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# The "Services" Explanation for Resale Price Maintenance: Deleterious Results Missed in the Economics Literature and in Legal Decisions

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Policy discussions and a U.S. Supreme Court decision interpret retailer services induced by retail price maintenance (RPM) as enhancing consumer surplus (CS) and welfare enhancing, marginalizing dissenting opinions that use similar models but with different parameters. However, if presales services stimulate demand by providing information about a product's value, they need not raise postsale value in use. Inframarginal consumers' presales perceived value may increase, but their postsale value may be unchanged, so their supposed CS gains are ephemeral, and their actual surplus falls proportional to price increase. We show that, even adding in gains to marginal consumers, effects on CS are far more negative than conceived of in this literature. Consequently, in a rule-of-reason antitrust environment, if RPM is challenged without alleging collusion or exclusion, presales demand-inducing information provision is a flimsy defense if CS is the standard and not always convincing if total surplus is the standard.

**JEL Classification: L42**

## 1. Introduction

Antitrust policy and court decisions toward resale price maintenance (RPM) have been influenced by literature that either emphasizes efficiency arguments or portrays RPM as a mechanism that may enable anticompetitive behavior, such as collusion or exclusion. As the portraying goes, it is not RPM that should be abolished; rather, it is the anticompetitive behavior that must be eradicated. However, our analysis shows that RPM can indeed be a more socially harmful vertical restraint than has been recognized in the literature. In our model, RPM is a unilateral practice in isolation; that is, it is not an element of any (illegal or legal) strategic interaction among market participants.

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Those efficiency-enhancing influential ideas are manifest in the 2007 U.S. Supreme Court ruling *Leegin*.[1] In the legal context,[2] since *Leegin*, RPM is no longer a per se antitrust violation. It is our concern that this current apparent legal leniency toward RPM stretches too far. In light of the results of our model, it is advisable that antitrust agencies remain vigilant against potentially harmful RPM practices even when apparently used in the way described by Telser (1960).

We focus on the presales services that inform consumers about the true value of a product prepurchase,[3] which provides the single standard for measuring welfare. We model optimizing behavior of retailers leading to zero profit (no rents) equilibrium, with an endogenous wholesale price. Our post-RPM demand need not be—and in fact is not—value in use; it is the *expected* value in use with greater information. This distinction is crucial for exposing flaws in some literature that, unfortunately, have had pivotal impacts on policy and court decisions.[4] This has been unnoticed even by prominent dissenting authors.

## 2. Related Literature

Our departing point is Telser's (1960) free-riding rationale for RPM when manufacturers want retailers to offer demand-stimulating services to consumers. But Telser does not evaluate the implications of vertical restraints for economic efficiency, which is the object of Bork (1966), who contends that restrictions on output are anticompetitive and that increases in output are procompetitive. Therefore, Bork concludes, all restraints imposed by manufacturers must be efficiency enhancing and procompetitive because manufacturers would not find it profitable to impose vertical restraints when consumers did not value the services at least as much as their incremental cost. Bork's analysis is afflicted with what Dixit and Norman (1978) show is a double-standard problem, as we shall explain. Additionally, his argument depends on all consumers valuing services by the same amount.

Comanor (1985) and Scherer (1983), using all but one of Bork's assumptions, come to a different conclusion. If some inframarginal consumers value services at $V_I$ and marginal consumers value services at $V_M$ and $V_I < V_M$ , then, when manufacturers gain and provide RPM, one may have a decrease in consumer surplus and total welfare as well. Thus, Comanor (1985, p. 998) says, "there is no basis on which to conclude that vertical restraints will always enhance economic efficiency." Nonetheless Bork's and Telser's analyses became the conventional economic wisdom on vertical restraints at their time, and their impact ripples still today despite their shortcomings.[5]

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[1] *Leegin Creative Leather Products, Inc. v. PSKS, Inc.*, 551 U.S. 877 (2007).

[2] In *Leegin*, the Supreme Court ruled that the possible efficiency benefits of RPM must be taken into account in the analysis of RPM on a case-by-case basis, thereby bringing RPM under the "rule of reason." In another potentially strong swing of the RPM pendulum, in March 2010 the U.S. Senate Judiciary Committee voted to pass legislation to counteract the effects of *Leegin* (http://www.mainjustice.com/2010/03/18/senate-panel-approves-bill-to-reverse-leegin-decision). A little earlier, in January 2010, the U.S. House Judiciary Committee had passed similar legislation. Currently, this proposed legislation awaits a vote in the U.S. Congress.

[3] Some types of services affect the true value in use, such as repair facility or services that explain "how to do something" once you take the product home.

[4] In the opinion of the Court in *Leegin*, the U.S. Supreme Court cited, among others, Bork (1978) and Posner (2001).

[5] They echo, for instance, in Motta (2006). In discussing RPM and other vertical restraints more generally, Motta sums up that they "avoid or reduce the free-riding problem to the benefit of both producer and consumer surplus" (p. 315).

Following Bagwell's (2007) taxonomy for advertising, our work is related to traditional informative views of advertising inasmuch as it is one channel through which information about the true value of a good in use may be communicated to consumers. In this context, using insights of Dixit and Norman (1978; henceforth D&N), we expose the welfare measures used in these conventional models of RPM. The point of D&N's analysis that is directly relevant to our article is the reference or standard against which changes in taste or valuation ought to be measured. They emphasize, "Whichever standard is chosen, one wants to measure the effect of a change in output as judged by that standard, and not the effect of altering the standard on the value of a given level of output." They also instruct us to seek the standard that most accurately and precisely captures "the consumer's true interests" (p. 4). Accordingly we adopt the most natural standard and measure changes in consumer surplus from the consumers' utilities derived from actually using the product.

In challenging Bork, Comanor[6] and Scherer[7] also adopt this double standard when evaluating the change in consumer surplus due to the introduction of RPM. Had they used the value-in-use demand curve, their consumer harm would be far greater, more apparent, and robust to inframarginal versus marginal consumer valuations.

Overall, Bork (1966), Posner (1976), Scherer (1983), Comanor (1985), and Blair and Fesmire (1994) all apply the double-standard approach to their analyses. Yet orthogonal conclusions emerge. Our results are in line with Scherer, Steiner, and Comanor (2005), who state, "It is quite possible to have increased output as a result of RPM and at the same time reduced consumer welfare." But our argument suggests not only a much greater loss in consumer surplus than these authors would suggest but also a loss that is robust to many assumptions about the difference between inframarginal and marginal consumer valuations.

Mathewson and Winter (1998) and Elzinga and Mills (2007) describe commonly known anticompetitive explanations for RPM. Asker and Bar-Isaac (2011) present a model of competitive harm that arises from the exclusion of a more efficient entrant though using RPM. Jullien and Rey (2007) formalize the use of RPM as a tool to monitor and enforce an upstream cartel agreement, but Kleit (1993) concludes that it seems unlikely that the primary motivation for RPM is cartel facilitation. Our article abstains from this discussion, as it does not require either collusion or exclusion to generate negative welfare results.

Some less legally contentious explanations for RPM have been offered as well. For example, Klein and Murphy (1988) examine manufacturer-desired retail services when retailer monitoring is costly. In a model where there is no role for demand-stimulating services, O'Brien and Shaffer (1992) show that vertical contracting without vertical restraints is not sufficient to maximize joint profits. Deneckere, Marvel, and Peck (1996) examine RPM as influencing manufacturer-desired retailer inventory behavior under demand uncertainty. Rey and Vergé (2010) capture strategic interactions among manufactures and retailers through a combination of RPM and a two-part tariff at the wholesale level. These articles are important exceptions to

[6] Comanor's figure 2 (1985, p. 996) clearly reveals his adoption of a double standard. Before RPM, consumer surplus is measured as the area of the triangle under the original demand curve and above the original price line. Likewise, after RPM, it is measured as the area of the triangle made between the new demand curve, the new price, and the vertical axis.

[7] This becomes clear in his first and second lines on page 698, where Scherer (1983) identifies the area between the original demand and the postservices demand and above the postservice equilibrium price as "a pure increase in consumer surplus."

the vast majority of the RPM literature, ours included, that uses Telser's "free riding on services" insights.

## 3. The Model

Our model consists of a monopolist manufacturer, perfectly competitive retailers, and an uncountable number of heterogeneous consumers. This framework allows us to show that a negative impact of RPM on economic efficiency comes from a source that is not related to any of the reasons associated with harmful consequences of RPM in the literature. Collusion either upstream or downstream plays no role here, as the manufacturer is already a monopolist and retailers are perfect competitors. Nor does exclusion, as there is no other manufacturer to be excluded and the exclusion of a retailer will not make any difference in the competitive retailing industry.

We present a more mathematically structured model than those used by Scherer, Comanor, and related authors so as to model behavior not analyzed in these articles. In particular, these articles take presales demand as equal to product value in use, and wholesale and retail prices, along with retailer service provision, are all exogenous. Our mathematical structure can show how presales demand may systematically differ from value in use and endogenize both prices and retailer service provision given the prices and the level of service determining presales demand.

Consumers buy the product at retail stores. In a store, a consumer considers buying one unit of the product at the retail price. If the presale services are available at the retail stores, each consumer takes advantage of the presale services (the amount or level of service provided at a store is denoted as $s$). From the perspective of the consumer, the services appear to be free.

Telser (1960) seems to be implying that service is needed when consumers undervalue products, such as may be the case for some "new products." This in no way means that consumers have valuations across products that reflect anything other than some form of rational expectations. Consider the case of new products. One possibility is that, with previously unknown products, consumers have imperfect signals as to quality. The average consumer consensus may undervalue new products 1, 2, … $k$ and overvalue $k + 1$, $k + 2$, …, $N$, and, on average, their valuations may be unbiased, as in one form of rational expectations. Then RPM should be driven by firm self-selection; the greater the undervaluation, the greater incentive to use RPM—overvaluation would obviously not lead a firm to want to use RPM.[8]

The consumers are distributed uniformly and continuously over the interval [0, 1]. Before using the product to its fullest extent (i.e., exploring all its possibilities, features, or niceties), no one knows with certainty the utility that can be obtained from the product. If presales services are offered, they affect the expected utility that one might derive from the product before one

[8] This is not the same as introductory low prices, but in the literature, introductory low prices are sometimes justified by getting some consumers to buy so that other consumers will gain information from observing or talking with early adopters. Another type of unbiased rational expectations undervaluation arises if consumers are risk averse (admittedly, we do not model this complication). With a new product, the perceived variance in value may be much wider than with well-established products. Consumers as a whole may on average correctly know mean valuations of all $N$ new products, yet if they know that their valuations are subject to more estimation error than for established products, risk aversion would lead to undervaluation of $E[U(x)] < E[U(\bar{x})]$ even if their quality assessment leads to $E[x] = \bar{x}$ across all new products.

purchases it. After being exposed to $s$ units of presales services but before buying the product and using it to its fullest extent, each consumer, $i$, $i \in [0, 1]$, expects an individual specific utility valuation from the product. This valuation is a random variable

$$\tilde{u}(i) = i + \frac{M}{2}x,$$

where $x \in [0, 1]$ is a random variable distributed as a beta distribution with parameters $s$ and 1, that is, $x \sim Beta\,(s, 1)$, and $M$ is a scale parameter that affects the magnitude of the uncertainty.

After exposure to presales services, at the moment of the purchase decision, the utility that consumer $i$ expects from the product is

$$u(i) = E[\tilde{u}(i)] = i + \frac{M}{2}E[x] = i + \frac{M}{2}\frac{s}{s+1}.^{9}$$

Assume further that after consumer $i$ buys the product and actually uses it to its fullest extent, she realizes its true value for her. We assume that this true value is given by $V(i) = i + M/2$.

Notice that in our formulation, consumer $i$ discovers that the product is worth $i + M/2$ only if she actually uses the product.[10] So the value that the consumer expects from the product, which translates into her reservation price, is always less than her actual value in use if she has the product. In other words, there is an undervaluation for the reservation price.[11]

Before any exposure to presales services (or when no service is available), consumer $i$ evaluates the value of the product as being \$$i$. If the store offers some presales services that communicate to her some of the initially overlooked features of the product, she realizes that the true value of the product is higher than $i$. But we constrain beliefs to be "reasonable" given truthful service information provision, so services can never convince someone that a product is worth more than its true value of $i + M/2$. She does not know with certainty the true value, but, depending on the effectiveness of the services, she assigns a probability distribution to the possible benefits (value) she may be able to derive from the product if she buys it. At the moment of the purchase decision, her reservation price is the product's expected utility as determined by the beta distribution; that is, she buys the product if the price is at most equal to her reservation price.

In the absence of services, the prepurchase average valuation of the product across all consumers is 1/2. On the other hand, the average in-use valuation is $1/2 + M/2$. Consequently, the percent difference between these average valuations is $M$ times 100%. Therefore, $M$ measures an uninformed consumer's degree of underestimation of product value in use.[12] The higher $M$, the greater the scope for the introduction of demand-stimulating presales services.

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[9] The expected value of a random variable that follows a beta distribution with parameters $a$ and $b$ is determined by $a/(a + b)$. The beta distribution captures well the relationship between the utility uncertainty and the effect of the retailer's presales services. When $s = 0$ (which characterizes either no service or the situation in which the consumer has not yet been exposed to the presales services), the beta distribution is such that $E[x] = 0$, so that $u(i) = i$. When $s = 1$, the distribution of $x$ becomes a uniform distribution over the interval [0, 1]. In this case, $E[x] = 1/2$, so that $u(i) = i + M/4$. As $s$ increases without limit, the "weight" of the distribution moves toward $x = 1$. Consequently, as $s$ approaches infinity, $E[x] = 1$, so $u(i) = i + M/2$.

[10] Her evaluation would converge to this value if the retailer provided an infinite amount of service, which will never occur in this model.

[11] Obviously, we could relax this assumption, but this assumption is giving the maximum credence to the "value-of-services" argument from Telser and much of the following literature.

[12] For example, if $M = 0.25$, it means that, on average, the in-value use of the product is 25% higher than the value that the consumers assign to the product prior to their exposure to any presales services.

We assume that the retail price of the product is $p$ and that consumer $i$ buys the product if and only if her reservation price is greater than $p$. Her reservation price depends on her own valuation $i$ and on the availability of presale services ($s$). She buys if and only if

$$p \leq i + \frac{M}{2}\frac{s}{s+1}.$$

Given $p$ and $s$, only those consumers with high enough reservation prices buy the product. The lowest-valuation consumer who still buys is defined by

$$i(p,s,M) = p - \frac{M}{2}\frac{s}{s+1}.$$

Consumers $i$, such that $i > i(p, s, M)$, buy the product. Purchases happen at the rate of one unit of the product per purchasing consumer. Thus, the total quantity is $q(p, s, M) = 1 \times [1 - i(p, s, M)]$.[13] From this, we can derive the total demand for the product as the measure of the buying individuals:

$$q(p,s,M) = 1 - p + \frac{M}{2}\frac{s}{s+1}.$$

The inverse demand function is then

$$p(q,s,M) = 1 - q + \frac{M}{2}\frac{s}{s+1} \quad \text{for} \quad 0 \leq q \leq 1. \tag{1}$$

Retailing is a perfectly competitive activity. Each retailer decides whether to offer the presale services, and, if they do decide to offer services, they decide on a level of services. Let $w$ be the wholesale price. Without RPM, the retailers do not provide the service and optimally choose

$$p = w. \tag{2}$$

However, when the manufacturer imposes RPM on the retailers so that the retail price is higher than the wholesale price, the retailers provide services in order to stimulate demand. The marginal cost of services is $c$. We assume no fixed costs. Adding up all retailers' costs, they incur the cost $c \times s$ in order to provide $s$ units (or level) of services to all consumers. Notice that even low-valuation consumers visit the stores and get the spiel. Because competition is perfect among the retailers, no profit is made at the retail level; that is,

$$pq = wq + cs.\text{[14]} \tag{3}$$

The manufacturer of the product is a monopolist. We assume that its marginal cost is zero. Because it knows that the demand for its product depends on the retailers' provision of services, the manufacturer computes its maximum profits with or without RPM and then chooses the best alternative. In both scenarios, in order to maximize its profits, the manufacturer chooses to make as many units of the product so that its marginal revenue is equal to its marginal cost. The manufacturer's profit is $profit = w \times q$; that is, wholesale price times quantity. Without RPM,

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[13] When $q = 1$, or 100%, it means that all consumers buy the product.

[14] In other words, retailers exactly cover their cost of providing services to all individuals (services are delivered at the rate $s$ per individual) and the wholesale payment to the manufacturer.

given Equation 2, we can also write $profit(q, 0, M) = p(q, 0, M) \times q$; that is, retail price times quantity.[15] Hence, without service, $q_0 = 0.5$, and $p_0 = w_0 = p(q_0, 0) = 1 - 0.5 = 0.5$.[16]

Now let us turn to the situation in which the manufacturer imposes RPM. In this case, given Equation 3, we can write $profit(q, s, c, M) = p(q, s, M) \times q - cs$. The manufacturer maximizes its profit by conveniently choosing its production (quantity) and the level of services *it would like to induce the retailers to offer*. The profit-maximizing first-order conditions with respect to $q$ and $s$ are

$$\frac{\partial(profit(q,s,c,M))}{\partial q} = 0 \Rightarrow q^* = \frac{1}{2}\left(1 + \frac{M}{2}\frac{s^*}{s^*+1}\right) \tag{4}$$

and

$$\frac{\partial(profit(q,s,c,M))}{\partial s} = 0 \Rightarrow s^* = \sqrt{\frac{M}{2}\frac{q^*}{c}} - 1. \tag{5}$$

The solution of the systems in Equations 4 and 5 allows us to write $q^*$ and $s^*$ as functions of $c$, the cost parameter associated with the provision of services, and $M$, the undervaluation parameter:[17]

$$q^* = (1+m)/3 + \left[m(1+m)^2 c\right] \Big/ k + k/36\, c\, m \tag{6}$$

and

$$s^* = [m(1+m)] \Big/ \sqrt{k} + \sqrt{k} \Big/ 6c - 1, \tag{7}$$

where $m = M/2$ and

$$k = \left(\left(-108\, c^2 m^2 + 2\sqrt{2916\, c^4 m^4 - (6\, c\, m - 6\, c\, m^2)^3}\right) \Big/ 2\right)^{2/3}. \quad {}^{18}$$

From these equations, we find $p^* = (1 + m)/3 + [m(1 + m)^2 c]/k + k/36\ cm$.[19] The monopolist imposes $p^*$ as the RPM price on the retailers. Note that $q^*$ and $p^*$ are optimal from the point of view of the manufacturer as long as the retailers do provide the *desired* level of services $s^*$. We have not yet dealt with the optimization of the retailers who have to *actually* set $s$. We turn to this next.

We have assumed that there are $N$ identical retailers. In symmetric equilibrium, each retailer buys from the manufacturer and sells to consumers $1/N$ of the manufacturer's total production, $q$. Each retailer offers services at a rate of $s$ units per client. By doing so, it

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[15] Notice that the retail price is determined by the inverse demand function (Eqn. 1), where $s = 0$, because, without RPM, retailers do not provide any service.

[16] That means that the manufacturer's production is enough to satisfy only one-half of the consumers. This is simply a manifestation of the property that with linear demand, marginal revenue is equal to zero at half the quantity for which price is equal to zero on the demand curve.

[17] This is a cubic system of equations. As such, for each pair $c$ and $M$, there are three pairs ($q^*$, $s^*$) that mathematically satisfy the system. However, only one pair solves the economic problem at hand. We discuss the possibilities in order to uniquely define the solution of interest. For any $c > M/4$, the solutions either are not a pair of real numbers or are not a pair of nonnegative numbers. But when $0 < c \leq M/4$, all solution pairs are distinct pairs of real numbers. Over this range, two pairs cannot be the solution for the economic problem because they would result in negative values for $s^*$. Only one pair solves mathematically and economically the profit maximization problem.

[18] Equations 6 and 7 and the expression for $k$ derives from the solution of cubic equations (http://en.wikipedia.org/wiki/Cubic_function).

[19] Note that $p^*$ has the same functional form as $q^*$. This is due to the linear demand with slope $-1$.

influences their willingness to buy according to Equation 1,

$$\left(p(s) = 1 - q + \frac{M}{2}\frac{s}{s+1}\right),$$

taking $q$, the manufacturer's production decision, as given.

Recall that the size of the population is 1. Therefore, the size of each retailer's clientele is $1/N$. Consequently, each retailer offers, in total, $s/N$ units of services to its clients. Assuming that $w$ is the wholesale price for the product imposed by the monopolist manufacturer (which is beyond the control of any of the retailers), each retailer chooses $s$ in order to maximize its profits, which are given by $\pi(s) = (p(s) - w)q/N - cs/N$.

Setting the first-order derivative of the profit function above with respect to $s$ to zero, we obtain the necessary and sufficient condition for the retailer's profit maximization problem:

$$s_r = -1 + \sqrt{\frac{M}{2}\frac{q}{c}}. \tag{8}$$

Comparing Equations 5 and 8, we note that the functional form of the manufacturer's optimal choice of $s$ is identical to the functional form of the retailer's optimal choice of $s$. Thus, looking backwards, that means the manufacturer optimally decides upon $q^*$, considering that the retailers choose $s^*$, that is, the level of services that the manufacturer would like the retailers to choose. In turn, *the retailers optimally decide* $s_r = s^*$; that is, the $s$ selected by retailers is $s^*$, consistent with the manufacturer's *desired* level of services above.[20]

Finally, well aware of that, the manufacturer chooses $w^* = p^* - (c \times s^*/q^*)$ so that the best the retailers can do is to earn zero profits. By doing this, the manufacturer retains all the profits that a monopolist can extract from this market. This equation bears a distinguishing feature of our model in comparison to the previously cited articles where the RPM price $p^*$ and the wholesale price $w^*$ are exogenous. Here, both are endogenous.

Let us now examine the welfare effects of the introduction of RPM. The unique (sole) standard we apply to measure the consumer surplus before and after the services is the "value-in-use" benchmark, as it more accurately represents the consumers' true interests, as prescribed by D&N. For this purpose, Figure 1 helps us clarify the concepts.

In Figure 1, assume that $M$, the undervaluation parameter, is fixed at, say, 50%. The straight line $D_{prf}$ represents the inverse demand function when consumers have perfect information about the product. This is equivalent to the situation in which the level of services goes to infinity. In this case, Equation 1 reveals that $D_{prf}$ intercepts the vertical axis at \$1.25. $D_{prf}$ can also be understood as the inverse demand curve that would emerge if consumers knew at the moment of their purchases their true valuations of the product. As such, we elect $D_{prf}$ as the standard against which we measure changes in consumer surplus. Note that this demand curve becomes vertical at $q = 1$, so the marginal revenue curve associated with this demand curve is discontinuously going to negative infinity at $q = 1$.

[20] The retailers' first-order condition is $(p - w)/c = ds/dq$. The zero profit condition implies that $(p - w)/c = s/q$. Consequently, $dq/ds - q/s$, which implies that retailer $q$ as a function of $s$ is a straight line from the origin or that in equilibrium this is equivalent to being at the minimum of an AC curve, where AC = MC. Barring having this condition, what one needs is for consumers to be able to detect which stores offer the most service and recognize the impact of it. That is like knowing that "discount stores" offer worse service than "mom-and-pop" or specialized retailers.

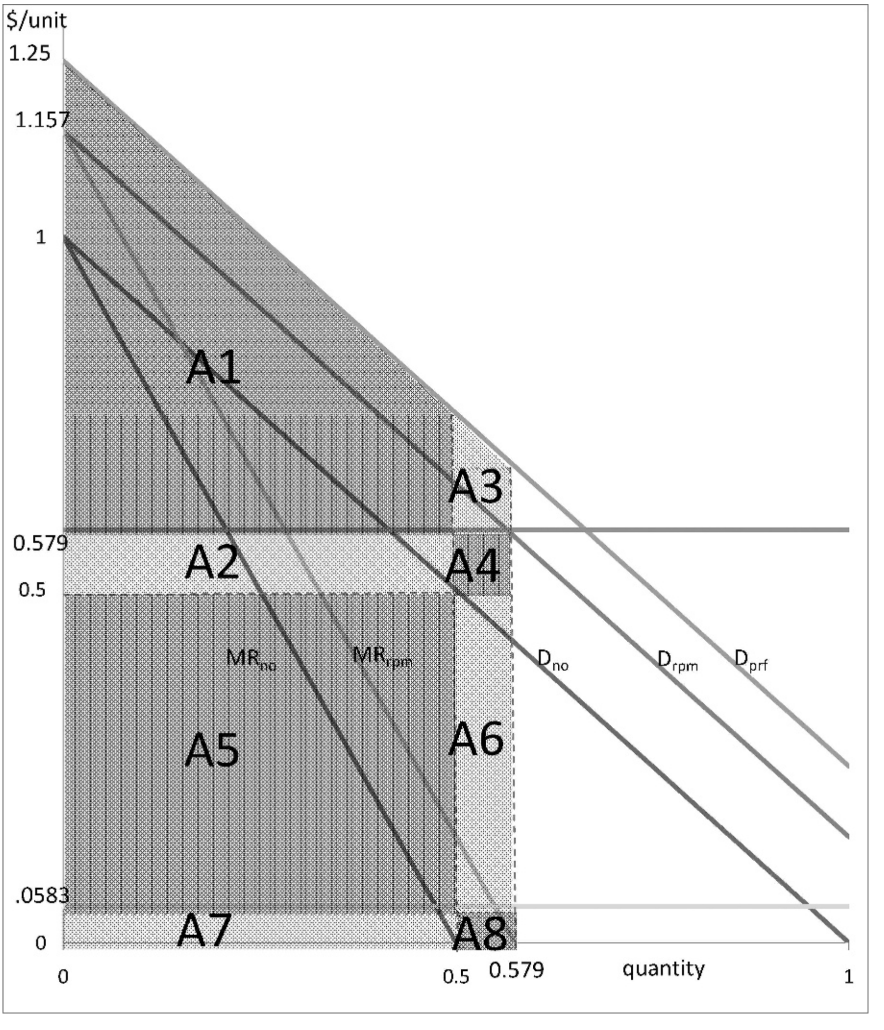


**Figure 1.** Equilibria and Welfare Analyses

The line $D_{no}$ represents the inverse demand function in the complete absence of presales services. It intercepts the vertical axis at \$1, according to Equation 1. The corresponding marginal revenue curve is identified by $MR_{no}$. Throughout, we assume that the marginal cost of the product is zero. Therefore, the pre-RPM equilibrium corresponds to the point (0.5, \$0.50) in Figure 1. The line $D_{rpm}$ is the inverse demand curve when the retailers offer the optimal level of services when $c =$ \$0.02. Equation 7 determines the optimal level of service as 1.689. Then Equation 1 determines that $D_{rpm}$ intercepts the vertical axis at \$1.157. The corresponding marginal revenue curve is represented by $MR_{rpm}$. The profit-maximizing condition when $c =$ \$0.02 is, again, that marginal revenue equals marginal cost. This condition yields the post-RPM equilibrium as the point (0.579, \$0.579). The area between the horizontal axis and the parallel line with intercept \$0.0583 and between the vertical axis and the vertical line through $q = 0.579$ represents the total costs associated with the provision of the services. At last, the wholesale price, determined according to Equation 3, is \$0.520.

Consumer surplus without presales services, $CS_0$, is determined by the sum of the area $A1$ and $A2$ in Figure 1. Likewise, consumer surplus with RPM, $CS^*$, is determined by the sum of areas $A1$

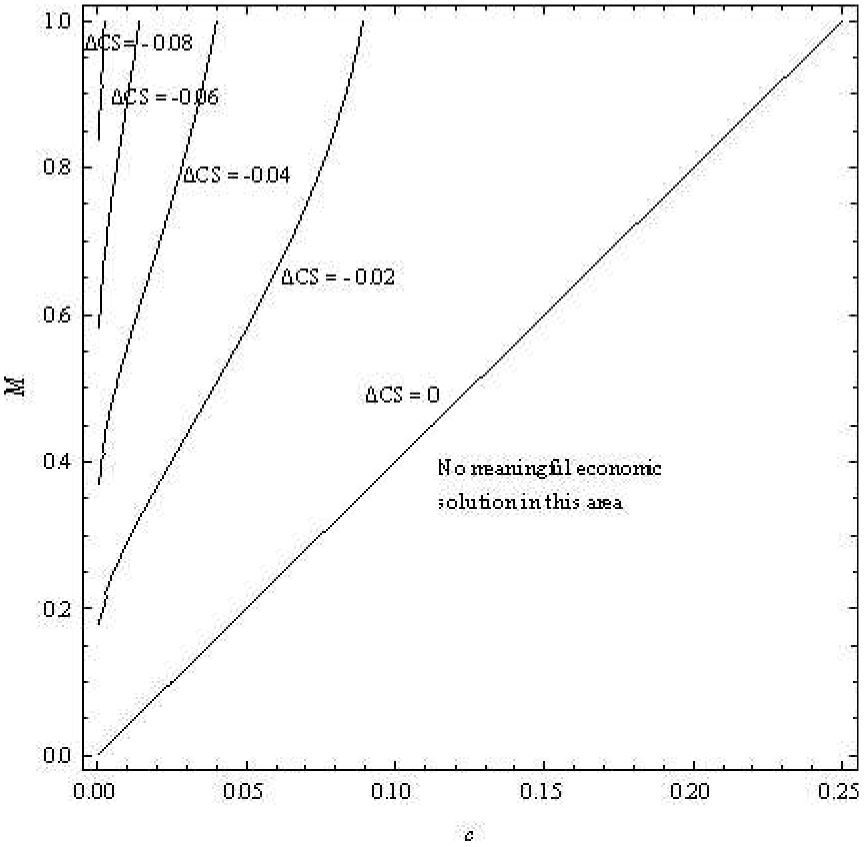


**Figure 2.** Change in Consumer Surplus

and $A3$. Consequently, the change in consumer surplus as result of the introduction of RPM is $\Delta CS = CS^* - CS_0 = A3 - A2$, or in terms of the solution $\Delta CS = (6q^* - 1 - 2M)(2q^* - 1)/8$.

Figure 2 shows a contour plot[21] for $\Delta CS$, where $c$ varies from 0 to 0.25 on the horizontal axis and $M$ varies from 0 to 1 on the vertical axis. The lines in the plot represent the combinations of $c$ and $M$ that yield a fixed $\Delta CS$. For example, the line indicated by "$\Delta CS = -0.02$" means that $\Delta CS$ is equal to $-0.02$ for all combinations of $c$ and $M$ that correspond to that line. Figure 2 reveals that within the plotted range of the parameters $c$ and $M$, the RPM-service equilibrium reduces consumer welfare in comparison to the no-service equilibrium. It shows that, for a given $M$, $\Delta CS$ becomes more negative as $c$ decreases. This means that as the cost of presales services decreases, the manufacturer is able to extract more consumer surplus because it offers more demand-stimulating services. This raises all consumers' reservation prices. The monopolist can profitably raise the price by an amount a little less than the increase in reservation price. Consequently, some consumers who would not buy the product but for the services change their buying decision after their exposure to the presales services. These

[21] A contour plot is a graphical technique for representing a three-dimensional surface by plotting constant slices of the dependent variable (in the present case, $\Delta CS$), called contours, on a two-dimensional format (just like an indifference curve map or isoquant map of two goods/inputs in two spaces). That is, given a value for $\Delta CS$, lines are drawn for connecting the ($c$, $M$) coordinates (the independent variables) where that $\Delta CS$ value occurs. In other words, the contour plot is an alternative to a three-dimensional surface plot.

consumers earn some nonnegative consumer surplus. However, all those consumers who would buy the product even in the absence of services end up paying higher prices after the introduction of the services because the presales services raise their reservation prices as well. But these inframarginal consumers' enjoyment of the product in use does not change so that they lose consumer surplus, and this loss corresponds to the increase in price that the monopolist imposes. Under the assumptions of our model with respect to the way that prepurchase services affect consumers' willingness to pay, on balance as a result of the application of the single standard approach to measure changes in consumer surplus, the inframarginal consumers' surplus loss is greater than the marginal consumers' surplus gain.

Now let us examine the manufacturer's profits. In the absence of the services, profit is determined by the area $A5 + A7$; that is, $\Pi_0 = w_0 q_0 = p_0 q_0 = 1/4$. Once optimal services are available to clients, profit is determined by the area $A2 + A4 + A5 + A6$; that is,

$$\Pi^* = p^* \times q^* - c \times s^*. \quad [22] \tag{9}$$

The change in profit as a result of the introduction of presales services is $\Delta\Pi = \Pi^* - \Pi_0 = A2 + A4 + A6 - A7$. This is positive for any combination of parameters.

The area $A7 + A8$ corresponds to the total cost of providing the services. In terms of the equilibrium solution, the change in profit can be expressed as $\Delta\Pi = (q^*)^2 - cs^* - 1/4$. One can show that change in profit is positive for all combinations of positive $c$ and $M$.

Figure 3 is a contour plot of the change of total welfare. It reveals that there exist combinations of $c$ and $M$ for which total welfare is reduced after the introduction of presales services. Manufacturer's profits are higher, but the reduction in consumer surplus is larger than the profit gain. Thus, the manufacturer would be willing to promote the presales services, even though it is more costly to consumers than the manufacturer's gains.

The results we obtained from the model thus far allow us to observe that in comparison to the no-service equilibrium, the with-service equilibrium is such that the consumers who would buy the product even in the absence of presales services are worse off, consumer surplus is reduced over the considered range of the cost parameter $c$ and $M$, harm to consumers is greater the smaller $c$ is, and there exist combinations of $c$ and $M$ for which consumer surplus is reduced and postservices total welfare is less than preservice total welfare, while the manufacturer is still better off.

We remind the reader that these results were obtained under the assumption of no fixed costs involved in the provision of presales services. Also, we assumed that information is equally valuable to all types of consumers so that the perceived value demand ($D_{rpm}$ in Figure 1) shifts parallel, as in Bork (1966), which is the origin of "if RPM is instituted it must be welfare enhancing."[23]

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[22] Equation 9 expresses Telser's insights. Postservice profit is a decreasing function of the cost of services, $c$ because as $c$ increases, not only the cost of providing services increases but also the optimum level of services decreases. Therefore, the demand is less stimulated, translating into reduced opportunity to increase profit.

[23] If instead of a parallel shift information had less effect on the high demanders and more on the low demanders so that the linear demand would pivot around the vertical intercept, the consumer surplus result could be reversed, depending on the parameters of the model, in particular, when the gap between the true and no-service demands ($D_{prf}$ and $D_{no}$, respectively, in Figure 1) is wide (large $M$) and/or when the cost of service ($c$) is low. For instance, Scherer (1983) and Comanor (1985), assuming exogenous wholesale price (it is endogenous in our model), have a lower increase in demand for high-valuation consumers, and find a drop in consumer surplus, which we claim is underestimated using D&N's insights. On the other hand, if the perceived value demand rotates out around the horizontal intersection point (e.g., when services increase perceived value by some percentage across all consumers so that the absolute incremental value of lower-valuation consumers is less than that of the high-valuation consumers), consumer surplus loss could be magnified in comparison to our results.

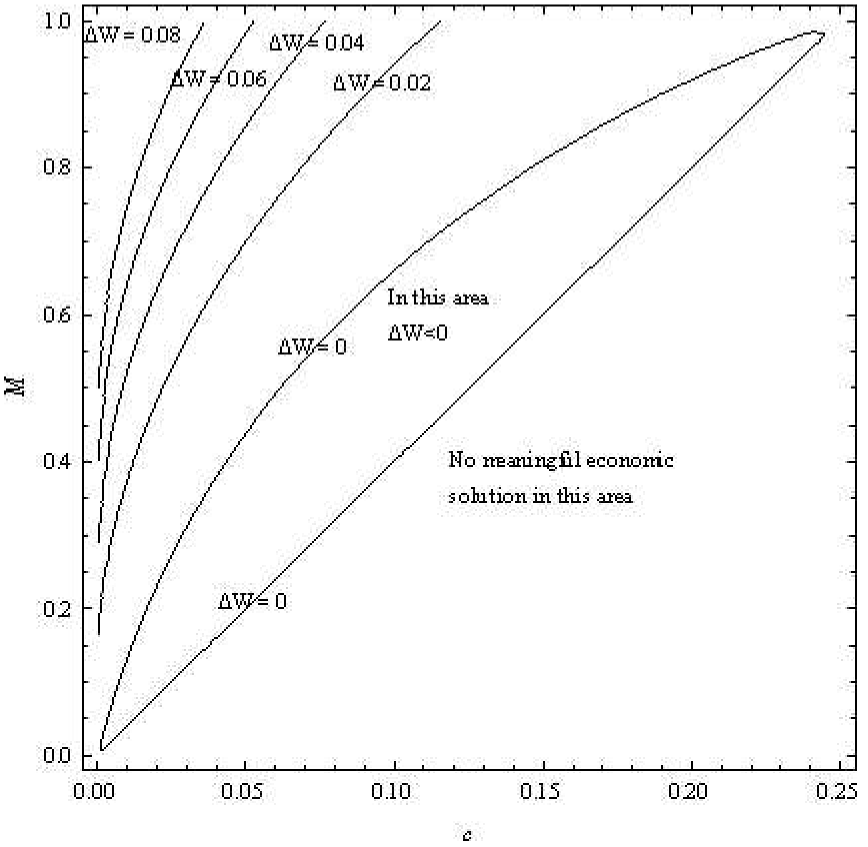


**Figure 3.** Change in Consumer Surplus plus Producer Surplus

## 4. Conclusion

We examine RPM when it is unilaterally imposed by an upstream monopolist manufacturer setting a minimum price below which downstream competitive retailers are not permitted to make sales. The consumers are heterogeneous in their valuation of the product. In the absence of informative presale services, their initial valuation remains low in comparison to the value they would extract from the actual use of the product were they to purchase it. When, however, the retailer offers these services, the consumers' expected valuations increase, but their actual valuations in use remain the same. As a consequence, the RPM equilibrium price and quantity are higher, while the consumer surplus may be reduced as the inframarginal consumers—who would buy the product even without the services—end up paying more without any gain in the actual in-use value of the product.

The manufacturer's profit is higher with the presale services. Hence, it tries to induce the retailers to adopt them. Setting a higher wholesale price and the appropriate RPM in equilibrium, retailers provide the services and charge a retail price that exactly covers the service's costs and the wholesale price. Moreover, by imposing RPM on all retailers, the manufacturer diffuses the retailers' concerns about the possibility of some consumers free riding on their services and subsequently buying from a nonservice retailer. In summary, with RPM, consumer surplus is reduced when higher minimum prices induce retailers to offer customers the level of services the manufacturer finds optimal. Even total welfare may be reduced over a nontrivial range of the parameters of the model despite the fact that the change in profits is always positive.

The service-efficiency justification for RPM by Bork and Posner was decisive and victorious in *Leegin*, even though prominent authors have correctly warned—without success—against some potential harm to consumers. All analyses relied on a "double-standard" approach to measure the change in consumer surplus that severely underestimates the perverse effects. We show that, when welfare changes are measured with a single and adequate standard, RPM reduces consumer surplus and even total welfare by more than previously noticed.

In the broader academic discussion that influenced *Leegin*, if the dissenters had applied our single standard, their arguments would have been much stronger and straightforward, all the while exposing the flaws of the winning argument. Specifically, we show that, even with parallel shifts (as in the winning modeling), in expected utility demand, it is not necessary to assume that some inframarginal consumers have valuations less than the marginal consumers' valuations (as in the dissenters' modeling) to reach the conclusion that inframarginal consumers are hurt. Our analysis rectifies this issue as well.

Accordingly a self-contained, freestanding (independent of finding collusion or exclusion) treatment of RPM in the antitrust statutes is a sensible attitude. Furthermore, a *rule of reason* treatment in countries where antitrust enforcement hinges on a consumer surplus standard may not be as appropriate, as much of current literature has suggested.

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