



**LEVERAGING OF REPUTATION THROUGH UMBRELLA
BRANDING: THE IMPLICATIONS FOR MARKET STRUCTURE**

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The Klein–Leffler model explains how fear of reputation loss can induce firms to produce high-quality experience goods. This paper shows that reputation can be leveraged across products via umbrella branding, but only by a firm with a monopoly on at least one product. Such a firm may be able to capture a market by using umbrella branding to make high quality credible at a lower price than the incumbent competitive firms. If monopolists compete for this capture, consumers are left better off than if the market remained competitive, in some cases even though the price increases.

1. INTRODUCTION

Umbrella branding is the practice of labeling more than one product under a single brand name. Kellogg's and General Electric are natural umbrella brands because they apply to products that are similar—breakfast cereals in the one case, household appliances in the other. But what about GE jet engines? Sometimes a brand will be applied to wildly dissimilar products. Vuarnet International sells sunglasses, skis, pens, and clothing. Virgin Records extended the name of its brand of phonograph record to airline services, vodka, and soft drinks. Andersson (2002) notes that the founder of Virgin, Richard Branson, said "Consumers understand that all the values that apply to one product—good service, style, quality, value and fair dealing—apply to the others." (*Time Magazine*, No. 26, June 1996) Executives at LG and Sony say: "The LG logo and motto are strong icons that connect everything together. Consumers take those beliefs and brand equity with them to the checkout as a source of reassurance," and "Everything we do now runs under a common identity; people know Sony and they believe the brand values of the master brand. Therefore, they feel reassured about what they are buying. The umbrella branding gives us a meaning, not just a logo." ("Talking shop: Umbrella branding," *Marketing Week*, Nov. 12, 2009, <http://www.marketingweek.co.uk/talking-shop-umbrella-branding/3006453.article>.) On the other hand, umbrella branding backfires if consumers are disappointed by the quality of one of the products under the umbrella. Swaminathan et al. (2001) analyzed scanner data on the products of a grocery food company with a

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sizeable market share in one product that used its brand name to introduce a new product which failed. They found that this reduced the purchases of consumers who were already buying the parent brand.

Umbrella branding is a natural way for a firm to try to earn extra profits from a reputation for quality. This depends on how reputation works. Models of reputation can be divided into two groups: adverse selection models (see Wernerfelt, 1988; Choi and Scarpa, 1992; Cabral, 2000; Miklos-Thal, 2012), in which a firm is committed to high quality but needs to convey that to consumers, and moral hazard models, in which the firm is not committed to high quality, but needs to convince consumers it will not cheat them. When the problem is moral hazard, as in the present paper, umbrella branding is based on linkage between the firm's incentives to choose high quality for its different goods. The classic reference is Klein and Leffler (1981), which explains how the threat of reputation loss incentivizes high quality. The firm could make an immediate one-time high profit if it cheated consumers with low quality, but it does not, because it prefers the smaller but permanent flow of profits from a good reputation and future sales. Klein and Leffler suggest that this could lead to economies of scope: "As long as consumers react to receiving unexpectedly low quality from a diversified firm by reducing purchases of the firm's entire product line, all the firm's nonsalvageable capital serves to assure the quality of each product it produces" (p. 636). The incentive-compatibility constraints for different products could interact, just as Bernheim and Whinston (1990) found that two colluding firms' incentives to cheat on their collusion agreement decline when they interact in more than one market.

Andersson (2002) extended the Klein–Leffler model to multiple products produced by a monopoly. He demonstrated what will be our Proposition 2: it is easier for a monopolist to maintain high quality when it sells more than one product. Cai and Obara (2006), Cabral (2009), and Dana and Spier (2009) apply the same idea with imperfect observability of quality by consumers. Branding (or horizontal integration, in Cai and Obara) reduces the impact of idiosyncratic shocks and thus allows consumers to better tell whether cheating is truly occurring. In addition, it allows for a greater variety of possible punishments by consumers. Cai and Obara assume that customers base their decisions on the average quality signal across all of a firm's products. They focus on how this affects optimal firm size when combined with the diseconomy of scale that the larger firm is more tempted to deviate to low quality in a few of its markets because that is a smaller fraction of its sales. Cabral focuses on how under imperfect observability a high-quality equilibrium can be supported by a more lenient customer punishment if the firm uses umbrella branding. If customers observe one high-quality and one low-quality signal and refrain from punishing the firm, that may still support a high-quality equilibrium. Fewer false positives by consumers can actually reduce welfare by reducing the risk a firm incurs when it cheats in one product but not the other. Dana and Spier assume that the imperfect signal of quality after purchase is private to the individual consumer. They show that it may be efficient for a firm to bundle its products to force consumers to receive more than one at a time from the same firm and thereby become better monitors, a benefit with externalities to everyone.

The existing literature has focused on umbrella branding by monopolies. It does not look at what will be our main focus here: the contrast between competitive and monopolized markets. We will show that although competitive firms can have profitable reputations for quality, they cannot leverage these reputations into other markets. Monopolies can. As a result, a monopoly may, under particular circumstances, be able to capture a competitive market by introducing umbrella branding.

Because we will be looking at the ability of a monopolist to leverage its reputation to take over a competitive market, this model could also be seen as part of the literature on foreclosure. The reason for foreclosure closest to the present paper's is Whinston (1990)'s tying model, in which a monopoly ties its monopolized product to a competitive product to increase the aggressiveness of its pricing in the competitive market and drive out rivals there. Section 5 will contrast that with the more innocent leveraging here.

2. SINGLE-PRODUCT EQUILIBRIUM

Let one or more firms produce a single good which has either low or high quality. Each firm chooses its quality anew each period. All firms have a marginal cost of c for the low-quality version of the product and $(1 + \gamma)c$ for high quality, with $\gamma > 0$.

We will look at both monopoly and competition. In the monopoly case, the monopolist chooses the price p . In the competitive case, a mass of size one of infinitesimal firms simultaneously choose price.

There is a mass of size x of identical infinitesimal consumers. Each wishes to buy one unit of the good and is willing to pay up to v for low quality or $(1 + \theta)v$ for high quality, with $\theta > \gamma$ so that producing high quality adds more to value than to cost. Let

$$(1 + \theta)v - (1 + \gamma)c > 0, \quad (1)$$

so that purchasing high quality at cost is better for the consumer than not buying at all. Consumers simultaneously decide which firm to patronize or whether not to buy at all. We will assume that if consumers are indifferent among a set of firms they spread evenly across those firms. A firm's quality in a given period is unobservable before purchase, but is observed by all consumers at the end of the period. The discount rate is r and there are an infinite number of periods.

At the start of a period, firms choose prices and qualities. Consumers then decide whether and where to buy. At the end of the period, firms pay the cost of production, consumers pay the firms and receive the product, and everyone learns the quality of the products. The next period begins with new decisions by firms about prices and qualities.

Infinitely repeated games have an infinite number of subgame perfect equilibria. The simplest equilibrium of the present game is a pessimistic equilibrium. If $v \geq c$, firms produce and consumers expect low quality, and firms charge a low price, which consumers pay. We will say that low quality is *viable* if $v \geq c$. If $v < c$, low quality is unviable: consumers expect low quality but are not willing to pay even $p = c$. In that case, no purchases are made in the pessimistic equilibrium.

We will focus on the simplest of the equilibria in which quality is high. We will consider both the competitive and monopoly cases.

2.1. SINGLE-PRODUCT EQUILIBRIUM IN A COMPETITIVE MARKET

A single-product equilibrium with high quality in a competitive market is supported by the following equilibrium behavior and beliefs, with the price, $p^*(comp)$, chosen as explained shortly.

The high-quality equilibrium for a competitive market. Each firm produces high quality every period and charges $p^*(comp)$. If a firm deviates to low quality, thereafter it always sells low quality at $p = c$. A consumer's strategy is to choose the maximum of the three payoffs from buying at the price p' of the lowest-price firm believed to be selling high

quality, buying at the price p'' of the lowest-price firm believed to be selling low quality, and not buying at all: $Max[(1 + \theta)v - p', v - p'', 0]$. Out of equilibrium, if a firm deviates to $p < p^*(comp)$, the consumer believes the firm has chosen low quality; if it deviates to $p > p^*(comp)$ the consumer believes it has chosen high quality.

Firms will not deviate from this equilibrium if the value of $p^*(comp)$ is chosen appropriately and consumers prefer high quality at $p = p^*(comp)$ to low quality at $p = c$, that is, if

$$(1 + \theta)v - p^*(comp) \geq Max(0, v - c). \quad (2)$$

Let us first determine the value of $p^*(comp)$. We need to discover what price makes a firm unwilling to deviate from the high-quality equilibrium. The present discounted value of the profits in the high-quality equilibrium is

$$\pi(\text{high quality}) = \frac{(p - c(1 + \gamma))x}{r}. \quad (3)$$

If the firm chooses low quality, no consumer will buy from it thereafter, since condition (2) ensures that even if low quality is priced at cost, consumers prefer high quality at the equilibrium price. Thus, the deviating firm earns one period of high profits and zero profits thereafter:

$$\pi(\text{low quality}) = \frac{(p - c)x}{1 + r}. \quad (4)$$

Equating equations (3) and (4) and solving for p yields

$$p^*(comp) = c + (1 + r)\gamma c. \quad (5)$$

We will refer to the price which induces a firm in a particular setting (competition, monopoly, or umbrella branding) to choose high quality as its "quality-guaranteeing price." The price in (5) is thus "the quality-guaranteeing price under competition." Using equation (5) to replace $p^*(comp)$ in condition (2) and simplifying yields the condition for a high-price equilibrium to exist in a competitive market, expressed in terms of the model's parameters:

$$\theta v \geq (1 + r)\gamma c + Max(c - v, 0). \quad (6)$$

If (6) is true we will say that high quality is viable. Otherwise, the high-quality equilibrium fails to exist. High quality is efficient compared to nonpurchase by assumption (1), but high quality is unviable if consumers are unwilling to pay a price enough above marginal cost to incentivize the firms.

To confirm that this is an equilibrium, we need to check whether consumers or firms will deviate. A consumer will not deviate if he earns positive consumer surplus from buying instead of not buying; that is, if $(1 + \theta)v - p^*(comp) \geq 0$. Condition (2) guarantees this. A firm could deviate in price, in quality, or in both. Any deviation to $p < c$ is unprofitable. Any deviation to $p \in [c, p^*(comp))$ will result in zero sales, regardless of quality, because consumers take that to indicate low quality and condition (2) guarantees that they will prefer to buy high quality from the competing firms. Any deviation to $p > p^*(comp)$ also results in loss of all sales to the competing firms. Finally, we know that deviation to low quality while charging $p^*(comp)$ is unprofitable because $p^*(comp)$ was constructed to make precisely that deviation unprofitable.

2.2. SINGLE-PRODUCT EQUILIBRIUM IN A MONOPOLIZED MARKET

Under monopoly, the high-quality equilibrium differs in three respects. First, the equilibrium price is $(1 + \theta)v$, the consumer reservation price for high quality. Second, the price specified by the equilibrium after deviations is $Max(v, c)$ rather than just c , because the monopoly faces no competition in selling low quality. Third, the quality-guaranteeing price, $p^*(mon)$, turns out to be different from $p^*(comp)$ if low quality is more than barely viable.

Let us start with the case where $v \leq c$, so low quality is unviable or barely viable. The monopolist’s incentive-compatibility constraint in that case is identical to the competitive firm’s: the permanent profit from p^* must not be less than a one-time deviation gain with zero profits thereafter, so the quality-guaranteeing prices under monopoly and under competition are equal.

If $v > c$, so low quality is strictly viable, the monopoly and competitive quality-guaranteeing prices differ. Even after deviation, the monopoly earns positive profits from selling low quality. The monopoly’s incentive-compatibility constraint thus compares the payoffs from high quality at price p and from low quality at price p the first period with price v thereafter:

$$\frac{(p - (1 + \gamma)c)x}{r} \geq \frac{(p - c)x}{1 + r} + \frac{(v - c)x}{(1 + r)r}. \tag{7}$$

When reduced to an equality and solved, this yields $p^*(mon) = v + (1 + r)\gamma c$. Combining the two cases, we have

$$p^*(mon) = c + (1 + r)\gamma c + Max(0, v - c). \tag{8}$$

Equation (8) says that when $v > c$ the quality-guaranteeing price is higher under monopoly than under competition. When low quality is strictly viable, the monopoly’s temptation to cheat is higher because it earns monopoly profits even from low quality, so it needs a greater high-quality price to prevent deviation. One might think this means that for some parameter ranges high quality is viable for a competitive industry but not for a monopoly. That turns out to be false.

PROPOSITION 1: *High quality is viable under competition if and only if it is viable under monopoly.*

PROOF: If $v \leq c$, low quality is either unviable or barely viable. The quality-guaranteeing price $p^*(comp)$ is then the same under monopoly and competition by equations (5) and (8). It therefore exceeds the consumer’s value of high quality for the same parameters under either market structure and the condition for high-quality viability is identical.

Suppose $v > c$ instead. Inequality (6) tells us that high quality is viable in a competitive market if and only if $\theta v \geq (1 + r)\gamma c$. For high quality to be viable under monopoly when $v > c$ requires that the monopolist not deviate to low quality and the consumer not deviate to purchasing nothing. By construction, $p^*(mon)$ will induce the firm to choose high quality. Thus, the question is whether the consumer is willing to buy at $p^*(mon)$. He will if and only if $p^*(mon)$ is less than his value for high quality, that is, if and only if

$$(1 + \theta)v \geq p^*(mon) = v + \gamma(1 + r)c. \tag{9}$$

Inequality (9) is true if and only if

$$\theta v \geq (1 + r)\gamma c, \tag{10}$$

which is therefore our condition for high quality to be viable under monopoly. This is identical to the viability condition for the competitive industry, inequality (6). Thus, high quality is viable under competition if and only if it is viable under monopoly. \square

Proposition 1 tells us that although the quality-guaranteeing price is higher under monopoly than under competition if low quality is strictly viable, high quality is no less and no more often viable under monopoly than under competition. To understand this, compare the most tempting deviations in each industry. In a monopoly, the firm that deviates to low quality gets a one-time windfall followed by a steady if low profit stream. The firm compares the capitalized value of the high-quality social surplus that it completely captures (call it X) to the combination of the low-quality social surplus (Y) plus the one-time gain from cheating (Z), to see if $X > Y + Z$. In a competitive industry, if some firms deviate to low quality and a price of c , the question is whether this will raise consumer surplus enough for consumers to purchase from them. Consumers compare the capitalized value of the high-quality social surplus (X) minus the capitalized value of the steady quality-guaranteeing price premium (which equals the one-time gain from cheating, Z) to the social surplus from low quality (Y), to see if $X - Z > Y$. The inequalities end up being equivalent.

Proposition 1 tells us that if a monopoly leveraging reputation by umbrella branding is profitable, it is not because even in a single market a monopoly has more incentive than competitive firms to produce high quality.

3. UMBRELLA BRANDING IN A MONOPOLIZED MARKET

Let us proceed to viability with two goods. We will start with the monopoly case. Two monopolies are selling two products subscripted $i = 1, 2$, with possibly differing parameters $v_i, \gamma_i, \theta_i, c_i$, and x_i . We will use K_i as an indicator variable, where $K_i = 1$ if $v_i \geq c_i$ so that low quality for product i is viable, and $K_i = 0$ if $v_i < c_i$.

If high quality is viable for both products, the firms sell them at prices $(1 + \theta_1)v_1$ and $(1 + \theta_2)v_2$. If neither is viable, the firms sell either nothing or low quality. In neither case could umbrella branding help. The interesting case is when high quality is strictly viable for product 1 but unviable for product 2, so

$$(1 + \theta_1)v_1 > p_1^*(mon) = c_1 + (1 + r)\gamma c_1 + K_1(v_1 - c_1), \quad (11)$$

but

$$(1 + \theta_2)v_2 < p_2^*(mon) = c_2 + (1 + r)\gamma c_2 + K_2(v_2 - c_2). \quad (12)$$

Monopoly 1 would produce high quality and monopoly 2 would produce either low quality or nothing. A two-product monopolist, however, might be able to produce both products at high quality if consumers believe that a deviation to low quality for product 2 implies the firm will produce low quality for product 1 in the future also. We will call these "umbrella beliefs." Umbrella beliefs are simple and represent a good benchmark case for showing what happens when reputation links two markets. Thus we obtain Proposition 2, which may also be found in Andersson (2002) and Cabral (2009).

PROPOSITION 2: *A monopoly selling two products can for some parameter values maintain high quality for both when two monopolies each selling one product cannot.*

PROOF: The two-product monopolist's postentry profit from producing both products with high quality is

$$\frac{((1 + \theta_1)v_1 - (1 + \gamma_1)c_1)x_1}{r} + \frac{(p_2 - (1 + \gamma_2)c_2)x_2}{r}, \quad (13)$$

where product 1 is sold at the high-quality monopoly price and product 2 is sold at some price p_2 as yet unspecified. The most profitable deviation payoff is from deviating to low quality for both products for one period and then continuing to sell with low quality in any market for which low quality is viable:

$$\frac{((1 + \theta_1)v_1 - c_1)x_1}{1 + r} + (K_1x_1)\frac{1}{1 + r}\frac{v_1 - c_1}{r} + \frac{(p_2 - c_2)x_2}{1 + r} + (K_2x_2)\frac{1}{1 + r}\frac{v_2 - c_2}{r}. \quad (14)$$

The profit from high quality is higher than from deviation if expression (13) is greater than (14), which is true if

$$[1 + r][(1 + \theta_1)v_1 - (1 + \gamma_1)c_1]x_1 - r[(1 + \theta_1)v_1 - c_1]x_1 - K_1(v_1 - c_1)x_1 > r(p_2 - c_2)x_2 - (1 + r)(p_2 - (1 + \gamma_2)c_2)x_2 - K_2(v_2 - c_2). \quad (15)$$

Solving this as an equality yields the umbrella-branding quality-guaranteeing price for good 2:

$$\begin{aligned} \bar{p}_2 = & [1 + (1 + r)\gamma_2]c_2 - K_2(v_2 - c_2) \\ & - \left(\frac{x_1}{x_2}\right) ((1 + \theta_1)v_1 - (1 + (1 + r)\gamma_1)c_1 - K_1(v_1 - c_1)). \end{aligned} \quad (16)$$

The stand-alone monopoly price is $p_2^*(monopoly) = c_2 + (1 + r)\gamma c_2 + K_2(v_2 - c_2)$ from equation (12). That price is greater than \bar{p}_2 in equation (16) as a direct result of high quality being viable for product 1 standing alone, inequality (11). Viability requires that the consumer's value for high quality for product 2, $v_2(1 + \theta_2)$, be at least as high as the \bar{p}_2 in equation (16). This will be possible for some parameter values even when high quality is not viable for a single-product monopoly. We thus have proved Proposition 2. \square

Umbrella branding is most useful when high quality is particularly important for product 1 and its market is large, and when the discount rate and the cost of high quality are low. The total profit from selling high-quality product 1 is then particularly high relative to profits from low quality, removing the temptation to sacrifice that profit for the one-time gain from cheating. Product 1's profit can be used as a hostage to ensure that the two-product monopolist does not cheat and sell low quality for product 2.

A peculiar feature of umbrella branding is that not only does it make product 2 viable; it does so without requiring the firm to sacrifice any profits whatsoever from product 1. Only the threat of losing those profits, an out-of-equilibrium event, is necessary. After extending its umbrella to product 2, monopoly 1 can still sell product 1 at the monopoly price of $p_1 = (1 + \theta_1)v_1$, so the extension turns out to be costless.

4. UMBRELLA BRANDING IN A COMPETITIVE INDUSTRY

Now let the industry be competitive: more than one firm can offer each product and they engage in price competition. A firm can sell either one or both of two products. Assume that consumers hold umbrella beliefs: a deviation to low quality in one product indicates that a firm will choose low quality in all its products in the future.

Suppose first that high quality is viable for both products. Could a firm that sells both products undercut the prices of single-product firms while still credibly producing high quality? A firm's profit from producing both products is, following equation (3),

$$\frac{(p_1 - (1 + \gamma_1)c_1)x_1}{r} + \frac{(p_2 - (1 + \gamma_2)c_2)x_2}{r} \quad (17)$$

compared with a deviation payoff, following equation (4), of

$$\frac{(p_1 - c_1)x_1}{1 + r} + \frac{(p_2 - c_2)x_2}{1 + r}. \quad (18)$$

Equations (17) and (18) are equated by the same values of p_1^* and p_2^* as when firms sell individual products. They are also equated by many other price pairs. Would any of those support an equilibrium? No. Any other price pair would require not just umbrella beliefs but also that $p_1 > p_1^*$ and $p_2 < p_2^*$ (or $p_1 < p_1^*$ and $p_2 > p_2^*$), because consumers would have to believe that the firm would be making so much extra profit on the "overpriced" product that it would not deviate to low quality because of the low price on the "underpriced" product. But then some other firm could offer just product 1 at $p = p_1^*$ and steal away market 1 from the umbrella-branding firm, destroying its credibility for high quality in market 2. So there is no advantage to umbrella branding if high quality is viable for both products.

What if high quality is viable for product 1 but not for product 2? An umbrella-branding firm would have to equate payoffs (17) and (18), but now $p_2^* > (1 + \gamma_2)v_2$ if it uses the value p_2^* that solves the single-product incentive-compatibility constraint. The firm must set p_2 below p_2^* to reduce it to below the consumers' reservation price, but then to equate payoffs (17) and (18) requires greater profit from product 1, so $p_1 > p_1^*$. The umbrella-branding firm cannot do that, because it must compete in market 1 with the competitive firms charging p_1^* . Hence, umbrella branding cannot be used to make an unviable product viable.

The problem is that firms do not have redundant profits from product 1 that they can put at risk to give themselves an incentive for high quality from product 2. The incentive-compatibility constraint for high quality is binding, unlike in the monopoly case. Thus we have Proposition 3.

PROPOSITION 3: *In a competitive industry, a firm cannot gain a price advantage by umbrella branding, nor can umbrella branding make high quality viable if it was not viable for a single-product firm.*

5. LEVERAGING MONOPOLY POWER USING UMBRELLA BRANDING

We have seen that umbrella branding helps in the monopoly case but not the competitive case. What if some products are sold competitively and some by monopolies? We will see that a monopolist will be able to use umbrella branding to leverage his monopoly in one market to take over a competitive market. We will start by showing this when high quality is strictly viable in both markets and then when it is unviable in the competitive market.

Let there be two monopolies and three products, all strictly viable for high quality, with demand and cost parameters $v_i, \gamma_i, \theta_i, c_i$, and $x_i, i = 1, 2, 3$. Monopolies 1 and 2 are the single possible producers of products 1 and 2, whereas product 3 can be produced at the same cost by those two firms and many competitive firms. This will allow us compare

not just competition between a competitive industry and a monopoly but between two monopolies.

The quality-guaranteeing price for product 3 will be different for the two monopolies and the competitive firms. Thus, let us clarify the out-of-equilibrium beliefs. On observing an out-of-equilibrium price, consumers believe a firm chose low quality if its price is below the quality-guaranteeing price p^* for that firm and high quality otherwise. We will continue to assume umbrella beliefs: a firm that deviates in any one market will produce low quality thereafter. Let $v_3 < c_3$ to keep market 3 simple by excluding equilibrium sales of low quality.

If the monopolies are not allowed to sell product 3, the market prices are, from (5),

$$\begin{aligned} p_1 &= (1 + \theta_1)v_1 \\ p_2 &= (1 + \theta_2)v_2 \\ p_3 &= p_3^*(comp) = c_3 + (1 + r)\gamma_3c_3. \end{aligned} \tag{19}$$

What if monopoly 1 but not monopoly 2 is allowed to sell product 3? At what price $p_3^*(mon. 1)$ would it be indifferent between high and low quality for product 3? The profits from high quality are

$$\frac{((1 + \theta_1)v_1 - (1 + \gamma_1)c_1)x_1}{r} + \frac{(p_3 - (1 + \gamma_3)c_3)x_3}{r}. \tag{20}$$

Under umbrella beliefs, the most tempting deviation is to low quality in both markets. The result will be one period of high profits in each market (the first and third terms of equation 21), and a second term valued at either zero (if $K_1 = 0$ because $v_1 < c_1$ and low quality is not viable in market 1) or $\frac{v_1 - c_1}{r}$ (if $K_1 = 1$ because $v_1 \geq c_1$ and low quality is viable). Discounting the three terms back to time 0 using $1/(1 + r)$ yields

$$\frac{((1 + \theta_1)v_1 - c_1)x_1}{1 + r} + \frac{K_1(v_1 - c_1)}{r(1 + r)} + \frac{(p_3 - c_3)x_3}{1 + r}. \tag{21}$$

Equating the payoffs and solving for p_3 yields

$$\begin{aligned} p_3^*(mon. 1) &= (1 + \gamma_3)c_3 + r\gamma_3c_3 - \frac{[(1 + \theta_1)v_1 - (1 + (1 + r)\gamma_1)c_1 + K_1(v_1 - c_1)]x_1}{x_3} \\ &= p_3^*(comp) - \frac{[(1 + \theta_1)v_1 - (1 + (1 + r)\gamma_1)c_1 + K_1(v_1 - c_1)]x_1}{x_3}. \end{aligned} \tag{22}$$

Product 1's high-quality viability implies that $(1 + \theta_1)v_1 > (1 + (1 + r)\gamma_1)c_1$ by equation (11). Hence, $p_3^*(mon. 1) < p_3^*(comp)$.

Thus, with monopoly 1 selling not just product 1 but also product 3, the competitive firms would be undercut. In equilibrium, monopoly 1 could capture the entire market, by charging just below the competitive quality-guaranteeing price, $p_3^*(comp)$.

Now open up product 3 to sales by monopoly 2. We know that monopoly 2's quality-guaranteeing price for good 3 would, by the same reasoning as for monopoly 1, be $p_3^*(mon.2) < p_3^*(comp)$. Suppose first that $p_3^*(mon.2) < p_3^*(mon.1)$, as would be the case if the cost of product 2 were lower, its reservation price higher, or its market bigger. When monopolies 1 and 2 compete in price, monopoly 2 will then capture the entire market for product 3, at price $p_3^*(mon.1)$, the price below which monopoly 1 cannot cut without losing the consumer belief that it has high quality. Since $p_3^*(mon.1) < p_3^*(comp)$, product

3's price has fallen, benefiting consumers. If, on the other hand, $p_3^*(mon.2) = p_3^*(mon.1)$, the equilibrium price will be competed all the way down to $p_3^*(mon.2)$. Either way, consumers benefit. Thus, we have demonstrated Proposition 4.

PROPOSITION 4: *An umbrella-branding monopoly can leverage high quality in one market to displace competitive firms producing high quality in a second market. If a second umbrella-branding monopoly competes to capture the competitive market, the leveraging has left consumers better off. In either case, the result obtains only if high quality is strictly viable in the original monopolized market.*

Note the importance of high quality's strict viability for both monopolies in their original markets. That is what provides the unused incentive capacity, the "excess hostages" that can be used to undercut firms in the competitive market.

Proposition 4 describes a situation where monopoly replaces competition but prices fall, benefitting consumers. Proposition 5 will show the possibility of consumer benefit even if the price rises after monopolization, because quality will also rise. We will continue with the same two-monopolist setting and the same values of $p_3^*(comp)$, $p_3^*(mon 1)$, and $p_3^*(mon 2)$. Now, however, let us relax the assumption that low quality is unviable (that $c_3 > v_3$) but assume that the competitive high-quality viability condition (2) is violated, so

$$p_3^*(comp) > (1 + \theta_3)v_3 + \text{Max}(0, c_3 - v_3). \quad (23)$$

Recall that $p_3^*(mon 1) < p_3^*(comp)$. This means it is possible that

$$p_3^*(mon 1) < (1 + \theta_3)v_3 + \text{Max}(0, c_3 - v_3), \quad (24)$$

and high quality is viable for the umbrella-branding monopolist even though it is not for the competitive industry. Let us assume inequality (24) is true.

If low quality is unviable, as in our earlier setting ($v_3 < c_3$), the competitive market was not selling any of good 3, and after entry by the monopolists, monopoly 2 will outcompete monopoly 1 and sell high quality at price $p_3^*(mon. 1) = (1 + \theta_3)v_3$. Clearly, this raises welfare and benefits consumers. Before, product 3 was available only at quality too low to yield consumer surplus; after entry, it is available at high quality and a price that is higher but does yield consumer surplus.

What if low quality is viable? In that case, before the monopolists' entry the competitive market was selling low quality at $p_3 = c_3$, and a consumer's surplus from purchase was $v_3 - c_3$. Suppose just monopoly 1 entered the market, and sold high-quality good 3. It could not charge $p_3(mon. 1) = (1 + \theta_3)v_3$ because it would have to leave consumers with at least the original surplus, $v_3 - c_3$, so

$$p_3(mon.1) = (1 + \theta_3)v_3 - (v_3 - c_3). \quad (25)$$

We know that this $p_3(mon.1)$ exceeds $p_3^*(mon 1)$ under assumption (24) and so credibly conveys high quality to consumers. Monopolist 1 would have entered the market, captured it from the competitive firms, and raised the price—but consumer surplus would have remained unchanged in the process.

Recall, however, that monopolist 2 has a lower quality-guaranteeing price: $p_3^*(mon. 2) < p_3^*(mon. 1)$. If monopoly 2 also enters the market for good 3, it will outcompete monopolist 1 and the price will fall to $p_3^*(mon. 1)$. At that price, consumer surplus will be higher than it was originally when consumers bought low quality at $p_3 = c_3$. Thus, we have Proposition 5.

PROPOSITION 5: *Under particular circumstances, entry into a competitive market by umbrella-branding firms with monopolies in other markets can raise both prices and consumer welfare by raising quality.*

Proposition 5 is important because ordinarily we think of monopoly capture of a formerly competitive market followed by an increase in price as the classic case of leveraging monopoly power from one market to another, something that reduces consumer welfare rather than increasing it. The next section will compare classic monopoly leveraging with Proposition 5's welfare-increasing umbrella branding.

5.1. A COMPARISON WITH THE WHINSTON (1990) MODEL OF MONOPOLY LEVERAGE

Antitrust law has long struggled with whether to worry about the leveraging of monopoly from one market to another. Here, that is exactly what happens. In our setting, however, the leveraging does not result from bundling, predatory pricing, exclusive dealing contracts, or production economies. Rather, it results from the ability of the monopolist to use its profits in its monopoly market as a bond for good behavior in the competitive market. This is a type of economy of scope, but it is a demand-side phenomenon, not a supply-side one.

Umbrella branding as monopoly leveraging is distinguishable from improper leveraging in two ways. First, it does not involve any kind of contract that ties the two markets together, unlike bundling or exclusive dealing. Second, although in the case described in Proposition 4 the monopoly undercuts the price of the competitive firms, it does not charge less than its own cost or that of the competitive firms. Instead, it outcompetes them because consumers feel safer paying a low price to the monopolist than to its one-product rivals. Unlike the rivals, at the low price the monopoly still has incentive to maintain its reputation, because shirking on quality will hurt profits in two markets rather than one.

Proposition 5 extended that idea to a market in which high quality is not viable but low quality is. In that case, if its reputation in the initially monopolized market is a sufficiently valuable bond, an umbrella-branding monopolist could enter with high quality and capture the market even if though its price is higher than what the competitive firms were charging for low quality. The outside observer would see that a competitive market with low prices had changed to a monopolized market with a high price, and would conclude that the monopolist must have used some kind of unfair competition. After adjusting for the quality change, however, consumers are no worse off, and what has happened is that umbrella branding has permitted the monopolist to be more credible in its quality claims than its one-product rivals.

The introduction of this paper mentioned the tying model of Whinston (1990), which has interesting similarities and differences from reputation leveraging. Imagine that goods A and B each have consumer reservation prices of 8 and are monopolized by a firm that has marginal cost of 5 for each of them. A new firm with a marginal cost of 3 appears which is able to enter the market for good B if it pays an entry cost of 1. If the monopolist sells the two goods separately, the new firm will enter market B and drive out the monopolist. If the monopoly commits to tying sales of A and B, however, and charges a price of 16 for the bundle instead of 8 for each, it is safe from entry. The reason is that if the new firm enters, the monopolist would be willing to let the bundle's price drop to 10.9, leaving consumers with a surplus of 5.1 which is greater than the

5 they could get by buying only good B from the new firm. The monopolist is willing to do this, because his payoff is still 0.9, better than the 0 he would get by losing the sale. By tying the two products, the monopolist has put his profits from good A at risk, effectively increasing his aggressiveness in market B.

The Whinston model and the umbrella model are alike in that the monopolist purposely puts its monopoly profits at risk in order to make profits in the market for a second good which is neither a substitute nor a complement. In the Whinston model, however, the monopolist succeeds because it has increased potential price cutting off the equilibrium path, inefficiently excluding rivals and hurting consumers. In the umbrella model, the monopolist succeeds because it has reduced potential quality-cheating off the equilibrium path, and done it in a way that competitive firms cannot match. It captures the market because consumers get more surplus from its high quality than from the rival's. Furthermore, while in the Whinston model the success of the leverage depends upon driving out competitors, in the umbrella model that is incidental, and no fixed cost is necessary to prevent competitors from returning to the market.

6. CONCLUDING REMARKS

When product quality is a problem of moral hazard rather than adverse selection, the problem is one of incentive-compatibility constraints. The seller must be able to earn enough from future sales of high quality to prefer not to deviate to low quality and a higher profit in the current period. This requires a price above the marginal cost of high quality, and if the quality-incentivizing price is too high, consumers will prefer to buy low quality at a low price or not to buy at all; the incentive-compatibility constraint for high quality cannot be satisfied with positive sales. Selling more than one product—umbrella branding—is a way to relax the constraint. It only works for a seller with a monopoly in one product, however, because the advantage of umbrella branding is in using some of the slack in the incentive-compatibility constraint of a monopoly seller who would sell at a high price anyway, even without the need to raise the price above marginal cost to incentivize quality. Firms in a competitive market have valuable reputations for high quality in individual products and earn monopoly-like profits, but they cannot leverage a reputation in one product over to another. This is a distinctive feature of quality as a moral hazard problem, relying as it does on the incentive-compatibility constraints being binding. A firm with a monopoly on one product, however, can not only extend its reputation umbrella to other products, but can outcompete competitive firms. This is not the monopoly leveraging of bundling models, where the puzzle is why the monopoly is willing to lose profits on one product to capture the market for another. Rather, it is costless leveraging of credibility, based on the monopoly's ability to use its excess profits in the monopolized market as a bond for high quality in the open market. This ability is socially useful, allowing it to produce a high-quality product the competitive market cannot, or to provide it at a lower price. Hence, although reputation leveraging will hurt the competitive firms that formerly sold the product at a quality-guaranteeing premium above cost, it will help consumers if competition among monopoly leveragers results in lower prices. Or, if high quality was initially not credible in the competitive market and only low-quality goods were sold, monopoly leveraging can help consumers by increasing quality even if the price rises at the same time.

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