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Resale Price Maintenance and the Service Argument (in the Book Trade)

by

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Abstract

The paper introduces a specification of the demand side which allows RPM to have different effects on prices and on service, which may increase or decrease due to RPM. A feature of the model which deviates from those found in the literature is due to the introduction of a class of consumers who do not search but decide on a purchase spontaneously. More interestingly social welfare is reduced by RPM (at least locally) exactly under those circumstances where RPM induces higher service (and price). Hence, welfare decreases exactly in the case which was frequently presented for the justification of RPM to promote service.

Keywords: resale price maintenance, service, welfare

JEL: D43, L13, L42

Resale Price Maintenance and the Service Argument (in the Book Trade)

The issue of resale price maintenance (RPM) has a long history. In the English-speaking world one attributes its beginning to the pricing of Alfred Marshall's *Principles of Economics* (Breit (1991)). However, the evidence for RPM e.g. in Germany, reaches back for a considerably longer time (Picot (1991)). But it is not merely a greeting from the distant past. Every once in while it becomes a hot topic in the political scene. Germany had recently a debate on resale price maintenance in the book trade which led to the remarkable situation that resale price maintenance is mandatory by law in this sector (since 2002), while it is forbidden per se for all other sectors.

Theoretically, this could reflect the ambivalent evaluation of RPM by the profession, where a positive attitude on the grounds of efficiency within a supply chain is counterbalanced by concerns about competition impeding effects. The efficiency defense for RPM is prominently connected to the service argument. Unconstrained price competition is said to lead to an inadequate supply of service. The free rider argument which posits that a customer may ask for product information (service) in one shop and than buy at a different shop which does not provide such information and can therefore offer the product at a cheaper price is one – albeit an extreme - variant of the efficiency argument (Mathewson and Winter (1998)). Indeed, in its extreme form this argument is not convincing in the book trade. Nevertheless, service in the form of space for presentation of books plays an important role in the book sector. When the “net book agreement” (NBA) collapsed in Great Britain, it is reported that the space for presentation of books increased (Monopolkommission (2000)). Hence, at least in this variant the service argument has at least some merit in the deliberations of the parties of a supply chain and cannot easily be dismissed. This increase in service may also have increased the utility of customers.

For a considerable time the effects of RPM on impeded competition were connected to the fear that either producers or retailers could be more easily form a cartel. As to the start of the German form of RPM in the book trade this has quite some evidence to its validity. Its beginnings are usually attributed to the fear of book sellers that mail order sellers may spoil their market. This would support the argument that retailers can more easily form a

cartel, when RPM is available. This view is, however, dismissed by most commentators for the current situation. At this point it should be stressed that the efficiency rationale which is coined at the interest of the parties of a supply chain, is not necessarily in the interest of the consumers. And therefore – even if RPM may be efficiency improving for the firms involved – overall efficiency may decrease. But as long as we regard an efficiency rationale the latter should be the ultimate measuring rod.

These remarks set the agenda for this paper. We know from R. Winter (1993) that a monopolistic producer would want to impose a price floor on the grounds of the service argument, if consumers are more sensitive to price competition than to service competition (this argument will be made more explicit in the main body of the paper). Winter's paper provides a model of the demand side which supports that consumers are more sensitive to price competition. The current paper deviates from this approach in that consumers in the aggregate can be more price sensitive or more service sensitive. This concerns an issue which has obvious relevance according to some commentators of the British situation. Some prices and service levels have increased while others have decreased after the break down of the British NBA. Secondly, the issue of the overall efficiency effects are taken up¹. The main result is that prices (and service) may decrease or increase due to RPM and that total efficiency increases or decreases according to whether prices and services jointly decrease or increase.

This is an interesting result. It says among other things that service (and prices) may increase if RPM is not available. This invalidates the usual claim that service will decrease (by necessity according to the usual arguments). More interestingly, RPM has its strength if it impedes oversupply of service – quite to the contrary to the usual argument.

The remaining parts of the paper are organized as follows. Section 1 gives some details on RPM in the book trade in Europe and especially in Germany. Section 2 provides the model used in this paper together with some supporting arguments as to the modeling approach. Section 3 establishes the equilibrium result and section 4 establishes the welfare result (locally). Section 5 concludes and relates the result to different additional contributions in the literature.

¹ Winter's contribution only contains a numerical example hinting at the possibility that service and price may be too high from the social point of view.

1. Resale price maintenance in the German book trade

The German history of RPM in the book trade dates back at least to 1888 when the Körner reform was established. This was a contractual arrangement between bookstores and publishers. Booksellers which signed the contract were not allowed to offer rebates on the price which was fixed by the publisher. Publishers were not allowed to supply books to booksellers not signing the contract. They did, however, have the right not to fix a price. At the end of 20-th century about 90% of the turnover in the German book trade had resale price maintenance imposed. Harsh sanctions deterred any deviating behavior.

This arrangement remained essentially intact until 2002, when it was replaced by law. RPM was forbidden in general by German competition law in the 1970s. However, the book trade obtained an exception from the rule. With the rise of an active competition policy of the European Union RPM was forbidden whenever trade among member states was involved. This became particularly important when the internet offered easy opportunities to deliver books to German customers from other member states like Austria. In this context many commentators observed that the contractual arrangement (“Sammelrevers”) in Germany is not compatible with European competition law. A hot debate started as to whether RPM should be kept in place or not. In the end, the German government opted for a law (Preisbindungsgesetz) forcing all publishers to fix their book prices. The treaty of the European Union allows member states to take measures to protect their cultural identity. It was argued that the law is necessary to do just that. At the formal level, economic reasoning played no essential role.

However, before the law was passed the debate was also taken up by economists. A report commissioned by the “Börsenverein des Deutschen Buchhandels” - the institution which supervised the RPM-arrangement in Germany - (Rürup (1997)) came to the conclusion that RPM should be kept in place because efficiency advantages were conjectured to dominate any competitive harm. The German Monopoly Commission called for an ending of RPM in the book trade in their biannual report (Monopolkommission (2000)). Among other arguments it stressed the point that there is no evidence available that the quality of service is of higher importance in the book trade than in other sectors. Moreover it did not find empirical evidence that the book trade underperformed in states without RPM. In particular the experience of breakdown of the British NBA about 1995 provided no indication that without RPM service deteriorated. To the contrary, as mentioned above the space for presentation of books increased. There was also no clear evidence that prices dropped sharply on average which seems to

be the fear of proponents of RPM. Again to the contrary, the resale price index for books increased by more than the general resale price index after the breakdown while it developed roughly in line before. Admittedly, the period of time which the Monopoly Commission was able to observe in Great Britain was short, too short to justify general conclusions.

It seems therefore warranted to refine our theoretical understanding of the consequences of RPM as long as clear empirical evidence is not available. And it is hoped that this theoretical understanding will improve empirical work. As mentioned above, in theory prices and service quality may change in both directions if RPM becomes unavailable. Can we say more about the determinants of the direction of change? If we can do that, can we say something about the overall change in efficiency? The following model was set up to shed light on these questions and to provide some answers.

2. The model

The general modeling approach follows closely that of R. Winter (1993). One monopolistic publisher produces books which are sold by two book sellers to the consumers. This fits the situation in the book trade quite well. The product is a book title and its copyright belongs to exactly one publisher. The retail sector of this trade is not particularly concentrated. Modeling competition as a duopoly without much bargaining power vis à vis the publisher seems therefore adequate.

According to many observers books are often bought by incidence. A consumer strolling through a city may suddenly decide to visit a book store and to find out what is on offer, although he had no intent to do so, when he decided to go downtown. Customers of this type typically do not actively search. Once a bookstore is entered he only decides whether or not a book that he finds promising is worth its price. But he will not visit another bookstore in order to search for a better price (in a world without RPM). If all consumers were of this type there would be no essential role for competition among retailers but for showy appearances in order to attract the consumers attention. A bookstore could more or less act like a local monopolist.

Certainly, not all consumers are of this type. Some decide to go downtown in order to buy a specific book or a book of a certain type e.g. a novel or a textbook. These consumers will also decide ex ante where to buy. They may prefer one store to another because it is closer in distance or because it exhibits a nicer atmosphere. But they may also decide on the grounds of information about price and service quality at that store.

Our model allows for both types of consumers. This deviates from the demand model in R. Winter (1993) which only captures the second type of consumers. We follow Winter to a large extent in modeling this type of consumers. But we simplify his model by assuming that these consumers will buy a book in any case which seems adequate in the present context. Stores are modeled as being located at the end points of a Hotelling line of length 1. There is a continuum of consumers each characterized by its location on the line. As usual the location can be interpreted geographically or in terms of product differentiation (atmosphere, appearance, internet shop versus mortar and brick store). The distribution of consumers with respect to their location is assumed to be uniform (another simplification compared with Winter). The mass of these consumers is denoted by β .

The service level and the price of store i is denoted by s_i and p_i resp. The service should be interpreted as dedicated to a book title. It may include personnel having read the book and thus being able to advise customers properly or it may include presenting the book at a prominent place or providing reports by critics on its content and quality.

The utility of a consumer located at α when patronizing store 1 (which is located at 0) is assumed to be

$$es_1 - p_1 - b\alpha$$

An analogous expression denotes the utility of this consumer when he purchases the book at store 2 (which is located at 1 and there α has to be replaced by $1 - \alpha$). Demand for store 1 stemming from this type of consumers is therefore

$$\frac{\beta}{2} + \frac{e\beta}{2b}(s_1 - s_2) + \frac{\beta}{2b}(p_2 - p_1)$$

with an analogous expression for the demand facing store 2.

The class of spontaneous consumers is characterized by the utility

$$A + ls_i - p_i$$

when a consumer visits store i . These customers differ in their reservation utility A_0 which is distributed uniformly in $[0, 1]$. For each store the number of consumers which drop in spontaneously is normalized to one. The demand at store i from these customers is therefore equal to the expression denoting the utility of a customer. Hence demand from both types of consumers patronizing store i is:

$$D_i(p_i, p_j, s_i, s_j) = A + ls_i - p_i + \frac{\beta}{2} + \frac{e\beta}{2b}(s_i - s_j) + \frac{\beta}{2b}(p_j - p_i).$$

As for the cost structure of the firms we assume that the publisher has constant marginal cost which we normalize to 0 and some fixed cost which are sufficiently small to not influence the decision variables of the publisher. Therefore the fixed cost will be neglected in the following. The provision of service is costly to the bookstores. Providing the level of s_i costs $cs_i^2/2$.

The pricing behavior of the publisher vis à vis the booksellers follows again Winter (1993). The publisher charges store i a price q_i per book and a fee F_i independently of the volume of sales. This captures among other things the use of rebates which are quite common in the relationship between publishers and bookstores. It also provides the publisher with an instrument to work against the problem of double marginalization.

The profit of bookstore i is therefore:

$$\pi_i(p_i, p_j, s_i, s_j) = (p_i - q_i)D_i(p_i, p_j, s_i, s_j) - cs_i^2/2 - F_i$$

Without RPM bookstores choose their level of price and service given q_i and F_i . With RPM the price is fixed by the publisher and the bookstores can only choose their level of service. In slight misuse of notation we denote the equilibrium choices as $p_i(\cdot)$ and $s_i(\cdot)$ in both cases.

The publisher's profit is

$$\Pi = \sum_{i=1}^2 (q_i D_i(p_i(\cdot), p_j(\cdot), s_i(\cdot), s_j(\cdot)) + F_i)$$

where under RPM $p_i(\cdot)$ equals the price which the publisher chooses.

3. The consequences of RPM for prices and service

Given the complete symmetry of the bookstores we will concentrate on symmetric equilibrium configurations. Hence prices and service levels are equal for both book stores. Under RPM prices are of course equal by definition of RPM.

To ease notation we will denote $A + \beta/2$ by a , $e\beta/2b$ by w and $\beta/2b$ by d . Thus bookstore i now faces demand

$$D_i(p_i, p_j, s_i, s_j) = a + ls_i - p_i + w(s_i - s_j) + d(p_j - p_i).$$

The demand system as modeled by Winter (1993) yields a clear answer with respect to the consequences of RPM for prices and service: It increases both, prices and service. This is not the case in our model: With RPM the price and the service level turns out to be

$$p_{RPM} = \frac{ac}{2c-l^2} \quad s_{RPM} = \frac{al}{2c-l^2} .$$

The appendix provides a proof of this result as well as proofs for all other assertions in this and the following section. At this point it should be noted that we impose some parameter restrictions which guarantee concavity of the relevant profit functions. They also imply that all prices are positive.

With RPM the parameters reflecting some competition among the bookstores, w and d , play no role. This is to be expected. RPM eliminates any price competition. Equal prices imply that the publisher is exclusively interested in aggregate demand which does not depend on w .

If RPM is not an option for the publisher prices and service turn out to be

$$p_c = \frac{a(c(1+d)^2 - dl(l+w) + w(l+w))}{2c(1+d)^2 - (1+2d)l(l+w) + w(l+w)}$$

$$s_c = \frac{a(1+d)(l+w)}{2c(1+d)^2 - (1+2d)l(l+w) + w(l+w)}$$

In general p_{RPM} and p_c do not coincide and the same is true for s_{RPM} and s_c . It is also clear that the publisher's profit will be less in general, if RPM is not available. With RPM he could otherwise choose p_c as price and ask a price q_i such that bookstores would choose s_c . As the optimal decision under RPM differs from these levels it must be true that the profit of the publisher is smaller without RPM.

Turning to the main result of this section we can state

Proposition 1: (a) If $w < dl$ then $p_{RPM} > p_c$ and $s_{RPM} > s_c$.
 (b) If $w > dl$ then $p_{RPM} < p_c$ and $s_{RPM} < s_c$.

Hence depending on the parameter values prices and service may move in different directions if RPM is enabled. Only if $w = dl$ nothing changes. Note that the inequality $w < dl$ can also be written as $e < l$, where l stands for the impact of service on the utility of spontaneous customers and e for the impact on the utility of the other type of customers.

This result may help to explain why prices of different types of books developed in different directions when the NBA broke down. The demand for scientific literature could be argued to be quite insensitive to service for those customers who visit a bookstore based on an conscious ex ante decision to buy a specific title. Well trained personnel in the content or presentation should play a very minor role for those customers. For spontaneous customers a prominent presentation may be a welcome reminder that they always wanted to buy this book. Hence $e < l$ captures this situation and in line with our result the prices of scientific books are reported to have declined after the NBA breakdown. The price of pocket books on the other hand increased. At least for novels this is also consistent with our theoretical result. Think of the situation that you only know that you want to buy a novel of a specific genre. Then well trained personnel becomes important as well as the presentation in the store which speaks for a high e . For spontaneous customers the advice of trained personnel is not that important, as they just browse around. This speaks for a relatively small l . It is not claimed here that these arguments explain the movement of prices in Great Britain fully. There are many more influences than we capture in this simple model. But the facts seem quite consistent with the result.

Winter (1993) points out that RPM will increase prices if and only if

$$\frac{\varepsilon_p^r}{\varepsilon_p^M} > \frac{\varepsilon_s^r}{\varepsilon_s^M}$$

where ε_p denotes the price elasticity and ε_s denotes the service elasticity of demand. The index M relates to the elasticities at the market level while the index r relates to the elasticities at the level of one retailer. One way of interpreting this equality is thus: If at the level of one retailer (bookstore) consumers are easier attracted by a decrease in price than by an increase in service, than competition among bookstores will drive down prices. As service than is worth less it will also decrease. RPM can than be used to stabilize a higher level of service. In Winter's model the demand system satisfies this inequality.

Given that this characterization for a price increasing effect of RPM is quite general (at least locally) it is not surprising that Proposition 1 is fully consistent with this inequality. The condition in part (a) can easily be checked to be a special case of the above inequality. But – deviating from Winter - our demand system is flexible enough to allow for the reversed inequality to hold, which is the case in part (b). As we have seen, casual empirical evidence supports the view that both directions of prices can be observed after RPM is no longer practiced.

4. The consequences of RPM for efficiency

While the effects of RPM on efficiency are at the core of most arguments which question its prohibition per se, the notion of efficiency is mostly focused on the inner workings of a supply chain. Gross profits for all firms involved is taken as the measuring rod for efficiency. In most cases the interests of consumers are kept out of the formal analysis. There seems to be a common understanding that more service is always better for consumers. But this clearly does not have to hold in general. Service is costly. A firm has an incentive to increase service until the additional revenue from a marginal consumer equates the marginal cost of providing enough service to attract this consumer. But the inframarginal consumers may or may not experience an increase in utility which would cover the additional costs. In other words, it is not clear whether customers enjoy more service given that the induced costs have to be covered.

Fortunately, our model can shed some light on the question whether social surplus increases or decreases with RPM. Our starting point is the situation where prices and service levels are the same under RPM and without it. In our model this is the case if $w = dl$. We can show that the difference between the social surplus without RPM, W_c , and the social surplus with RPM, W_{RPM} , decreases in w . This is the main result of this section:

$$\text{Proposition 2: } \left. \frac{\partial(W_c - W_{RPM})}{\partial w} \right|_{w = dl} < 0$$

The proof is again in the appendix. Note that at $w = dl$ we have $W_c = W_{RPM}$ and that therefore a move of w (implicitly a move of e) into the direction $w > dl$ yields lower social surplus without RPM than with RPM. Hence RPM can be socially helpful if it works against excessively high prices and service.

More interestingly, in the case when w moves into the direction $w < dl$ RPM decreases welfare. But this is exactly the case which figures so prominently in the literature – stressing the fear that service may be too low without RPM. From the point of view of the firms involved this is true. But the reverse is true for society! The increased service due to RPM is not worth its costs.

The result is also in line with the numerical example in Winter (1993). Of course, it must be conceded that the result is a local one. A glance at the expressions for W in the appendix reveals that a global result is not easy to obtain. Attempts to obtain such a result were not successful so far, although preliminary thoughts tend to point to the validity of such a result.

It should also be noted that we have abstained from modeling interbrand competition in any way. While it is true that a publisher usually holds an exclusive copyright on a book title, books of similar types are substitutable to a certain extent. It is a frequent result in the study of vertical restraints that negative efficiency effects are weakened by interbrand competition (cp. Motta (2004)). But usually these negative effects remain in existence whenever competition is not very intense. And thus the warning included in proposition 2 that RPM may have negative consequences in terms of efficiency seems justified.

5 Concluding remarks

The paper introduces a specification of the demand side which allows RPM to have different effects on prices and on service, which may increase or decrease due to RPM. More interestingly social welfare is reduced by RPM exactly under those circumstances where RPM induces higher service (and price).

A feature of the model which deviates from those found in the literature is due to the introduction of a class of customers who do not search but decide on a purchase spontaneously. This is certainly an adequate modeling strategy with respect to the book trade. But it may also be adequate for other product markets, especially those where the price of the commodity represents a relatively small fraction of the consumer's budget.

While the prices and the service level are influenced by the relative importance of those consumers who do search, the qualitative effect of RPM on prices, service, and social surplus are not affected, as can be easily checked.

The findings of the paper support the view that RPM may have an efficiency enhancing potential which always sheds doubt on a per se prohibition of RPM – especially when other forms of vertical restraints are not prohibited per se. But the concern for the problem points into a different – more precisely an opposite – direction. While usually the concern is directed at RPM helping to establish higher service quality, we find that this is not the problem on a market without RPM practice. To the contrary, this is exactly the situation where RPM is not efficiency enhancing if the social surplus criterion is applied.

The most serious omissions of the model concern the absence of competition among publishers and the absence of uncertainty which certainly is of considerable importance for the production of a specific book. Competition is only very loosely incorporated in the model as the cost of

service can be interpreted as the opportunity cost of not providing prominent shelf space or informational service for other books (of a rival publisher). Given the vast number of book titles available shelf space is certainly scarce and it also impossible for the personnel to be properly informed about all books of certain genre.

There are some contributions to the literature dealing with the scarcity of shelf space in the retail sector, most prominently by Shaffer (1991a, 1991b). However, both papers are of restricted importance to the book trade. In Shaffer (1991b) a multi-product monopolist tries to convince retailers (which all enjoy a local monopoly) to stock their full line of products. It is shown that one possibility of reaching the full integration result consists in imposing RPM and paying a flat fee for shelf space. Competition is only present, as retailers have the option to use their shelf space for presentation of commodities of another competitive industry which is not specified more precisely. Aside from the fact that competition is not modeled in any more detail than in the present paper, the desire to be present on the shelves of a book store seems to be of less importance in the book trade contrary to the situation in other industries. At least in Germany, publishers are not known to buy prominent shelf space as is the case in other sectors. This is probably at least partly due to the fact that a well organized whole-sale market exists. In Shaffer (1991a) manufacturers are perfectly competitive and sell to retailers with considerable market power. This scenario seems not well suited for the book trade in Germany. Contributions which address the service argument for RPM in a context of interbrand as well as intrabrand competition are not known to the best of my knowledge.

The success of books is usually very uncertain at the time of production. The management of the corresponding risk is therefore an important part of the strategy of publishers and retailers alike. Deneckere et al. (1996, 1997) have taken up demand uncertainty and its relationship to RPM in two remarkable papers. They show that a monopolistic manufacturer has an incentive to impose RPM on its sales to perfectly competitive retailers and that this imposition may (but need not) improve welfare and even expected consumer surplus. One driving force of the result is that retailers have to order inventories before uncertainty unveils and that the costs of these inventories are completely sunk. Again, while a very interesting result by itself, it fits the book trade less well. The uncertainty in those papers deals with the demand of one specific homogenous commodity. If a manufacturer produces essentially one product this is a suitable modeling strategy. A publisher, however, produces a whole line of new books each year. Possibilities to form a less risky portfolio of titles are open to a publisher. In addition, it is quite common that publishers take back unsold inventories.

Hence costs related to inventories are not completely sunk. But this drives the results of those papers. Hence, it is not clear how the results would change if both aspects of the book trade would be incorporated, let alone the main issue of the present paper: the service argument.

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Appendix A1: Prices and Service with RPM

Recall that demand can be written as

$$D_i(p_i, p_j, s_i, s_j) = a + ls_i - p_i + w(s_i - s_j) + d(p_j - p_i)$$

and that the aim of the publisher is

$$\Pi = \sum_{i=1}^2 (q_i D_i(p_i(\cdot), p_j(\cdot), s_i(\cdot), s_j(\cdot)) + F_i)$$

The usual argument applies to show that F_i will be set such that booksellers obtain a reservation profit of 0. This implies

$$F_i = (p_i - q_i) D_i(p_i, p_j, s_i, s_j) - cs_i^2 / 2$$

and the profit of the publisher becomes:

$$\Pi = \sum_{i=1}^2 (p_i D_i(p_i(\cdot), p_j(\cdot), s_i(\cdot), s_j(\cdot)) - cs_i^2 / 2)$$

As prices are equal for both booksellers with RPM, this reads in more specific terms:

$$\Pi = p(2a + l(s_1 + s_2) - 2p) - c(s_1^2 + s_2^2) / 2$$

Suppose the publisher could directly set p and both s_i . Then maximizing the profit would yield the first order conditions:

$$2a + l(s_1 + s_2) - 4p = 0$$

$$pl - cs_i = 0$$

Solving this system gives the expressions for p_{RPM} and s_{RPM} .

For these expressions to make sense, c has to be large enough which is assumed in the following.

In our setup the publisher cannot directly set s_{RPM} . It remains to be shown that he can implement this level of service by charging a suitable price q_i to the retailers. In the RPM context the profit of retailer i is:

$$\pi_i = (p - q_i)(a + ls_i - p + w(s_i - s_j)) - cs_i^2 / 2 - F_i$$

Maximizing with respect to s_i gives the first order condition:

$$(p - q_i)(l + w) = cs_i$$

In order to obtain the service level s_{RPM} , the publisher should therefore set q_i according to

$$q_i = p_{RPM} - \frac{cs_{RPM}}{l + w} = \frac{ac}{2c - l^2} - \frac{acl}{(2c - l^2)(l + w)} = \frac{acw}{(2c - l^2)(l + w)}$$

which establishes the result.

Appendix A.2 Prices and service without RPM

If retailers choose their price as well as the service level the profit takes the form

$$\pi_i = (p_i - q_i)(a + ls_i - p_i + w(s_i - s_j) + d(p_j - p_i)) - cs_i^2 / 2 - F_i$$

which is concave in the retailers own price and service level, if c is large enough. More specifically we will assume:

$$(A1) \quad c(1 + d) > \max(l, w)(l + w)$$

The first order conditions can be written as:

$$(1) \quad a + q_i(1 + d) + (l + w)s_i - ws_j - 2(1 + d)p_i + dp_j = 0$$

$$(2) \quad (p_i - q_i)(l + w) - cs_i = 0$$

Solving (2) for s_i and inserting the result in (1) gives:

$$(3) \quad a + q_i(1 + d) - q_i \frac{(l + w)^2}{c} + q_j \frac{w(l + w)}{c} - \left(2(1 + d) - \frac{(l + w)^2}{c} \right) p_i + \left(d - \frac{w(l + w)}{c} \right) p_j = 0$$

As announced in the main body of the paper we will concentrate on the symmetric solutions. Hence we posit $q_1 = q_2 = q$ and this implies $p_1 = p_2 = p$. Then (3) becomes:

$$ac + q((1+d)c - l(l+w)) = ((2+d)c - l(l+w))p$$

which gives

$$(4) \quad p(q) = \frac{ac + q((1+d)c - l(l+w))}{(2+d)c - l(l+w)}$$

Inserting this back into the solution of (2) gives

$$(5) \quad s(q) = \frac{(a-q)(l+w)}{(2+d)c - l(l+w)}$$

For the same reasons as in appendix A.1 the profit of the publisher can now be written as:

$$\Pi = p(q)(D_1(p(q), s(q)) + D_2(p(q), s(q))) - cs^2(q)$$

Note that the first order conditions for the retailers' equilibrium have the form:

$$(1a) \quad (p_i - q) \frac{\partial D_i}{\partial p_i} + D_i = 0$$

$$(2a) \quad (p_i - q) \frac{\partial D_i}{\partial s_i} - cs_i = 0$$

This form will be used in a moment. Consider now the first order condition for maximizing the publisher's profit with respect to q :

$$\begin{aligned} \frac{\partial p}{\partial q} \left(\left[D_1 + p \frac{\partial D_1}{\partial p_1} + p \frac{\partial D_2}{\partial p_1} \right] + \left[D_2 + p \frac{\partial D_2}{\partial p_2} + p \frac{\partial D_1}{\partial p_2} \right] \right) + \\ \frac{\partial s}{\partial q} \left(\left[p \frac{\partial D_1}{\partial s_1} + p \frac{\partial D_2}{\partial s_1} - cs \right] + \left[p \frac{\partial D_2}{\partial s_2} + p \frac{\partial D_1}{\partial s_2} - cs \right] \right) = 0 \end{aligned}$$

Using (1a) and (2a) this yields:

$$\frac{\partial p}{\partial q} \left(\left[q \frac{\partial D_1}{\partial p_1} + p \frac{\partial D_2}{\partial p_1} \right] + \left[q \frac{\partial D_2}{\partial p_2} + p \frac{\partial D_1}{\partial p_2} \right] \right) + \frac{\partial s}{\partial q} \left(\left[q \frac{\partial D_1}{\partial s_1} + p \frac{\partial D_2}{\partial s_1} \right] + \left[q \frac{\partial D_2}{\partial s_2} + p \frac{\partial D_1}{\partial s_2} \right] \right) = 0$$

and using the specific expressions for the demand system gives:

$$2 \left(\frac{\partial p}{\partial q} [-q(1+d) + dp] + \frac{\partial s}{\partial q} [q(l+w) - pw] \right) = 0$$

Inserting the derivatives of (4) and (5) this condition now reads:

$$((1+d)c - l(l+w))(-q(1+d) + dp) - (l+w)(q(l+w) - pw) = 0$$

Next insert p according to (4). After a series of rearrangements this can be rewritten as.

$$a[(1+d)cd - l(l+w)d + w(l+w)] - [2(1+d)^2c - (1+2d)l(l+w) + w(l+w)]q = 0$$

Note that under assumption (A1) the second expression in brackets is positive. It follows that the profit function of the publisher is concave in q .

Hence, the publisher will charge each bookseller a price of

$$(6) \quad q = \frac{a[(1+d)cd - l(l+w)d + w(l+w)]}{2(1+d)^2c - (1+2d)l(l+w) + w(l+w)}$$

The remaining steps are conceptually simple: just insert (6) into (4) and (5). As doing these steps and getting the result in the main part of the paper is not that straightforward we offer some details here. Let us start with the price. Inserting (6) into (4) gives

$$((2+d)c - l(l+w))p/a =$$

$$c + ((1+d)c - l(l+w)) \frac{(1+d)cd - l(l+w)d + w(l+w)}{2(1+d)^2c - (1+2d)l(l+w) + w(l+w)}$$

The right hand side of the equation above can therefore be written as:

$$\frac{c(2c(1+d)^2 - (1+2d)l(l+w) + w(l+w))}{2(1+d)^2 - (1+2s)l(l+w) + w(l+w)} + \frac{((1+d)c - l(l+w))((1+d)cd - l(l+w)d + w(l+w))}{2(1+d)^2 - (1+2s)l(l+w) + w(l+w)}$$

Next we focus on the numerator of this expression. Note that

$$2c(1+d)^2 = (1+d)(2+d)c + (1+d)cd$$

Therefore we can write the numerator as follows:

$$\begin{aligned} & c(1+d)((2+d)c - l(l+w)) + cd((1+d)c - l(l+w)) + cw(l+w) + c^2d(1+d)^2 - \\ & \quad 2cdl(l+w) - 2cd^2l(l+w) + dl^2(l+w)^2 + c(1+d)9w(l+w) - lw(l+w)^2 \\ &= c(1+d)[(2+d)c - l(l+w)] + w(l+w)[(2+d)c - l(l+w)] + \\ & \quad c^2d(1+d)(2+d) - 3cdl(l+w) - 2cd^2(l+w) + dl^2(l+w)^2 \\ &= c(1+d)[(2+d)c - l(l+w)] + w(l+w)[(2+d)c - l(l+w)] + \\ & \quad c^2d(1+d)(2+d) + dl(l+w)[l(l+w) - (2+d)c] - (1+d)cdl(l+w) \\ &= [(2+d)c - l(l+w)][(1+d)c + w(l+w) - dl(l+w) + (1+d)cd] \end{aligned}$$

From this expression the result for the price in the main body of the paper follows immediately. Deriving the result for s poses no problems.

Appendix A3 Comparison of prices and service levels

Let us start with a comparison of the service levels:

$$s_c = \frac{a(1+d)(l+w)}{2c(1+d)^2 - (1+2d)l(l+w) + w(l+w)} < s_{RPM} = \frac{al}{2c - l^2}$$

$$\Leftrightarrow (1+d)(l+w)(2c - l^2) < l[2c(1+d)^2 - (1+2d)l(l+w) + w(l+w)]$$

$$\Leftrightarrow 2c(1+d)(w - dl) < l(l+w)(w - dl)$$

Because of assumption A1 this is equivalent to $w < dl$.

The price with RPM is higher than the price without RPM iff

$$p_{RPM} = \frac{ac}{2c - l^2} > p_c = \frac{a[c(1+d)^2 - dl(l+w) + w(l+w)]}{2c(1+d)^2 - (1+2d)l(l+w) + w(l+w)}$$

$$\Leftrightarrow c[l^2(1+d)^2 - (l+w)^2] > l^2(l+w)(dl-w)$$

$$\Leftrightarrow (dl-w)[l((2+d)c - l(l+w)) + cw] > 0$$

Again given assumption A1 this is equivalent to $w < dl$. This establishes proposition 1.

Appendix A4 Social surplus effects

The aggregate gross utility of spontaneous customers patronizing bookstore i is

$$\int_0^{A+ls_i-p_i} (A+ls_i - A_0) dA_0 = \frac{1}{2}(A+ls_i - p_i)(A+ls_i + p_i)$$

Given the symmetric configurations the aggregate gross utility of the other type of customers patronizing bookstore i is

$$\beta \int_0^{0.5} (es_i - b\alpha) d\alpha = \frac{\beta es_i}{2} - \frac{\beta b}{8}$$

At symmetric solutions social surplus is therefore

$$W(p, s) = (A + ls - p)(A + ls + p) + \beta es - \beta b / 4 - cs^2$$

which can be rewritten as

$$W(p, s) = A^2 - \beta b / 4 + 2(Al + bw)s + (l^2 - c)s^2 - p^2$$

As at $w = dl$ prices and service levels are same under RPM and without RPM, it is obvious that the social surplus is also the same in both situations. We denote by W_c resp. W_{RPM} the value of W , if the arguments (p_c, s_c) resp. (p_{RPM}, s_{RPM}) are inserted.

We consider now an increase in e which induces an increase in w without changing any of the remaining parameters. When we change w ceteris paribus the change of e is what we have in mind.

$$(7) \quad \frac{\partial W}{\partial w} = 2bs + 2(Al + bw) \frac{\partial s}{\partial w} + (l^2 - c)2s \frac{\partial s}{\partial w} - 2p \frac{\partial p}{\partial w}$$

Note that (p_{RPM}, s_{RPM}) do not depend on w . Therefore

$$\frac{\partial W_{RPM}}{\partial w} = 2b \frac{al}{2c - l^2}$$

While this derivative is independent of the value of w , the derivative of W_c will in general depend on w . In order to calculate the derivative of W_c we need

$$\frac{\partial s}{\partial w} = \frac{a(1+d) \left[2c(1+d)^2 - (1+2d)l(l+w) + w(l+w) - (l+w)(-1+2d)l + l + 2w \right]}{\left[2c(1+d)^2 - (1+2d)l(l+w) + w(l+w) \right]^2}$$

which at $w = dl$ collapses to

$$\frac{\partial s}{\partial w} = \frac{a}{(1+d)(2c - l^2)}$$

The derivative of p with respect to w has similar appearance. In particular it has same denominator. Let us denote the denominator by K . Then we have:

$$K \frac{\partial p}{\partial w} = a(-dl + l + 2w) \left[2c(1+d)^2 - (1+2d)l(l+w) + w(l+w) \right] - a \left[c(2+d)^2 - dl(l+w) + w(l+w) \right] (-1+2d)l + l + 2w$$

which collapses at $w = dl$ to

$$\frac{\partial p}{\partial w} = \frac{al}{(1+d)(2c - l^2)}$$

Inserting these values in (7) yields at $w = dl$

$$\begin{aligned} \frac{\partial W_c}{\partial w} &= 2b \frac{al}{2c-l^2} + 2(Al+bw) \frac{a}{(1+d)(2c-l^2)} + (l^2-c) \frac{2al}{2c-l^2} \frac{a}{(1+d)(2c-l^2)} \\ &\quad - \frac{2ac}{2c-l^2} \frac{al}{(1+d)(2c-l^2)} \\ &= \frac{2bal}{2c-l^2} + \frac{2a(Al+bd)}{(1+d)(2c-l^2)} - \frac{2a^2l}{(1+d)(2c-l^2)} \end{aligned}$$

Recalling that $A = a - \beta/2$ this can be simplified to

$$\frac{\partial W_c}{\partial w} = \frac{2bal}{2c-l^2} - \frac{a\beta l}{(1+d)(2c-l^2)}$$

From this it follows that

$$\left. \frac{\partial(W_c - W_{RPM})}{\partial w} \right|_{w=dl} = -\frac{a\beta l}{(1+d)(2c-l^2)} < 0$$

which is the content of proposition 2.