Resale Price Maintenance and Restrictions on Dominant Firm and Industry-Wide Adoption

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1 Introduction

In 1911, the U.S. Supreme Court in Dr. Miles v Park & Sons implemented a general ban on resale price maintenance (RPM) on the grounds that "vertical price fixing" was almost always anti-competitive. Over time, however, the definition of what constituted RPM was narrowed, and in the Court's landmark decision in June 2007, the nearly one hundred year old ban on RPM was overturned.[3] Like other vertical restraints, the competitive effects of RPM are now to be judged by the rule of reason.

The rule-of-reason approach is viewed by many as being more appropriate than a per se approach because, in addition to concerns about the use of RPM to facilitate cartels and dampen competition,[4] it is widely believed that RPM can also have efficiency benefits.[5] However, a full-blown rule-of-reason approach is potentially very costly in terms of time and resources. In practice, therefore, when evaluating whether or not a particular practice or vertical restraint should be challenged, the courts and competition authorities often use a more structured rule-of-reason approach in which individual firm and industry-wide "safe harbors" are established. If the adoption of a particular practice is found to lie within these safe harbors, then the practice at hand is typically not challenged. But if its adoption is found to lie outside of these safe harbors, then the practice typically receives greater scrutiny.

Both the European Commission and the U.S. Department of Justice see collusion as the main threat from vertical restraints in general.[6] One thus typically observes two types of safe harbors: (i) restrictions on dominant firm adoption, and (ii) restrictions on industry-wide adoption. According to guidelines in the U.S., the practice would not be challenged if, among other things, industry-wide adoption of the practice accounted for less than 60% of the relevant market and the firm employing the restraint had a market share of 10% or less.[7] The European Commission's

[3] See the Court's decisions in Monsanto v Spray Rite, 1984; Business Electronics v Sharp Electronics, 1988; State Oil v Khan, 1997; and Leegin Creative Leather Products v. PSKS, 2007.

[4] See, for example, Jullien and Rey (2007) and the discussion in Overstreet (1983).

[5] See the articles by Telser, 1960; Marvel and McCafferty, 1984; Mathewson and Winter, 1984; Perry and Besanko, 1991; and Winter, 1993.

[6] Easterbrook (1984: 162) opines that "every one of the potentially-anti-competitive outcomes of vertical arrangements depends on the uniformity of the practice."

[7] These guidelines were issued in 1985 by the Department of Justice in order to reduce the busi-

vertical-restraints guidelines offer a block exemption for vertical restraints used by firms with a market-share below 30%, but, at the same time, the guidelines enable the Commission to exclude from the scope of the block exemption any given type of vertical restraint where the restraints cover more than 50% of the relevant market.

In this paper, we examine the use of safe harbors (and the market-share thresholds that are implicitly or explicitly behind them) when evaluating whether a given restraint should be challenged. To this end, we set up a model *a la* Shaffer (1991) with perfect competition upstream and market power downstream.[8] We then solve for the equilibrium of the model with and without restrictions on the use of RPM. We consider two types of restrictions: (i) a restriction on the extent of industry-wide adoption of RPM, and (ii) a restriction on the adoption of RPM by dominant firms.

Our first contribution is to show that even though each firm in the model uses RPM to dampen competition, market forces may nevertheless suffice to minimize its overall impact. RPM might even become harmless. To demonstrate this, we start by assuming there are no restrictions on the use of RPM. We consider a game in which at stage one, retailers choose between a contract that specifies a wholesale price and RPM and a contract that only specifies a wholesale price. At stage two, retailers that choose the latter (only a wholesale price) compete in prices, while the others set the RPM price they committed to in stage one. There exist multiple equilibria in this game. In one equilibrium, all firms choose RPM. In this equilibrium, the firms compete as if they were in a simultaneous Bertrand pricing game, and RPM has no effect. In the other equilibria, all but one firm commits to RPM in stage one.

Our second contribution is to show that a ban on the use of RPM by a dominant firm always increases welfare, whereas placing restrictions on the extent of industry-

ness uncertainty associated with antitrust enforcement in this area. However, they immediately met opposition from Congress, which felt that they were a thinly veiled attempt to treat price and non-price restraints alike, and were rescinded in 1993 because of the administration's perception that they were to quick to "... discount the anti-competitive potential of vertical intrabrand restraints and so easily to assume their efficiency-enhancing potential as to predetermine the conclusion against enforcement action in almost every case (www.usdoj.gov/atr/public/speeches/0867.htm)."

[8] In Leegin it was alleged that the manufacturer was small, had no market power, and operated in an environment in which RPM was not pervasive and in which the market was competitive. It was also alleged that the use of RPM in this case was within traditionally recognized safe harbors.

wide adoption of RPM may have adverse welfare effects.[9] The latter finding is due to the fact that beyond the threshold, average retail prices may be decreasing—thus benefiting consumers and increasing welfare—in the number of firms using RPM.

With the Supreme Court's recent decision in Leegin, it becomes increasingly important to analyze the effects of a structured rule-of-reason regarding vertical price-fixing restraints.[10] The present article is the first that we know of to address the subject of guidelines and what should go in them. An important recent article by Dobson and Waterson (2007) analyzes industry-wide adoption of RPM by comparing the outcome if all firms use RPM to the outcome if no firms use RPM. In contrast, in our model, the choice of whether to adopt RPM is endogenous. Another difference is that Dobson and Waterson (2007) have shown that by eliminating double marginalization, RPM may have beneficial welfare effects if manufacturers have enough bargaining power. In contrast, because the retailers in our model have all the bargaining power, double marginalization does not occur even in absence of RPM. We nonetheless also find that RPM may have relatively benign welfare effects.

The rest of the paper proceeds as follows. In Section 2, we describe the model and solve for the equilibrium outcomes when there are no restrictions on the adoption of RPM. In Section 3, we first analyze the policy implications of limiting industry-wide adoption of RPM. We then analyze the implications of prohibiting the adoption of RPM by a dominant firm. In the last section, Section 4, we offer concluding remarks.

2 The Model

We consider a market structure in which n differentiated retailers buy a homogeneous input from a manufacturing sector that is perfectly competitive. The upstream firms have constant marginal costs $c \geq 0$. The downstream firms' marginal costs

[9]Although we focus exclusively on anti-competitive motives for adopting RPM, allowing for efficiencies in the model would only strengthen our qualitative conclusions. If firms are adopting RPM for efficiency reasons, then restrictions on industry-wide usage of RPM would lower welfare.

[10]This issue was recognized by the Supreme Court in Leegin, which noted that "as lower courts gain experience considering the effects of these restraints by applying the rule of reason over the course of decisions, they can establish the litigation structure to ensure the rule operates to eliminate anticompetitive restraints from the market and to provide more guidance to business."

are normalized to zero. One unit of input is needed to produce each unit of output.

The timing of the game is as follows. In stage one, each retailer chooses which of the numerous upstream firms will be its supplier and agrees on contract terms. All contracts specify a wholesale price and may or may not specify a retail price (RPM) at which the product is to be sold to end users. Contracts that specify a retail price are called RPM contracts. Contracts that do not specify a retail price are called non-RPM contracts. In stage two, retailers with non-RPM contracts choose prices and retailers with RPM contracts set the RPM prices they agreed to in stage one.[11]

We assume the RPM contracts signed in stage one are observed by all retailers prior to the start of stage two. This gives the RPM contracts commitment power and implies that retailers who sign RPM contracts in stage one are in effect choosing to become price leaders (l) in stage two, while retailers who do not sign RPM contracts in stage one are in effect choosing to become price followers (f).[12] We further assume that the players in each stage have perfect knowledge of how their actions affect the actions in all succeeding stages, and that all information is common knowledge.[13]

The assumption that contracts are observable merits further discussion. If instead contracts were unobservable, then the game would be solved as if all retail prices were chosen simultaneously, and there would be no commitment value to signing an RPM contract. In this case, Bertrand prices would prevail. Clearly, it is in the interest of the retailers to ensure that their contracts are observable and that rivals believe they are bound to them. Whether this is possible may depend on the existence of trade associations and long-run reputational issues that lie outside the scope of this paper. Alternatively, one can imagine that contracts might be imperfectly observed, or observed with some probability. In these intermediate

[11]At this point, it is helpful to think of the RPM prices as fixed. As we proceed, it should become apparent that price floors would work equally well. We assume for simplicity that RPM contracts can be enforced by large penalties if the terms are violated. We also assume that the contracts signed in stage one cannot be renegotiated in stage two, after rivals' contract choices are observed.

[12]This idea is based on the strategic delegation literature, where the seminal article is Fershtman and Judd (1987). Shaffer (1991) compares slotting allowances and RPM and shows that both may be used to dampen competition if it is the retailers - not the suppliers - who have the bargaining power. Gal-Or (1991), Bonanno and Vickers (1988) and Rey and Stiglitz (1988, 1995) build on the same framework, but they assume that the bargaining power is in the hands of the suppliers. See also the articles by Jansen (2003), Corts and Neher (2003), and Moner-Colonques et. al. (2004).

[13]Our set up is thus identical to that in Shaffer (1991) except that we allow for $n > 2$ retailers.

cases, the ability of RPM to dampen competition in what follows would surely be compromised but not eliminated, and we would expect our results to go through.

The assumption that differentiation occurs only at the downstream level is a useful simplification that captures situations in which manufacturers claim to have little or no market power. Alternatively, one can imagine differentiation at both the upstream and the downstream levels—in this case, we would still expect market participants to be better off if they can sort themselves into leaders and followers.

The rest of our assumptions are straightforward. Following much of the vertical literature, we assume the demand faced by retailer i is given by $D^i(\mathbf{p})$, where $\mathbf{p}$ is the vector of prices charged by the n retailers, and satisfies the usual properties:

$$D_i^i < 0, \quad D_j^i > 0, \quad D_{ij}^i > 0 \quad D_i^j < -D_i^i \quad i, j = 1, ...n., \ i \neq j. \tag{1}$$

With subscripts indicating partial derivatives with respect to retail prices, condition (1) implies that (i) demand is downward sloping, (ii) the products are imperfect substitutes, (iii) the marginal demand effect of a price increase by retailer i is strictly increasing in retailer j's price (this ensures that retail prices are strategic complements, as defined in Bulow et al, 1985), and (iv) own effects dominate cross effects.

Given these assumptions, we can write retailer i's profit, and the profit of the manufacturer who supplies it, as

$$\pi_i = (p_i - w_i)D^i(\mathbf{p}), \tag{2}$$

and

$$\pi_i^M = (w_i - c)D^i(\mathbf{p}). \tag{3}$$

respectively, where p_i is retailer i's price and w_i is the price paid to the manufacturer.

Henceforth, we will assume that π_i is concave in p_i, and that in any subgame, there is a uniqueness of equilibrium which is characterized by first-order conditions.

2.1 Market equilibrium

In solving the game, it is useful to make two preliminary observations. The first is that the manufacturers' participation constraints will be binding ($\pi_i^M = 0$) in any equilibrium whether or not RPM is offered. This implies that $w_i = c$ in all equilibria (one can think of the retailer as making a take-it-or-leave-it offer to its chosen supplier, which the supplier will agree to provided it expects to earn non-negative payoff under the offered terms).[14] The second is that in any equilibrium in which retailer i has an RPM contract, p_i maximizes its profit given the other leaders' prices and taking into account the effects of the leaders' prices on the prices to be set by the followers. Thus, in any equilibrium, retailer i's RPM price solves

$$p_i = \arg\max_{p_i} \ (p_i - c)D^i(p_1^l, ..., p_i, ..., p_m^l, p_{m+1}^f, ..., p_n^f),$$

where the superscript l denotes a leader's price and f denotes a follower's price.

Let retailers 1 through m be leaders and retailers $m+1$ through n be followers. Then the following must be true.

Proposition 1: *There are n subgame-perfect equilibria of the game with $m^* = n-1$ leaders, and one subgame-perfect equilibrium of the game with $m^* = n$ leaders.*

Proof: See appendix.

To see why there can be no other equilibria, suppose the number of leaders equals

- $m = 0$. In this case, each firm earns its Bertrand profit with differentiated products—which is less than what it could earn by unilaterally deviating to an RPM contract. By becoming a *de facto* Stackelberg leader, the firm can essentially pick its profit-maximizing point on its rivals' reaction functions (which it cannot do if all firms choose prices simultaneously). Thus, $m = 0$ cannot arise in equilibrium.

- $m < n - 1$ (so that there are $n - m$ followers). In this case, the prices of the m firms with RPM contracts, which are chosen in stage one, are essentially fixed at stage two. Given this, would a follower have an incentive to deviate and sign an RPM contract? The answer is yes for the same reason as in the case above: as a Stackelberg leader, a retailer can pick her optimal retail price on the $n - m - 1$ followers' reaction functions.[15] Consequently, $m < n-1$ cannot arise in equilibrium.

[14] We have assumed that fixed fees are infeasible. If they are not feasible and wholesale prices are observable, then retailers may agree to $w_i > c$ in exchange for slotting fees (see Shaffer (1991).

[15] By the same logic, none of the price leaders would prefer to become a price follower.

• $m = n - 1$. In this case, there is only one follower. The follower will therefore have nothing to gain by becoming a leader herself (unlike in the two cases above, there are no other followers' reaction functions to exploit). Moreover, none of the leaders have anything to gain by becoming a follower because each would then lose its opportunity to pick its preferred point on the other follower's reaction function. Therefore, $m = n - 1$ can arise in equilibrium, and there are n such equilibria.

• $m = n$. In this case there are no followers, and no retailer can gain by becoming a follower when all other firms are leaders. It follows that $m = n$ is an equilibrium.

We thus have multiple equilibria: there are n subgame-perfect equilibria with $n - 1$ leaders (where the equilibria are distinguished by which firm is the follower), and one subgame-perfect equilibrium in which all firms are (or try to be) leaders. Note that the case of $m = n$ means that all firms have committed in stage 1 to an RPM contract that effectively fixes their retail prices in stage 2. When this happens, all firms are *de facto* choosing prices simultaneously (albeit in stage one instead of in stage two), and hence, the equilibrium in which all firms are leaders ($m^* = n$) leads to the same prices and profits that would arise in an n-firm Bertrand pricing game in which all firms are followers ($m = 0$). This observation will prove useful in what follows because although the case of $m = 0$ does not arise in an unrestricted market equilibrium, it would arise, for example, if there were a general ban on RPM.

Note also that prices and profits are higher in a Stackelberg game with leaders and followers than in a Bertrand game in which n firms simultaneously choose prices, and that this holds for all equilibria with $n - 1$ leaders. Thus, it follows that all retailers (the leaders and the follower) will have higher prices and profits in all equilibria with $n - 1$ leaders compared to the equilibrium where $m^* = n$ are leaders.

2.2 Welfare

Because prices are higher when there are $n - 1$ leaders than when there are n leaders, the deadweight loss will be higher when $m^* = n - 1$. Let welfare (W) be the sum of consumer surplus and profits, and let $W_{m=0}$ denote welfare in the simultaneous Bertrand game in which no firm has signed an RPM contract, $W_{m=n}$ denote welfare in the simultaneous Bertrand game in which all firms have signed RPM contracts, and $W_{m=j}$ denote the maximum welfare in any subgame equilibrium in which exactly j firms have signed RPM contracts, where $j \leq n-1$.[16] Then, our results imply:

Proposition 2: *For all* $1 \leq j \leq n-1$, *welfare is such that* $W_{m=0} = W_{m=n} > W_{m=j}$. *It thus follows that welfare is strictly higher when* $m^* = n$ *than when* $m^* = n-1$.

It can be shown that the welfare difference between $m^* = n-1$ and $m^* = n$ can be relatively large when n is small (for example, when $n = 2$, welfare is minimized when $m^* = n-1$, as shown in Shaffer, 1991). However, the difference decreases in n and vanishes in the limit. This relationship will be analyzed in more detail below, where we also discuss how the welfare effects of RPM - and of a policy that restricts its use - depend on the degree of substitution among retailers. Note that our results in Propositions 1 and 2 hold whether or not demands are assumed to be symmetric.

3 Policy implications

3.1 Restrictions on Industry-Wide Adoption

Safe harbors in vertical-restraints guidelines are meant to provide policy makers with roadmaps to better decision making. One such safe harbor concerns the prevalence of the practice in the relevant upstream or downstream market and is typically specified in terms of a market-share threshold, e.g., a firm's use of RPM is permissible if RPM accounts for less than 50% of the sales in a market. Unfortunately, when retailers are asymmetric in size, a cap on the percentage share of sales in a given market that can be covered under RPM does not easily translate into a prescription for how many firms can adopt RPM before it receives some scrutiny. To simplify, we therefore specialize now to the case in which all n retailers are ex-ante symmetric.

When retailers are ex-ante symmetric, the number of firms that can safely adopt RPM without scrutiny is approximately n times the market-share threshold used in

[16] We allow for the possibility that the retailers may be asymmetric. When this is the case, the identity of the leaders and followers matter for prices, profits, and welfare. We will explore this issue further in Section 3.2, when we consider the effects of restrictions on dominant firm adoption.

the guidelines.[17] Let k denote the largest integer that is less than or equal to this number. Two polar cases are worth noting. Under a policy of laissez-faire, all firms are allowed to adopt RPM, and the market-share threshold is effectively 100%. In this case, $k = n$. On the other hand, if all instances of RPM are subject to scrutiny, then $k = 0$, and the threshold is 0%. This corresponds to a per-se prohibition if it effectively implies that no firm can adopt RPM. For all other cases, $k \in \{1, ..., n-1\}$.

Because RPM has no efficiency justification in our model, we assume that it will be challenged if it is subjected to scrutiny (i.e., if the safe-harbor threshold is exceeded).[18] It follows that k will be the upper bound on the number of retailers that may adopt RPM. Using Proposition 1, we thus have the following result:[19]

Proposition 3: *Under a safe-harbor threshold that allows $k \leq n-1$ firms to adopt RPM without scrutiny, the equilibrium number of leaders will be $m^* = k$ for all $k \leq n-1$. Under a laissez-faire policy that allows all n retailers to adopt RPM without scrutiny, the equilibrium number of leaders will be $m^* = n-1$ or $m^* = n$.*

Given that the only rationale for using RPM in the model is to dampen competition, one might expect that a policy of limiting the scope of coverage, while not first best, would still be better than doing nothing. However, this need not be true. Welfare under a laissez-faire policy may be strictly higher than welfare under even the most judiciously chosen safe harbor. We shall now demonstrate this in a simple way by assuming that consumers have the following quadratic utility function:

$$U(q_1.., q_i, .., q_n) = v \sum_{i=1}^{n} q_i - \frac{n}{2} \left[(1-b) \sum_{i=1}^{n} q_i^2 + \frac{b}{n} \left(\sum_{i=1}^{n} q_i \right)^2 \right]. \tag{4}$$

The parameter $v > 0$ is a measure of market size, $q_i \geq 0$ is the quantity consumed of retailer i's product, $n \geq 2$ denotes the number of retailers, and $b \in [0, 1]$ measures the degree of differentiation (e.g., the retailers' products are independent at $b = 0$

[17] It is approximate because the prices of the leaders will in general be higher than the prices of the followers, thus causing each leader's share to be somewhat smaller than each follower's share.

[18] This may be justified, for example, if policy makers hold the view that in the absence of clear efficiencies, RPM is likely to be facilitating a cartel.

[19] Note that Proposition 3 would hold even if demands were asymmetric; the only reason we have assumed ex-ante symmetry is that this allows us to translate market shares into number of firms.

and identical at $b = 1$).[20] Note that (4) implies that the retailers are ex-ante symmetric.[21]

Solving $\partial U/\partial q_i - p_i = 0$ for $i = 1, ..., n$, we find that

$$q_i = \frac{1}{n}\left(v - \frac{p_i}{1-b} + \frac{b}{1-b}\bar{p}\right), \tag{5}$$

where $\bar{p} = \frac{1}{n}\sum_{j=1}^{n} p_j$. The demand function facing retailer i is thus a linear combination of its own price p_i and the average price, $\bar{p}$. Total demand equals $Q = \sum_{i=1}^{n} q_i = v - \bar{p}$.

As before, we assume that m retailers are leaders, while the remaining $n - m$ retailers are followers. For the sake of simplicity, we let $c = 0$. In stage two, any followers set p_i^f. Solving $\partial \pi_i^f/\partial p_i^f = 0$ and then imposing symmetry, we find that:

$$\widehat{p^f} = \frac{v(1-b)n}{n(2-b) + b(m-1)} + \frac{b}{n(2-b) + b(m-1)}\sum_{j=1}^{m} p_j^l. \tag{6}$$

Solving the first-order conditions for the leaders ($\partial \pi_i^l/\partial p_i^l = 0$), subject to the followers' reaction functions from (6), and then imposing symmetry, we find that:

$$p^l = \frac{vn(2n-b)(1-b)}{b^2(1+m) + 2\left[n^2(2-b) - 2bn\right]}. \tag{7}$$

An explicit expression for the price charged by the followers can be found by inserting (7) into (6). It is then easily verified that we get the standard result that leaders charge higher prices than followers ($p^l > p^f$) for all $b \in (0, 1)$. It can further be verified that there is a humped-shaped relationship between the average consumer price $\bar{p}$ and m. The intuition for this is straightforward; for small m, $d\bar{p}/dm > 0$ because then we are moving away from the static Bertrand equilibrium. However, as $m \to n$, we again approach the static Bertrand equilibrium and thus $d\bar{p}/dm < 0$.

Above we defined welfare as the sum of consumer surplus and profits, where $CS = U - \sum_i^n p_i q_i$ and $\sum \pi_i = \sum_{i=1}^{n}(p_i - c)\, q_i$. Since we have set marginal costs

[20] This utility function, which is due to Shubik-Levitan (1980), has the property that market size does not vary with b or n. See Motta (2004), who uses it in several models in order to analyze vertical restraints and other competition policy issues, Shaffer (1991), who uses it in his comparative welfare analysis of slotting allowances and RPM, and Deneckere and Davidson (1985), who use the Shubik-Levitan utility function when they analyze the merger incentives of price-setting firms.

[21] We relax the assumption of symmetry in Section 3.2.

equal to zero, welfare is simply equal to consumer surplus net of payments; $W = U$. It is now convenient to express welfare in terms of b and the prices to consumers:

$$W = \phi_1 + \frac{1-b}{2}\phi_2, \tag{8}$$

where

$$\phi_1 = \frac{1}{2}\left(v^2 - \bar{p}^2\right),$$

and

$$\phi_2 = (v-\bar{p})^2 - \left[\frac{m}{n}\left((v-\bar{p}) - \frac{p^l - \bar{p}}{1-b}\right)^2 + \frac{n-m}{n}\left((v-\bar{p}) - \frac{p^f - \bar{p}}{1-b}\right)^2\right].$$

The first term on the right-hand side of equation (8) measures how welfare depends on the average price, $\bar{p}$, while the second term in (8) measures how welfare is affected by price variations among the retailers - consumers prefer the lowest possible average price (high ϕ_1) and the lowest possible price variation among the retailers (high ϕ_2). It is straightforward to show that ϕ_2 is maximized at $\phi_2 = 0$ when $p^l = p^f$. For $p^l \neq p^f$, $\phi_2 < 0$. In the Appendix, we further prove the following:

Proposition 4: *Suppose consumers' preferences are described by the utility function in (4). Then welfare is U-shaped in the number of leaders. Moreover, for all* $b \in (0,1)$*, there exists* $\hat{m}(b) \in (0, n/2]$ *such that welfare is minimized when* $m = \hat{m}(b)$*.*

Proposition 4 implies that welfare is minimized in the interior at some number of leaders that is less than or equal to $n/2$. The intuition for this can be given in two parts. First, the average price to consumers is initially increasing and then decreasing in m, as was established earlier. Other things being equal, the opposite must therefore be true for welfare. Second, the gap between p^l and p^f is decreasing in m, as would be expected given that the leaders are becoming less concentrated and the followers are becoming more concentrated. This effect in isolation implies that welfare is always increasing in m. Thus, for large enough m, both effects go in the same direction and welfare is strictly increasing in m. The proposition then follows after noting that the average price to consumers is decreasing at $m = n/2$.

Because welfare is increasing in the number of leaders for all $m \geq n/2$, and because Proposition 3 shows that the number of leaders will be $m^* = k$ under a safe-harbor threshold of $k \leq n-1$ and $m^* = n-1$ or $m^* = n$ under a laissez-faire policy, it follows that welfare will be increasing in k for all $k \geq n/2$. Consequently, a relaxed RPM policy in which the safe-harbor threshold is set at $k \geq n-1$ will do almost as well for large n (and maybe just as well) as a policy that specifies $k = 0$.

We can state:

Corollary 1: *Suppose consumers' preferences are described by the utility function in (4). Then a public policy that reduces the number of firms with RPM below the laissez-faire equilibrium reduces welfare if the number of firms that have RPM is larger than or equal to $n/2$. In this case, welfare would be higher without the policy.*

This suggests that existing vertical guidelines may not fare well. In the case of the EC's guidelines, where the safe-harbor threshold for industry-wide adoption is 50%, Proposition 4 suggests that welfare might even be minimized. Applying Corollary 1 to the 1985 U.S. guidelines, where the safe-harbor threshold for industry-wide adoption is 60%, we see that these guidelines would fare somewhat better at inducing higher welfare in the model, paradoxically by allowing a larger share of the firms to employ anti-competitive RPM. However, in both cases, the thresholds might be counterproductive compared to laissez-faire. The intuition is that even though RPM is used to dampen competition, market forces may suffice to minimize the overall impact (and render it harmless in the case of all firms adopting RPM).

3.2 Restrictions on Dominant-Firm Adoption

We showed in Proposition 1 that under a laissez-faire policy there exist n equilibria where the number of leaders equals $m^* = (n-1)$ and one where $m^* = n$. Since all firms' profits are lower in the latter equilibrium, we may expect firms to coordinate on one of the equilibria with $n-1$ leaders. This is true whether the retailers are ex-ante symmetric or not. Still, it is not immaterial which firm is the follower if the retailers differ in their market potential. From a welfare point of view it may be particularly worrisome if the firm with the greatest market potential (the "dominant firm") is a leader. The reason is that a firm's incentives to set a high price tend to be larger the greater is its output (q_k); in our case the marginal profit of a small price increase is simply $d\pi_k/dp_k = q_k + p_k dq_k/dp_k$. As a leader, the dominant firm's relatively high price induces the follower to charge a relatively high price too. This suggests that the average price may be higher if the dominant firm is a leader than if it is a follower. To see this formally, let us modify the utility function in (4) to

$$U(q_1.., q_i, .., q_n) = \sum_{i=1}^{n} v_i q_i - \frac{n}{2}\left[(1-b)\sum_{i=1}^{n} q_i^2 + \frac{b}{n}\left(\sum_{i=1}^{n} q_i\right)^2\right]. \tag{9}$$

In this case, asymmetry is introduced among the retailers by allowing firms to have different market potentials; the larger is v_i, the greater is retailer i's market potential. In what follows, let the retailers be ordered according to their market potential such that $v_1 \geq v_2 \geq ... \geq v_n$, so that firm i's market potential is (weakly) larger than firm j's market potential for all $j > i$. Then, solving $\partial U/\partial q_i - p_i = 0$, we have

$$q_i = \frac{1}{n(1-b)}\left[v_i - p_i + b(\bar{p} - \bar{v})\right], \tag{10}$$

where $\bar{p} = \frac{1}{n}\sum_{j=1}^{n} p_j$ (as in Section 3 above) and $\bar{v} = \frac{1}{n}\sum_{j=1}^{n} v_j$.

Suppose first that the firm with the largest market potential, retailer 1, is the follower. Then retailer 1's first-order condition is $\partial\pi_1/\partial p_1 = q_1 + p_1 \partial q_1/\partial p_1 = 0$. Substituting for q_1 from equation (10), this yields retailer 1's profit-maximizing price

$$p_1 = \frac{v_1 + b(\bar{p} - \bar{v})}{2n - b}. \tag{11}$$

In contrast, the first-order condition for retailer j, $j \neq 1$, is

$$\frac{d\pi_j}{dp_j} = q_j + p_j \frac{dq_j}{dp_j} = 0, \tag{12}$$

where

$$\frac{dq_j}{dp_j} = \left(\frac{\partial q_j}{\partial p_j} + \frac{\partial q_j}{\partial p_1}\frac{dp_1}{dp_j}\right). \tag{13}$$

The first term in the bracket on the right-hand side of (13) measures the direct quantity effect for retailer j of increasing its price, which from (10) is $\frac{\partial q_j}{\partial p_j} = -\frac{n-b}{n^2(1-b)} < 0$.

However, there is also an indirect effect; a price increase from retailer j induces the follower to charge a higher price, thus reducing (but not eliminating) the negative quantity effect for retailer j. Using (10) and (11) we find that $\frac{\partial q_j}{\partial p_1} = \frac{b}{n^2(1-b)}$ and $\frac{dp_1}{dp_j} = \frac{b}{2(n-b)}$, respectively. Simplifying, we can thus rewrite the derivative in (13) as

$$\frac{dq_j}{dp_j} = -\frac{2\left(n-b\right)^2 - b^2}{2n^2\left(1-b\right)\left(n-b\right)} p_j. \tag{14}$$

Combining (10), (12) and (14) we can write the first-order condition for retailer j as

$$v_j - \frac{2n\left(2n-3b\right)+b^2}{2n\left(n-b\right)} p_j + b\left(\bar{p}-\bar{v}\right) = 0. \tag{15}$$

Summing (15) over all leaders, $j = 2, ..., n$, using that $\sum_{j=2}^{n} v_j = n\bar{v} - v_1$ and $\sum_{j=2}^{n} p_j = n\bar{p} - p_1$, and substituting for p_1 from equation (11) we can write the average price $\bar{p}^{1F}$ (with superscript $1F$ to indicate that retailer 1 is the follower) as

$$\bar{p}^{1F} = \frac{\left[2n\left(1-b\right)\left(n-b\right)\left(2n-b\right)+b^3\right]\bar{v} - b^2 v_1}{2\left(n-b\right)\left[2n\left(2-b\right)-b\left(4-b\right)\right]n}. \tag{16}$$

If instead retailer d, where $d \neq 1$ is the follower, then the average price is

$$\bar{p}^{dF} = \frac{\left[2n\left(1-b\right)\left(n-b\right)\left(2n-b\right)+b^3\right]\bar{v} - b^2 v_d}{2\left(n-b\right)\left[2n\left(2-b\right)-b\left(4-b\right)\right]n}. \tag{17}$$

Subtracting (17) from (16) we find that

$$\bar{p}^{1F} - \bar{p}^{dF} = -\frac{b^2}{2\left(n-b\right)\left[2n\left(2-b\right)-b\left(4-b\right)\right]n}\left(v_1 - v_d\right),$$

which is strictly negative if and only if $v_1 > v_d$. It follows that the average price is lowest if the firm with the greatest market potential is the follower. More generally, one can show that the average price in the market is lower if retailer i is the follower than if retailer d is the follower if and only if $v_i > v_d$. By the same token, it is straightforward to show that the price variation among retailers is increasing in the average price. Thus the price variation is lower if retailer i is the follower than if retailer d is the follower if and only if $v_i > v_d$. In the present case – where $m^* = n-1$ – welfare is therefore higher when the lone follower has a greater market potential.

Above we have defined welfare in the equilibrium with all firms as leaders, $m^* = n$, as $W_{m^*=n}$. We now define W_{iF}, where $i = 1, ..., n$, as welfare in the equilibrium where $m^* = n-1$ and retailer i is the follower. Then we have the following result:

Proposition 5: *Suppose consumers' preferences are described by the utility function in (9), and suppose retailers are ordered such that* $v_1 \geq v_2 \geq ... \geq v_n$*. Then,* $W_{m^*=n} > W_{1F} \geq W_{2F} \geq ... \geq W_{nF}$*, where* $W_{iF} > W_{jF}$ if and only if $v_i > v_j$.

This result has implications for public policy:

Corollary 2: *Suppose consumers' preferences are described by the utility function in (9). Then, a public policy that prohibits the dominant firm from using RPM ensures a higher welfare than in any of the other equilibria with* $m^* = n - 1$ *leaders.*

It is well known that all firms earn higher profit in a Stackelberg game than in a Bertrand game, and that followers earn higher profits than leaders when firms are symmetric. However, this does not necessarily hold when the firms are asymmetric. On the contrary, it can be shown that a dominant firm can earn higher profit as a leader than as a follower if it is sufficiently larger than the other firms. This is because it can ensure higher market prices than otherwise if it becomes a leader.

One might therefore expect the dominant firm to emerge as one of the leaders in an unrestricted equilibrium. This has policy implications because it means that among the equilibria with $m^* = n - 1$ leaders, welfare is not maximized. It follows that banning a dominant firm from adopting RPM may be beneficial even if there are no restrictions on industry-wide adoption. However, it should be noted that such a ban would also prevent the equilibrium with $m^* = n$ leaders from being reached.

4 Concluding Remarks

There has been a call from economists, legal scholars, and policy makers in recent years to apply a rule of reason approach in RPM cases. In June 2007, the U.S. Supreme Court agreed, and the nearly one-hundred year old ban on RPM was lifted.

This raises the question of how a rule-of-reason approach should be structured. One possibility is for policy makers to rely on already drafted vertical restraints guidelines in the U.S. and EU, which establish market-share thresholds (or safe harbors) to indicate when adoption of RPM by a single firm might raise concerns.

For the most part, the underlying assumption in these existing guidelines is that the vertical practice at hand may be used to facilitate collusion. Hence, by limiting the pervasiveness of the practice, and by taking it out of the hands of the largest firms, the presumption is that welfare can be improved upon and certainly not worsened.

In this paper, we have illustrated some issues with the practical implementation of competition policy, and in particular with the use of safe harbors in guidelines, when firms unilaterally adopt RPM to dampen competition. As we have shown, in this setting, a public policy that prohibits dominant firms from adopting RPM may well improve welfare, but a policy that has the effect of reducing the number of firms that adopt RPM below the number that would otherwise arise in an unregulated market economy may instead, unless prohibited altogether, perversely lower welfare.

Thus, we have found that an increase in the proportion of the market covered by RPM can be welfare improving. This goes against the EU legal framework on vertical restraints (as well guidelines that have been proposed in the U.S.) in which industry-wide RPM adoption beyond certain threshold levels is viewed adversely.

The case at hand is particularly relevant given the Supreme Court's recent decision in Leegin. Leegin makes leather products. In 1997, it began to sell its products only to retailers who maintained its suggested retail prices. When it was discovered that a retailer sold at a lower price, Leegin stopped its shipments to this retailer. Leegin thereby allegedly violated the long-standing *per se* ban against RPM. Leegin's advocates, however, argued that the case was a perfect vehicle to revisit the general ban on RPM because Leegin had little or no market power and operated in an environment of intense competition. As a consequence, they argued that RPM could not be anticompetitive. The Supreme Court agreed and lifted its ban. What it did not do, however, was offer guidance on how a rule-of-reason should be applied.

In this article, we considered various restrictions that might be part of a structured rule of reason in an environment in which firms use RPM to dampen competition. As a next step, it is important to analyze other motivations for RPM and assess the desirability of restrictions on dominant firm and industry-wide adoption. Finally, it should be noted that much of the policy debate on RPM pertains to the presumed trade-off between dampening intra-brand competition versus dampening inter-brand competition. Our model has little to say about this issue. Including such aspects would be a useful, interesting, and important path for future research.[22]

[22]We thank an anonymous referee for this observation.

Appendix

Proof of Proposition 1:

First, we will show that equilibria with $m^* = n$ and $m^* = n-1$ leaders exist. We will then show that no other equilibria exist.

Consider the case with $m^* = n$ leaders. In this case, each firm in the candidate equilibrium is choosing an RPM price equal to the price it would choose in a simultaneous Bertrand game. In order for this to be an equilibrium, it must be the case that no firm can unilaterally increase its profit by becoming a follower. Suppose a firm were to become a follower. Then, given that the other firms are all charging their Bertrand prices, this firm's best response would also be to charge its Bertrand price and receive the same profit. Therefore, $m^* = n$ leaders is an equilibrium.■

Now consider the case with $m^* = n-1$ leaders. Without loss of generality, let retailer n be the follower. Then, it must be that retailer i's price, p_i^l, satisfies

$$\left(p_i^l - c\right)\frac{\partial D^i(\mathbf{p})}{\partial p_i} \;+\; D^i(\mathbf{p}) \;+\; \left(p_i^l - c\right)\frac{\partial D^i(\mathbf{p})}{\partial p_n}\frac{dp_n^f}{dp_i} \;=\; 0, \tag{18}$$

where $\mathbf{p} = (p_1^l, ..., p_i, ..., p_{n-1}^l, p_n^f)$, and retailer n's price, p_n^f, satisfies

$$\left(p_n^f - c\right)\frac{\partial D^n(\mathbf{p})}{\partial p_n} \;+\; D^n(\mathbf{p}) \;=\; 0. \tag{19}$$

In order for this to be an equilibrium, it must be that no firm can unilaterally gain by deviating. If a leader became a follower, she would be adding a restriction to her profit maximization problem. As a leader, she could have chosen the price forced by a followers reaction function. Looking at her decision another way, by becoming a follower she would no longer be able to exploit the follower's reaction function.

More formally, suppose firm i's equilibrium price if she had chosen to be a follower along with retailer n when all other firms are leaders and have prices p_k^l, $k \neq i, n$, is p_i^f. Note that firm i could have chosen p_i^f as a leader. By doing so, firm n's price would be the same and the first two terms in (18) would be zero. However, the last term would be positive, implying that it would be more profitable for firm i to raise her price as a leader. It follows that firm i is strictly better off remaining as a leader.

Now consider whether retailer n would want to become a leader given that all other firms are leaders and have prices p_k^l, $k \neq n$. In this case, the best retailer n

can do would be to charge p_n^f, which is the same as it would charge if it remained a follower. It follows that prices and thus profits are independent of whether retailer n is a leader, given that all other firms are leaders. Since being a leader yields the same profit for retailer n as being a follower, retailer n will be indifferent between staying a follower and becoming a leader. Therefore $m^* = n-1$ leaders is an equilibrium.■

Finally, we show by contradiction that there exists no equilibrium with $m^* < n-1$ leaders. Assume that there exists an equilibrium where $m^* < n-1$. Then retailer $m+1$'s first-order conditions as follower and leader are, respectively:

$$(p_{m+1} - c)\frac{\partial D^{m+1}}{\partial p_{m+1}} \; + \; D^{m+1} \; = \; 0, \tag{20}$$

$$(p_{m+1} - c)\frac{\partial D^{m+1}}{\partial p_{m+1}} \; + \; D^{m+1} \; + \sum_{i=m+2}^{n}(p_{m+1} - c)\frac{\partial D^{m+1}}{\partial p_i} = 0. \tag{21}$$

Let p_{m+1}^f and p_{m+1}^l denote retailer $m+1$'s price as a follower and leader, respectively. Then, with some abuse of notation, it is straightforward to see that retailer i can always do at least as well being a leader since it can always choose p_{m+1}^f as her leader price, and thus $\pi_{m+1}^f(p_{m+1}^f) = \pi_{m+1}^l(p_{m+1}^f)$. By evaluating (21) at p_{m+1}^f, the two first terms are zero, while the third term is positive. Retailer $m+1$ will thus increase its profit by increasing price to p_{m+1}^l, and retailer $m+1$ will consequently want to switch from being a follower to being a leader, i.e. $\pi_{m+1}^l(p_{m+1}^l) > \pi_{m+1}^f(p_{m+1}^f) = \pi_{m+1}^l(p_{m+1}^f)$. Thus, $m^* < n-1$ cannot be an equilibrium. If there is more than one follower, one of them would benefit from becoming a leader. The firm can only be better off, since it can always choose the same price it was charging as a follower. Since the other leaders' prices are fixed, becoming a leader would allow the firm to exploit the other followers' reaction functions and raise their prices. Thus, there do not exist equilibria with $m^* < n-1$ leaders. ■

Proof of Proposition 4

For convenience, we repeat the welfare function that corresponds to the preferences in (4)

$$W = \frac{1}{2}\left(v^2 - \overline{p}^2\right) + \frac{1-b}{2}\phi_2,$$

where the first and second term measure how welfare depends on the average price and price variations, respectively. Differentiating these two terms with respect to m, it turns out that we get $f(b) = b^2(1-b)$ as a common factor. It is therefore useful to define $W_1 \equiv \frac{1}{2}\left(v^2 - \overline{p}^2\right)/f(b)$ and $W_2 = \frac{1-b}{2}\phi_2/f(b)$ in order to find the relative strength of the two terms in the welfare function when m increases. We then have

$$\frac{dW}{dm} = f(b)\left(\frac{dW_1}{dm} + \frac{dW_2}{dm}\right).$$

We now find that $\left.\frac{dW_1}{dm}\right|_{b=0} = \frac{v^2}{8n^3}\left(m - \frac{n}{2}\right)$ and $\left.\frac{dW_2}{dm}\right|_{b=0} = 0$. In the neighborhood of $b = 0$ we thus have $sign\frac{dW}{dm} = sign\left.\frac{dW_1}{dm}\right|_{b=0} = sign\left(m - \frac{n}{2}\right)$. In this area, welfare will in other words increase with the number of retail leaders if $m \geq n/2$.

We further have $\left.\frac{dW_1}{dm}\right|_{b=1} = 0$ and $\left.\frac{dW_2}{dm}\right|_{b=1} = \frac{(n-m)^2 v^2 N}{2(1+m+2n^2-4n)^3(n+m-1)^3}$, where $N = \left(-5n^2 - 27mn^2 + n + 20mn - 3nm^2 - 4m - 2n^4 + 10mn^3 + 6n^3 + 4m^2n^2\right)$. In the neighborhood of $b = 1$ we thus have $sign\frac{dW}{dm} = sign\left.\frac{dW_2}{dm}\right|_{b=1} = signN$. This implies that $\frac{dW}{dm} > 0$ around $b = 1$ if

$$m > \frac{\sqrt{1281n^4 - 1236n^3 + 628n^2 - 660n^5 - 160n + 16 + 132n^6} + 27n^2 - 20n + 4 - 10n^3}{2n\left(4n-3\right)}.$$

The reason why $\frac{dW_2}{dm}$ dominates over $\frac{dW_1}{dm}$ for high values of b and vice versa, is that when b is high, the followers have strong incentives to undercut the leader in order to steal business. Therefore p^l will be relatively high compared to p^f. For low values of b, on the other hand, the retailers are such poor substitutes that the undercutting incentives of the followers are small. The difference in the prices charged by the leaders and the followers are thus strictly increasing in b :

$$\frac{\partial\left(p^l/p^f\right)}{\partial b} = \frac{2\left(n-m\right)\left(\left(4-b\right)n - b + b\left(m-1\right)\right)nb}{\left(b^2 + 2\left(n^2\left(2-b\right) - 2bn\right) + 2bmn\right)^2} > 0.$$

Moreover, as explained in the text, the term $\frac{dW_1}{dm}$ is relatively small for high values of b because both the market power of the firms and the industry's ability to charge a high average price are low when the retailers' products are close substitutes.

We now show that $m \geq n/2$ is a sufficient condition for $dW/dm > 0$. The proof consists of two parts. We first show that the price variation is decreasing in the number of leaders. To this end we note that

$$\frac{d\left(p^l - p^f\right)}{dm} = \frac{vnb^2\left(1-b\right)\Psi_1}{D^2},$$

where $D \equiv (b^2(1+m) + 2(n^2(2-b) - 2bn))(n(2-b) + b(m-1))$ and $\Psi_1 \equiv$

$$\left[b\left(12 - 4b + b^2\right) - 4(2-b)n\right]n^2 - \left[(2m-1)b^3 + 6b^2\right]n + \left(1+m^2\right)b^3.$$

We thus have $sign\frac{d\left(p^l - p^f\right)}{dm} = sign\Psi_1$. Since

$$\frac{d\Psi_1}{dm} = -2b^3(n-m) \tag{22}$$

it follows that if $\Psi_1 < 0$ for $m = 0$, then$\Psi_1 < 0$ for all possible values of $m < n$. We also have

$$\frac{d\Psi_1}{dn} = -\left[12(2-b)n - \left(2b^3 + 24b - 8b^2\right)\right]n - 2b^3m + b^3 - 6b^2 \tag{23}$$

A sufficient condition to ensure that $\frac{d\Psi_1}{dn} < 0$ is that the terms in the square bracket of (23) are negative, which is always true if $n \geq 3/2$. It is further straightforward to show that $\Psi(m = 0, n = 3/2) < 0$. From (22) and (23) it thus follows that Ψ is negative in the relevant area ($n \geq 2$ and $m \geq 0$). This proves that the variation in prices is decreasing in m.

The second part of the proof consists of showing that the average price is decreasing in m for $m \geq n/2$. To this end we note that

$$\frac{\partial \bar{p}}{\partial m} = -\frac{v(1-b)b^2(2n-b)\Psi_2}{D^2},$$

where $\Psi_2 \equiv 2(m - n/2)b^2 + 2mn[b(m-2n) + 4(n-b)] - 2n^3(2-b) + 4n^2b$. We immediately see that Ψ_2 is increasing in m, and at $m = n/2$ we have $\Psi_2 = \frac{1}{2}n^3b > 0$. This proves that a sufficient condition for $\frac{\partial \bar{p}}{\partial m} < 0$ is that $m \geq n/2$. ■

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