Minimum Resale Price Maintenance Can Reduce Prices

Jacob Burgdorf[*], Michael Sacks[†]

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Abstract

Theories suggesting that minimum resale price maintenance (RPM) are pro-competitive typically rely on inducing costly investments by downstream firms that are valued by consumers. We present a model in which minimum RPM can be implemented by an upstream monopolist with many downstream retailers that benefits consumers independent of the provision of complementary services or inventory effects. Minimum RPM disrupts coordination by downstream firms that sustains the monopoly price, leading to lower retail prices and higher retail quantities. Counter-intuitively, therefore, a binding minimum resale price can reduce retail prices, which increases consumer surplus and aggregate producer surplus.

[*]Expert Analysis Group, Antitrust Division, US Department of Justice, jacob.burgdorf@usdoj.gov

[†]David D. Reh School of Business, Clarkson University, Potsdam, New York 13699, msacks@clarkson.edu.

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1 Introduction

Theories on minimum resale price maintenance (RPM) predict minimum RPM may be used anti-competitively to facilitate collusion, exclude rivals, and raise prices to consumers (Jullien and Rey, 2007; Asker and Bar-Isaac, 2014; Hunold and Muthers, 2024; Dertwinkel-Kalt and Wey, 2024) or that minimum RPM may be used pro-competitively to induce costly activities from downstream firms. Pro-competitive effects arise via increased services (Telser, 1960; Scherer, 1983; Mathewson and Winter, 1998; Klein, 2009), reduced free-riding downstream (Klein and Murphy, 1988; Klein, 2014), or increased inventories (Deneckere et al., 1996, 1997).[1] In this paper, we propose a mechanism that does not rely on inducing costly activities downstream but can unambiguously increase both aggregate producer surplus and consumer surplus. Counter-intuitively, we find that minimum RPM can be used to *uniformly lower* prices and increase output.[2]

We present a model where an upstream manufacturer sells a homogeneous product with linear pricing to retailers downstream who may collude at supra-competitive prices. By imposing a minimum resale price, the upstream manufacturer increases the continuation value to the downstream firms of not colluding, reducing the set of discount factors for which collusion is sustainable. We show for any discount factor that supports collusion, there exists a minimum resale price that will raise the continuation payoff sufficiently to prevent collusion. This decreases retailer profits, but increases manufacturer profits, consumer surplus, and total surplus. Further, models in which minimum RPM induces services downstream predict price increases. Average prices may be lower across uncertain demand states with minimum RPM if the policy induces retailers to hold more inventory as in Deneckere et al. (1996, 1997). Our model is counter-intuitive in that by imposing a minimum price at which downstream firms can resell the product, the equilibrium price decreases, and equilibrium quantities increase, with no changes in services or inventories.

There are alternative ways a manufacturer may prevent collusion from resulting in double marginalization, such as imposing a maximum retail price.[3] Maximum RPM decreases the payoff downstream firms receive from colluding directly and, if demand is known, can be set at the competitive retail level downstream. This would have the advantage of completely eliminating double marginalization, whereas our model shows a minimum price only partially reduces double marginalization. However, we posit that when downstream services, free-riding mitigation, or inventory holdings in the presence of uncertain demand may be important to manufacturers, minimum RPM could be preferred to maximum RPM, as maximum RPM addresses only double-marginalization, and may hinder costly downstream services, while minimum RPM may address both. The formal modeling of this choice is left for future research.

2 Baseline Model

Time is discrete and indexed by t with an infinite horizon. Future payoffs are discounted by the common factor $\delta \in [0, 1)$. An upstream monopolist manufacturer u produces and sells a single

[1] For reviews of the RPM literature, see Ippolito (1991), Elzinga and Mills (2008), Klein (2014), MacKay and Smith (2014), and MacKay and Smith (2017).

[2] Contemporaneous work by Baye et al. (2025) develops an alternative mechanism where minimum RPM can increase output and manufacturer profits absent costly activities, which benefits consumers loyal to specific retailers and harm those who are not.

[3] Maximum RPM has been subject to a rule of reason approach since the 1997 *Kahn* case, whereas minimum RPM has been subject to rule of reason only since the 2007 *Leegin* case.

product to $n > 1$ downstream Bertrand retailers $r = 1, \ldots, n$ at common wholesale price w. The manufacturer's marginal cost of production is constant at $c > 0$. Each retailer faces no additional costs and sells the product to consumers at a price p_r. The product remains undifferentiated at the retail level, so consumers purchase only from the retailer with the lowest price. We assume that when multiple firms share the lowest price, they split the market evenly. Define $p = \min_r p_r$ as the lowest retail price and let $q = F(p)$ denote market demand for the product, which we assume to be continuous and log-concave with a finite choke price. Though each p_r (and thus p) is a function of w we suppress this notation. To guarantee the existence of best responses, we restrict w and each p_r to the finite grid $G = \{g_0, \ldots, g_L\}$. Let $\varepsilon = g_\ell - g_{\ell-1}$ denote the difference between adjacent prices on the grid, which we assume to be sufficiently small.

In each period, u first sets a wholesale price w. Then, after observing w, each r simultaneously and independently sets prices p_r. Consumers then purchase from the retailer(s) with the lowest price(s). As this game has an infinite horizon, retailers are free to employ dynamic (e.g., trigger) strategies. For simplicity, we consider two strategies: a static strategy (simultaneously and independently maximizing profits of the stage game) and the grim trigger strategy. Thus, we can view the stage game as a normal form game with two strategies: collude at the monopoly price $p^m = \arg\max_{p \in G} \pi^m = \arg\max_{p \in G}(p - w)F(p)$ or do not collude.

When colluding, retail profits are the monopoly profits equally split among the n retailers: $\frac{\pi^m}{n} = \frac{1}{n}(p^m - w)F(p^m)$. If any retailers deviate from the monopoly price in a given period, all retailers revert to the static-Nash equilibrium in every subsequent period and set $p_r = w$, so profits are 0 for all r. Let $g_m = p^m \in G$ and observe that the deviation payoff from collusion by a single firm is $\pi^d = (g_{m-1} - w) \times F(g_{m-1})$. Thus, retailers will set $p_r = p^m = g_m$ for all r if

$$\frac{\pi^m}{(1-\delta)n} > \pi^d \Longrightarrow \delta > \frac{n\pi^d - \pi^m}{n\pi^d} \equiv \delta_0.^4 \tag{1}$$

Henceforth, we assume $\delta > \delta_0$ and, in the baseline model, retailers set prices $p_m > w$. The manufacturer maximizes its profits $\pi_u = (w - c) \times F(p(w))$, setting wholesale price $w^* = \arg\max_{w \in G}(w - c) \times F(p(w))$.

2.1 Minimum Resale Price

We now augment the model by allowing the manufacturer to choose both the wholesale price w and to set a contractual minimum resale price for all retailers $\underline{p} \in G$.[5] If $\underline{p} < w$, then the price is nonbinding so we assume that $\underline{p} \geq w$, where $\underline{p} = w$ is the equivalent of no minimum resale price. Suppose for the moment that $\underline{p} > w$. Let $\pi^{rpm} = (\underline{p} - w)F(\underline{p})$ denote aggregate retail profits when $p_r = \underline{p}$ for all r. Then, $p_r = p^m$ for all r only if

$$\frac{\pi^m}{(1-\delta)n} > \pi^d + \frac{\delta}{(1-\delta)n}\pi^{rpm} \Longrightarrow \delta > \delta_0 \left(\frac{n\pi^d}{n\pi^d - \pi^{rpm}} \right) \equiv \delta_{\underline{p}}, \tag{2}$$

where π^d is defined as in the previous section for $\underline{p} < p^m$ and $\pi^d = \pi^m$ for $\underline{p} = p^m$.[6]

[4] Note that as $\varepsilon \to 0$, $\delta_0 \to \frac{n-1}{n}$.

[5] We assume that this contractual provision is observable and enforceable and do not model costly monitoring and enforcement; i.e., $\underline{p}$ is a binding minimum price.

[6] We ignore $\underline{p} > p^m$ as it is strictly dominated by $\underline{p} = p^m$.

Lemma 1. *For any w and $\underline{p} \in [w, p^m]$, $\delta_0 \leq \delta_{\underline{P}} \leq 1$.*

Proof. First, as $p^m \geq \underline{p}$, π^m and π^d are independent of $\underline{p}$. Second, as $\pi^{rpm} = (\underline{p} - w)F(\underline{p})$ is strictly increasing in $\underline{p}$ for all $\underline{p} < p^m$ (by the log-concavity of F), $\frac{n\pi^d}{n\pi^d - \pi^{rpm}}$ is monotonically increasing in $\underline{p}$. As $\underline{p} \to w$, $\pi^{rpm} \to 0$, so $\delta_{\underline{p}} \to \delta_0$. As $\underline{p} \to p^m$, $\pi^{rpm} \to \pi^m$, so $\frac{n\pi^d}{n\pi^d - \pi^{rpm}} \to \delta_0^{-1}$, which implies that $\delta_{\underline{p}} \to 1$. Thus, for all $\underline{p} \in [w, p^m]$, $\delta_0 \leq \delta_{\underline{P}} \leq 1$. □

Lemma 2. *For any w, the manufacturer's profit maximizing minimum resale price $\underline{p}^*(w) = \min_{\underline{p} \in G}\{\underline{p} : \delta - \delta_{\underline{p}} \leq 0\}$.*

Proof. Recall that $p = \min_r p_r$. For any w, $\pi_u = (w - c)F(p)$ is strictly decreasing in p for all $p > w$. Hence, u wants to set $\underline{p}$ to minimize $(p - w)$. For all $\delta > \delta_{\underline{p}}$, $p = p^m(w)$. As $\delta_{\underline{p}}$ is monotonically increasing in $\underline{p}$ (Lemma 1), the smallest $\underline{p}$ such that $p = \underline{p}$ is given by the $\underline{p}$ that leaves retailers indifferent between $p_r = p^m$ and $p_r = \underline{p}$, i.e., where $\delta_{\underline{p}} = \delta$. Confined to G, the result follows. □

Let $\underline{w}$ denote the manufacturer's profit maximizing wholesale price in the presence of a minimum resale price. Applying Lemmas 1 and 2 we can state the main result.

Theorem 1. $\underline{w} \leq w^* < \underline{p}^* < p^m$. *Therefore, implementing a minimum resale price* (i) *does not increase the wholesale price,* (ii) *increases both manufacturer profits and consumer surplus, and* (iii) *decreases the retail price and retail profits.*

Proof. Suppose that $\underline{w} = w^*$ and let $\underline{p}^*$ be defined as in Lemma 2. As $\delta < 1$, by Lemma 1, $p_r = \underline{p}^*$ for all r and $w^* < \underline{p}^* < p^{m*}$ (the monopoly price at w^*) for ε sufficiently small. Because the wholesale price is unchanged with the introduction of the minimum resale price and the minimum retail price is strictly lower, supplier profits are strictly higher with the minimum resale price. That consumer surplus increases and retailer profits decrease immediately follows.

Lastly, we show that the optimal wholesale price under the minimum resale price $\underline{w}$ is no greater than the wholesale price with no minimum resale price. Suppose to the contrary that the manufacturer sets a wholesale price $w' > w^*$. As we have already established that p^m is strictly increasing in w, the envelope theorem implies that π^m is strictly decreasing in w, as is π^{rpm}. Furthermore, note that $\delta_{\underline{p}}$ is decreasing in $\underline{p}$ if and only if $\underline{p} < p^m$, which is true. Therefore, $\underline{p}' > \underline{p}^*$, where $\underline{p}'$ is the minimum resale price given $w = w'$ (by Lemmas 1 and 2). Note that wholesale profits are maximized at $\hat{w} = \arg\max_{w \in G}(w - c)F(w)$. Thus,

$$\begin{aligned}
(\hat{w} - c)F(\hat{w}) &\geq (w^* - c)F(w^*) \\
&> (w^* - c)F(\underline{p}^*) \\
&> (w' - c)F(\underline{p}^*) \\
&> (w' - c)F(\underline{p}').
\end{aligned}$$

Hence, $(w^* - c)F(\underline{p}^*) > (w' - c)F(\underline{p}')$, a contradiction. Thus $\underline{w} \leq w^*$. □

Figure 1 illustrates the theorem, where the price falls from p^m to $\underline{p}^*$ and output rises from q^* to q^{rpm}.

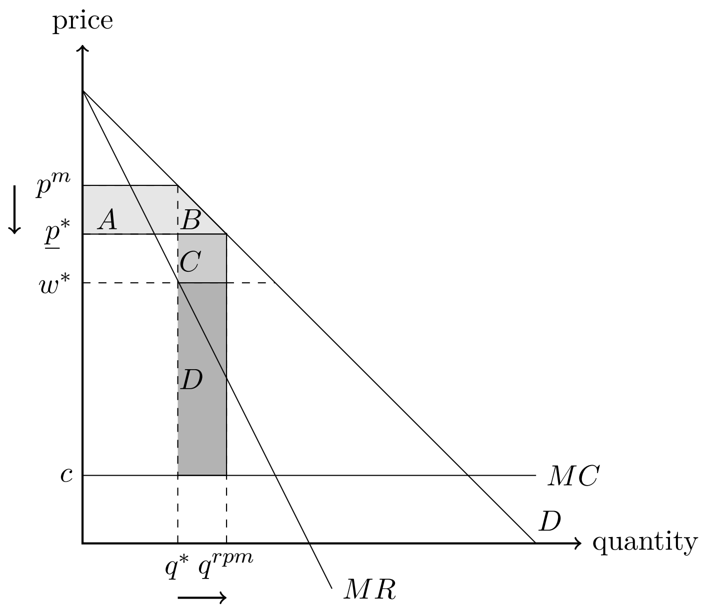

Figure 1: For simplicity, we fix $\underline{w} = w^*$ (which is true for linear demands $q = a - bp$ and constant-elasticity demands $q = ap^{\varepsilon}$) and consider continuous prices. q^* corresponds to the quantity when there is no minimum resale price, where the associated retail price is the monopoly price $p^m(w^*)$ and q^{rpm} corresponds to the equilibrium quantity given a minimum resale price of $\underline{p}^*$. $A + B$ is the increase in consumer surplus from implementing the minimum resale price at p^*. $C - A$ is the aggregate decrease retailer profits. D is the increase in manufacturer profits. $B + C + D$ is the decrease in deadweight loss.

Corollary 1. *Aggregate producer surplus is strictly higher in the presence of minimum RPM.*

Proof. Total industry profits are maximized at $p = \hat{w}$, as defined in the proof of Theorem 1. The log-concavity of F and $\hat{w} < \underline{p}^* < p^m(w^*)$ implies that $\pi_u(\underline{p}) + \pi^{rpm} > \pi_u(w^*) + \pi^m$. □

3 Conclusion

This paper shows a surprising result: a minimum resale price can *lower* the price paid by all consumers in cases when downstream retailers can either explicitly or tacitly (e.g., via lowest price guarantees) keep prices above the competitive level. A minimum resale price increases the continuation value of deviating from the collusive price and can break this high price outcome, resulting in lower retail prices. A policy of a maximum resale price could obviously achieve the same at a lower price to consumers and increased profits to manufacturers, but but the additional well-established benefits of a minimum resale price could imply minimum RPM is preferred when downstream services and inventories are sufficiently valued.

Lastly, it merits mention that the result is not unique to a monopolist manufacturer. The general result can extend to competition at both the downstream and upstream levels provided that the upstream manufacturers are sufficiently forward looking so that they prefer to maintain an agreement with a minimum resale price at $\underline{p}^*$ rather than undercutting each other with lower minimum prices or no minimum RPM.

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