Chapter 5

The anti-collusive effect of resale price maintenance

The manufacturers’ interests seem to be best served when distributors resell their products under such competitive conditions as may exist at the level of distribution and at the lowest prices resulting from that competition.

Lester G. Telser (1960, p. 86)

5.1 Introduction

This chapter revisits the topic of resale price maintenance (RPM), which is perhaps one of the oldest problems in the industrial organization literature. When an upstream firm engages in RPM, he limits the degree of freedom of downstream firms have in setting prices. An RPM agreement may prevent a downstream to charge below a certain threshold (a price floor), above a threshold (a price ceiling), or a combination of both. This chapter focuses on minimum RPM, or a price floor, which seems to be the most common form of RPM.\(^1\) The practice of RPM is puzzling. As Telser (1960) observed, there seems to be no good explanation for a manufacturer to constrain price competition among retailers, as high prices reduce final demand.

The literature offers three types of explanations.\(^2\) First, RPM may be used as

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\(^1\) Ippolito (1991), Table 2, reports that between 1976 and 1982 about 95% of the antitrust cases with a resale price maintenance charge involved minimum RPM. Throughout this chapter, the concepts of RPM and price floor are used interchangeably.

\(^2\) See Mathewson and Winter (1998) or Rey and Vergé (2003) for recent surveys.
part of a cartel between manufacturers (Jullien and Rey, 2007). The idea is that RPM reduces downstream price variation, and this helps to detect cartel deviations. Second, RPM could be used to maintain a cartel between retailers. In this scenario retailers force the manufacturer to impose and maintain a price floor. Third, RPM can be viewed as a method to induce retailers to provide the optimal level of services (Telser, 1960).

This chapter advances a different theory. Resale price maintenance, in the form of a price floor, enables the manufacturer to prevent the emergence of tacit collusion between retailers. The argument is relatively simple. When firms repeatedly interact, they may be able to coordinate on a collusive, but non-cooperative, equilibrium. In this equilibrium each firm sets the joint profit maximizing price in every period. A firm is willing to do this because he believes, correctly, that if he undercuts the monopoly price, all other firms lower their prices in the subsequent periods. Thus, collusion is sustained by a threat to punish a deviation. This strategy of tacit collusion does not work when firms are relatively impatient. In that case, they value the present profits from deviating from the cartel agreement higher than the delayed loss in profits as a result of the punishment. The discount factor for which firms are exactly indifferent between deviating from and complying with the cartel agreement is called the critical discount factor. If a variable, such as the number of firms, affects the critical discount factor, it affects the stability of a cartel. A price floor has an effect on the critical discount factor as well. By imposing a price floor, the manufacturer increases the non-cooperative profits a retailer earns in the punishment phase. This increases the critical discount factor, because higher non-cooperative retailer profits reduces the punishment for deviation.

The analysis below formalizes this intuition in the canonical model of a monopolistic manufacturer and two retailers. The key difference between the framework in this chapter and most of the theoretical literature is that this chapter studies RPM in an infinitely repeated game, whereas the literature typically restricts the analysis to a one-shot game. Notable exceptions are Jullien and Rey (2007) and Rey and Vergé (2008).

Although this alternative, anti-collusive interpretation of RPM seems counter-intuitive at first, it is consistent with some salient features of RPM. According to many observers, the pro-collusive interpretation of RPM is generally invalid. Ip-polito (1991) examines U.S. antitrust cases between 1976 and 1982, in which firms were alleged of engaging in (the illegal act of) RPM. She concludes that there is little evidence to support the hypothesis that RPM is used to maintain collusion. Coo-
per, Froeb, O’Brien and Vita (2005) summarize the empirical research on vertical restraints and reach the same conclusion.

Telser’s (1960) service provision theory, and its variants, seems to better fit Ippolito’s (1991) data. However, service provision cannot explain the existence of price floors on markets for relatively simple goods, such as refined sugar, beer, milk or candy.

These observations necessitate an alternative explanation for the use of RPM for simple goods. The theory in this chapter explains the existence of price floors for such products. In the suggested model, it is perfectly rational for a manufacturer to impose a price floor. The model also explains a remarkable empirical stylized fact. According to Overstreet (1983), prices in “traditional stores” fall after a price floor is imposed. Exactly this is predicted by the model below.

Additionally, Dufwenberg, Gneezy, Goeree and Nagel (2007) obtain, in a laboratory experiment, results that are predicted by the analysis in this chapter. Dufwenberg et al. (2007) consider the effect of an increase in the price floor on the pricing behavior of subjects in a Bertrand game. They find that, on average, the lowest (market) price decreases as the price floor increases with two competitors. The opposite holds for sessions with four competitors. Hence, an increase of the price floor tends to decrease prices but only if collusion was stable before the treatment.

Before presenting the formal model, it may be appropriate to briefly summarize the current legal status of RPM. Traditionally, RPM is subject to a much more stringent treatment than other, sometimes outcome-equivalent, vertical restraints such as exclusive dealing or tie-ins. The European Commission views price floors generally as anti-competitive. In the United States, RPM is considered as illegal since Dr. Miles in 1911. Last year, however, the Supreme Court overruled this position in Leegin and RPM is now subject to a rule of reason. The next section introduces the formal model. Sections 5.2.2 and 5.2.3 develop the main result of this chapter, namely that price floors may have an anti-collusive effect. It is shown that this result extends to competition with differentiated products in section 5.2.4. Section 5.3 concludes.

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3 The Commission’s position is further explained in Guidelines on Vertical Restraints, Official Journal of the European Communities, October 13, 2000.

4 Dr. Miles Medical Co. v. John D. Park and Sons Co., 220 U.S. 373 (1911).

5.2 The model and analysis

5.2.1 Preliminaries

An upstream firm, the manufacturer, produces a good at zero marginal costs. The manufacturer sets a linear price $c$ to maximize profits. The product is the sole input factor of two downstream firms, retailer 1 and 2. They produce a homogeneous good which is sold to the final consumers. The retailers compete by simultaneously announcing prices. Demand is given by $Q(p)$, where the market price $p$ is the minimum of $p_1$ and $p_2$. Demand is equally split between retailers whenever $p_1 = p_2$. As is standard, market demand is decreasing in the market price, and there exists a unique $p_k(c) \geq 0$ which maximizes $(p - c)Q(p)$. The downstream firms may engage in tacit collusion and, if they elect to do so, they maintain cooperation through grim trigger strategies.

The timing of the game is as follows. First, the manufacturer announces the wholesale price $c$ and, possibly, the price floor $f \geq c$. Subsequently, the two downstream firms observe $c$, which defines their common marginal costs, and may form a cartel. Then, the retailers interact an infinite number of times on the market stage. Time is discrete and firms use a common discount factor $\beta \in (0, 1)$ to weigh future payoffs.

5.2.2 Equilibrium

The assumption of perfect substitutes implies that non-cooperative price competition yields the retailers zero profits. In the non-cooperative equilibrium, the retailers set their prices equal to marginal costs in every stage game. By colluding on the monopoly price, each retailer earns a stage profit of

$$\pi^k = \frac{1}{2} \left( p^k - c \right) Q \left( p^k \right).$$

The retailers may not be able to coordinate on the monopoly price. When it is more profitable for a cartel member to deviate from the agreement and undercut his fellow cartel member, collusion is unstable. An optimal deviation from the collusive agreement is to set $p^k - \epsilon$, with $\epsilon$ arbitrarily small but positive. The associated stage profits are

$$\pi^d = \left( p^k - c \right) Q \left( p^k \right).$$
With grim trigger strategies, defection is not profitable if
\[
\frac{1}{2} \frac{1}{1 - \beta} \left( p^k - c \right) Q\left( p^k \right) > \left( p^k - c \right) Q\left( p^k \right)
\]
and this simplifies to
\[
\beta > \frac{1}{2}.
\]
So, the stability of the cartel, and therefore the likelihood that collusion emerges, is independent of \( c \). In the first period, the manufacturer maximizes profits by setting \( c \) such that
\[
Q\left( c \right) + cQ'\left( c \right) = 0 \tag{5.1}
\]
if \( \beta \leq \frac{1}{2} \). For this case, the manufacturer charges the monopoly price of the fully integrated structure, \( p^k(0) \). Otherwise, he maximizes \( cQ\left( p^k\left( c \right) \right) \). The corresponding first-order condition is
\[
Q\left( p^k \right) + \frac{cQ'\left( p^k \right)^2}{\left( p^k - c \right) Q''\left( p^k \right) + 2Q'\left( p^k \right)} = 0. \tag{5.2}
\]
Hence, the manufacturer obtains the profits of the fully integrated vertical structure if the retailers are sufficiently impatient. When the retailers are patient, and form a cartel, the classic double marginalization problem arises, at the expense of the manufacturer.

### 5.2.3 A price floor

Now, suppose that the manufacturer is allowed to impose a price floor \( f \geq c \). In a standard static game doing so would be irrational, because a profit-maximizing manufacturer wishes to maximize sales, given that everything else stays the same. Under a price floor, sales (and therefore the manufacturer’s profit) would typically decrease. The simple message of this chapter is that ‘everything else’ does not stay the same when the manufacturer introduces a price floor. In a dynamic environment, a price floor may be profitable for the manufacturer, as it induces non-cooperative behavior from retailers who would otherwise form a cartel.

Under a price floor agreement, the retailers agree not to sell at a price below \( f \). It is assumed that the manufacturer is capable of enforcing the contract.
Note first that the non-cooperative profits increase under a price floor. Retailers would charge $f$, which is strictly above marginal cost. The non-cooperative profits become
\[
\pi^N = \frac{1}{2} (f - c) Q(f).
\]
The collusive and defection profits are unaffected by the price floor. The optimal cartel price is still $p^k(c)$. Of course, this assumes that $p^k(c) > f$. A price floor above the cartel price can never be in the interest of the manufacturer. The condition for cartel stability changes to
\[
\left( p^k - c \right) Q\left( p^k \right) + \frac{1}{2} \frac{\beta}{1 - \beta} (f - c) Q(f) < \frac{1}{2} \frac{1}{1 - \beta} \left( p^k - c \right) Q\left( p^k \right). \tag{5.3}
\]
It is straightforward to show that for any $\beta \in (0, 1)$, there exists an $f$ such that the above inequality is violated (and collusion is infeasible). A profit-maximizing manufacturer would clearly impose a price floor when $\beta > 1/2$. To see this, fix $c$. Without a price floor, the retailers form a cartel (since they are sufficiently patient and collusion is profitable) and the manufacturer’s profit is $c Q(p^k(c))$. By imposing the lowest $f \in (c, p^k)$ such that 5.3 is violated, collusion breaks down. The manufacturer’s profit increases to $c Q(f)$. These observations imply the main result.

**Proposition 5.1.** If $\beta \leq 1/2$, the retailers act non-cooperatively and set price equal to their marginal cost (the wholesale price $c$). The manufacturer chooses $c$ such that $c Q(c)$ is maximized. If $\beta > 1/2$ the manufacturer induces non-cooperative behavior by imposing a price floor $f$. The retailers obtain a positive profit. The manufacturer selects $f$ such that 5.3 holds with equality.

A price floor enables the manufacturer to induce non-cooperative behavior among the downstream firms. The existing literature takes downstream behavior as given, and therefore concluded that a manufacturer cannot profitably impose a binding price floor.

### 5.2.4 Product differentiation

The above analysis assumes that the retailers produce perfect substitutes. This may be reasonable when retailers just serve as outlets of the manufacturer and do not add any value to the product. Typically, however, retailers do add value and differentiate themselves away from their rival’s product. This section shows that the
anti-collusive effect of resale price maintenance can be easily extended to differentiated products. Suppose that
the retailers produce imperfect substitutes and retailer \( i \)'s demand is given by

\[
q_i = \frac{1}{2} \left( 1 - p_i \left( 1 + \frac{d}{2} \right) + \frac{dp_j}{2} \right)
\]

(5.4)

where \( d \in [0, \infty), i = 1, 2 \) and \( i \neq j \). This demand specification was proposed by Shubik (1980) and applied by, amongst others, Rothschild (1992) and Albæk and Lambertini (1998). The degree of substitution is captured by \( d \). For \( d = 0 \), the firms offer independent products and are \textit{de facto} monopolists. As \( d \) increases, the products become increasingly similar. It can be shown that (5.4) is a special case of Singh and Vives’ (1984) specification.

The game is solved through backward induction. Suppose the manufacturer announces \( c \geq 0 \) in the first period. Then, if the retailers act non-cooperatively at each subsequent market stage, they charge

\[
p^N = \frac{2 + 2c + cd}{4 + d}
\]

(5.5)

in the symmetric equilibrium. The retailers are active if and only if \( c \leq 1 \), since they incur negative profits otherwise. Given non-cooperative behavior, the manufacturer maximizes

\[
\pi_M^c = c \left( 1 - \frac{2 + 2c + cd}{4 + d} \right)
\]

(5.6)

with respect to \( c \). At the optimum, the manufacturer sets \( c = 1/2 \). Then, the stage profits of the retailers and manufacturer become

\[
\pi_R^N = \frac{2 + d}{4(4 + d)^2}, \quad \pi_M^N = \frac{2 + d}{16 + 4d}.
\]

(5.7)

When the retailers form a cartel, the optimal cartel price is given by \( \frac{1+c}{2} \). Again, it is optimal for the manufacturer to set \( c = 1/2 \). The stage profits are \( \pi_R^k = 1/32 \) and \( \pi_M^k = 1/8 \). Remarkably, profits are independent of \( d \) in the presence of a downstream cartel.

As before, the retailers should have no incentive to defect from the cartel agreement. If a retailer considers to violate the (tacit) agreement, his optimal deviation
price is
\[
p^d = \begin{cases} 
\frac{12+5d}{16+8d} & \text{for } d \in \left[0, 2(1 + \sqrt{3})\right] \\
\frac{3}{4} - \frac{1}{2d} & \text{for } d > 2(1 + \sqrt{3})
\end{cases}
\] (5.8)

The optimal deviation price as a function of \(d\) has a kink at \(2(1 + \sqrt{3})\), because for \(d > 2(1 + \sqrt{3})\), the defector’s rival is pushed out of the market. See Albæk and Lambertini (1998) for details. The corresponding deviation profits are

\[
\pi^d_R = \begin{cases} 
\frac{(4+d)^2}{256(2+d)} & \text{for } d \in \left[0, 2(1 + \sqrt{3})\right] \\
\frac{(d-2)(d+1)}{16d^2} & \text{for } d > 2(1 + \sqrt{3})
\end{cases}
\] (5.9)

Now, consider the effects of a price floor. If the manufacturer chooses to impose a price floor \(f > c\), it needs to have a destabilizing effect on the cartel. Otherwise, it is optimal for the manufacturer to choose \(f \leq c\). An optimal price floor should satisfy \(p^N < f < p^k\), because a floor below the Nash price is ineffective, and a floor above the collusive price is costly to the manufacturer. Then, given that the price floor binds, the manufacturer maximizes \(2cq\) subject to the constraint that collusion is not feasible. Let \(\beta(c, f)\) be the critical discount factor for which collusion is just feasible. Now, the objective function can be rewritten as

\[
\max_{\{c, f\}} c(1 - f) \quad \text{s.t. } f \in \left[\frac{2+2c+cd}{4+d}, \frac{1+c}{2}\right] \quad \text{and} \quad \beta < \beta(c, f). \tag{5.10}
\]

To simplify this problem a bit, suppose that \(d \in \left[0, 2(1 + \sqrt{3})\right]\) and \(f > p^d\), where \(p^d\) is given by (5.8). Then, collusion is not feasible under grim trigger strategies if

\[
\left(\frac{f-c}{2}\right) \left(1-f \left(1 + \frac{d}{2}\right) + \frac{d}{2} \frac{1+c}{2}\right) + \frac{\beta}{1-\beta} \left(\frac{f-c}{2}\right)^2 \left(1-f \left(1 + \frac{d}{2}\right) + \frac{d}{2} \frac{1+c}{2}\right) > \left(\frac{1}{1-\beta} \frac{1}{2} \left(1+\frac{1+c}{2} - c\right) \left(1 - \frac{1+c}{2} \left(1 + \frac{d}{2}\right) + \frac{d}{2} \frac{1+c}{2}\right) \right) \tag{5.11}
\]
This can be simplified to
\[ \beta < \frac{1 + c + cd - 2f - df}{cd - df} = \beta(c, f). \] (5.12)

Since the manufacturer’s profit is decreasing in \( f \), it must be optimal to choose \( f \) such that (5.12) holds with equality. Then, collusion is prevented at the lowest cost to the manufacturer. Substituting \( f(\beta, c) \) into the objective function yields
\[ \pi_M(c, f) = c \left( 1 - \frac{1 + c + cd - cd\beta}{2 + d - d\beta} \right). \] (5.13)

At the optimum, \( c = 1/2 \) and
\[ f = \frac{3 + d - d\beta}{4 + 2d - 2d\beta}. \] (5.14)

It is straightforward to check that \( f > p^d \) for all \( \beta > 1/2 \). The manufacturer’s profit becomes
\[ \pi_M = \frac{1 + d - d\beta}{8 + 4d - 4d\beta}. \] (5.15)

As this is larger than 1/8, the manufacturer is better off by using a price floor as a tool to prevent downstream collusion.

It may be instructive to examine the optimal price floor (5.14) more closely. Taking the first derivative with respect to \( d \), one sees that
\[ \frac{\partial f}{\partial d} = -\frac{1 - \beta}{2(-2 + d(\beta + 1))^2} < 0. \] (5.16)

So, the price floor decreases in the degree of product differentiation. The reason is that collusion becomes harder to sustain as \( d \) increases on the interval \([0, 2(1 + \sqrt{3})]\). As a result, \( f \) is allowed to decrease. The same intuition applies for increases in the discount factor:
\[ \frac{\partial f}{\partial \beta} = \frac{d}{2(-2 + d(\beta + 1))^2} > 0. \] (5.17)

When firms become more patient, collusion is easier to sustain, and the manufacturer has to increase the attractiveness of defection by increasing the price floor.
5.3 Concluding remarks

Price floors, or minimum RPM, can serve as an instrument to combat collusion between retailers. This is, to the best of my knowledge, a novel interpretation of RPM. The traditional view holds that RPM promotes collusion or prevents retailers from free-riding in the provision of service. The available empirical evidence is slated against the pro-collusion argument and, moreover, it is difficult to understand why a manufacturer would impose a price floor to sustain a retailer cartel. The service provision theory seems more promising, but it cannot explain price floors for simple goods. The theory advanced in this chapter explains the use of RPM for these markets and is consistent with recent experimental evidence (see Dufwenberg et al., 2007).

In 2007, the U.S. Supreme Court decided that RPM must be judged by the rule of reason. This chapter provides an additional argument in favor of this decision by qualifying the existing pro-cartel arguments against RPM.

The reader may wonder whether the manufacturer has alternative anti-cartel instruments at its disposal. In particular, why would the manufacturer not simply report collusive behavior to the antitrust authority. This may be difficult when the manufacturer lacks hard evidence, as pure tacit collusion is virtually impossible to prosecute. Another strategy could be for the manufacturer to integrate with one downstream retailer and foreclose the other. This enables the manufacturer to prevent collusion and obtain the maximum attainable profits. Clearly, foreclosure is more profitable than a price floor, but may be blocked by the antitrust authority.

The results of this chapter by no means imply that each type of vertical restraint is anti-collusive. It is conceivable that other restraints, such as two-part pricing, actually induce collusion. Under two-part pricing, the manufacturer charges each retailer a linear price, plus a fixed franchise fee. The manufacturer could obtain the profits of the fully integrated structure by charging a linear price equal to his own marginal costs and set the franchise fee equal to the collusive profit. Then, the retailers are essentially forced to organize a cartel, otherwise they would be unable to repay the fee.