac{\partial \phi}{\partial \bar{p}} - 1 \right) y'' + (p - \bar{p} + s) y''' \frac{\partial \phi}{\partial \bar{p}} \right] \quad (\text{A.4})$$

and so: $\frac{\partial G}{\partial s} = -\frac{\partial G}{\partial \bar{p}}$. We can now analyze the cross partial derivative of $\phi(\bar{p}, s)$. We know that

$$\frac{\partial \phi}{\partial \bar{p}} = \frac{y' [\phi(\bar{p}, s)]}{G(\bar{p}, s)} \quad (\text{A.5})$$

and so

$$\frac{\partial^2 \phi}{\partial \bar{p} \partial s} = \frac{y'' \frac{\partial \phi}{\partial s} G - y' \frac{\partial G}{\partial s}}{G^2} \quad (\text{A.6})$$

and we know that

$$\frac{\partial \phi}{\partial s} = -\frac{y' [\phi(\bar{p}, s)]}{G(\bar{p}, s)}. \quad (\text{A.7})$$

We can then compute

$$\frac{\partial^2 \phi}{\partial s \partial \bar{p}} = \frac{-y'' \frac{\partial \phi}{\partial \bar{p}} G + y' \frac{\partial G}{\partial \bar{p}}}{G^2} \quad (\text{A.8})$$

But

$$\frac{\partial^2 \phi}{\partial \bar{p} \partial s} = \frac{-y'' \frac{\partial \phi}{\partial \bar{p}} G + y' \frac{\partial G}{\partial \bar{p}}}{G^2} = \frac{\partial^2 \phi}{\partial s \partial \bar{p}} \quad (\text{A.9})$$

APPENDIX B

Proof of Lemma 2: Solving (2) for y and substituting it in (8) we get:

$$\frac{p^{RRP}}{\bar{p}^{RRP}} = \left(1 + \frac{\partial \phi}{\partial \bar{p}}\right) \left(\frac{\bar{p} - s}{\bar{p}}\right) = \left(1 + \frac{\partial \phi}{\partial \bar{p}}\right) \left(\frac{\kappa}{\kappa + s}\right) \quad (\text{A.10})$$

It is obvious from (A.10) that, in order to have $\frac{p^{RRP}}{\bar{p}^{RRP}} < 1$ (underpricing) we need that $\left(1 + \frac{\partial \phi}{\partial \bar{p}}\right) \left(\frac{\kappa}{\kappa + s}\right) < 1$. But this implies that $s > \kappa \frac{\partial \phi}{\partial \bar{p}}$. The same procedure leads, with opposite inequality, to identify when overpricing arises: $\frac{p^{RRP}}{\bar{p}^{RRP}} > 1$ implies that $\left(1 + \frac{\partial \phi}{\partial \bar{p}}\right) \left(\frac{\kappa}{\kappa + s}\right) > 1$, i.e. $s < \kappa \frac{\partial \phi}{\partial \bar{p}}$. When $s = \kappa \frac{\partial \phi}{\partial \bar{p}}$ we have that $p^{RRP} = \bar{p}^{RRP}$ and so an endogenous RPM takes place. \square

Proof of Proposition 1: First we evaluate $\frac{d\pi_R^{RRP}}{dp}$ when $p = \bar{p}^{ARPM}$. From (2) we get:

$$\left. \frac{d\pi_R^{RRP}}{dp} \right|_{p=\bar{p}^{ARPM}} = y + sy' = (2s - \bar{p}^{ARPM})y' \quad (\text{A.11})$$

The last step of the above expression is obtained by substituting (14). The sign of $\left. \frac{d\pi_R^{RRP}}{dp} \right|_{p=\bar{p}^{ARPM}}$, being $y' < 0$, depends on the sign of $(2s - \bar{p}^{ARPM})$.

If $s < \frac{\bar{p}^{ARPM}}{2}$ then $p^{RRP} > p^{ARPM} = \bar{p}^{ARPM}$. If $s = \frac{\bar{p}^{ARPM}}{2}$ the two prices coincide (i.e. $p^{RRP} = p^{ARPM} = \bar{p}^{ARPM}$). If $s > \frac{\bar{p}^{ARPM}}{2}$ then $p^{RRP} < p^{ARPM} = \bar{p}^{ARPM}$. Hence only if s is sufficiently small, the price under RRP will be higher than that under ARPM. Consequently, consumer surplus under RRP is lower than that under ARPM. A high s changes the sign of this comparison.

Second, we analyze channel profit. It is easy to compute that

$$\frac{d(\pi_M^{RRP} + \pi_R^{RRP})}{dp} = y + py'$$

Computing this derivative when $p = p^{ARPM} = \bar{p}^{ARPM}$ we find

$$\left. \frac{d(\pi_M^{RRP} + \pi_R^{RRP})}{dp} \right|_{p=\bar{p}^{ARPM}} = y + \bar{p}^{ARPM} y' = sy' < 0 \quad (\text{A.12})$$

Note that the last step in (A.12) is obtained by substituting (14) for y . It is also possible to compute $\frac{d(\pi_M^{RRP} + \pi_R^{RRP})}{dp}$ when $p = p^{RRP}$ (i.e. the price charged by the retailer under the RRP regime). In this case we get

$$\left. \frac{d(\pi_M^{RRP} + \pi_R^{RRP})}{dp} \right|_{p=p^{RRP}} = y + p^{RRP} y' = (\bar{p}^{RRP} - s)y' < 0 \quad (\text{A.13})$$

This derivative is negative since $y' < 0$ and $\bar{p}^{RRP} > s$. Note that the last step is obtained by substituting (2) for y . Since the first order derivative of the channel profit with respect to p is negative both when $p = p^{ARPM}$ and when $p = p^{RRP}$, both prices are too high in comparison with the price that maximizes channel profit, provided that the latter is a strictly concave function. It follows that, under the two pricing regimes, decreasing p induces an increase in channel profit. Hence a decrease in p will lead to an increase in both consumer surplus and channel profit, and, consequently, in welfare.

Hence, in order to compare the two pricing regimes, it is necessary to identify the regime charging the lower price. But the latter depends upon the sign of (A.11), and so on the level of s . \square