

Leveraging of Reputation through Umbrella Branding: The Implications for Market Structure

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Abstract

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, but only by a firm with a monopoly on at least one product. Such a firm, however, 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. The expanding monopolist can do this without bundling, and if monopolists compete in leveraging, consumers are left better off than if the market remained competitive, in some cases even though the price rises.

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1. Introduction

Umbrella branding is the practice of labelling more than one product under a single brand name. Kellogg's breakfast cereals and General Electric household appliances are natural umbrella brands since the products are similar, but sometimes a brand will be applied to wildly dissimilar products. Vuarnet sells sunglasses, skis, pens, and clothing. Virgin went from being a brand of phonograph record to a brand of airline services, vodka, and soft drinks. As Andersson (2002) notes, 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) variety of appliances and electronics. Executives at LG and Sony have said, "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>)

Umbrella branding is a natural way for a firm to try to earn extra profits from its reputation for quality. How that works depends on how reputation works. Reputation models can be divided into two groups: adverse selection models, 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 adverse selection, umbrella branding is based on some intrinsic link between the qualities of the two products the firm sells— technology or corporate culture, for example. Wernerfelt (1988) builds an adverse selection model of this kind, to show the advantage of umbrella branding for a firm with market power and exogenous quality. Choi and Scarpa (1992) show how reputation extension can lead to credible spatial pre-emption in a location model. Cabral

(2000) looks at the introduction of new products when consumers learn about the quality of the new product from the quality of the old product, and the signal of the firm's decision to use umbrella branding. Miklos-Thal (2010) also looks at product introduction, but with consumers also learning about the quality of the old product from the quality of the new.

When the problem is moral hazard, as in the present paper, umbrella branding is based on a linkage between the firm's incentives to choose high quality for its different goods. The classic reference is by Klein and Leffler (1981), who explain how the threat of reputation loss can make firms produce high quality. The firm could make a one-time high profit in the present if it cheated consumers with low quality, but does not because of the smaller but permanent flow of profits from a good reputation and future sales. Klein and Leffler even 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).

Klein and Leffler do not construct a mathematical model, but another way of putting the idea is that the incentive compatibility constraints for different products could interact, just as Bernheim and Whinston (1990) found that two colluding firms' incentives to cheat fall when they interact in more than one market. Anderson (2002) extended the Klein-Leffler model to multiple products produced by a monopoly. He demonstrated what will be our Proposition 2: that it is easier for a monopolist to maintain high quality when it sells more than one product. Cabral (2009) shows the same in a model with imperfect observability of quality by consumers and notes that asymmetry of the two products is not key to the benefits of branding. Cai and Obara (2009) also analyze imperfect observability. In their model, horizontal integration (branding) allows consumers to better tell whether cheating is truly occurring by eliminating idiosyncratic shocks but creates the possibility of new kinds of deviation from high quality in subsets of products. Dana and Spier (2009) use a Klein-Leffler model with imperfect observability of quality

by consumers in which the low-quality product “fails” only with some probability. In their model, a consumer who buys more products from a firm becomes a better monitor of its behavior because he collects more signals of quality.

Guja (2012) looks at economies of scale in reputation in a special setting: accounting firms which wish to maintain a reputation for auditing corporations carefully and without accepting bribes. She shows that an auditor serving more customers, with a greater reputational capital at stake, will be able to charge a lower price for an credibly high-quality audit. This is not umbrella branding; rather, it is the result of the interaction of the number of sales with probabilistic detection of cheating in each sale. Iacobucci (2012) also looks at a special setting: law partnerships. In his model, identical partners each choose low or high quality. If they make the choice simultaneously, the quality-guaranteeing price does not change because that just doubles the equilibrium and deviation payoffs. If one partner chooses first, however, that increases the credibility of quality, because low quality leads to loss of both his future profits and his partner’s.

Other work combines features of moral hazard and adverse selection. In Rotemberg (2010), some firms are altruistic and some consumers take a firm’s perceived altruism into account in their purchase decisions. This means that a firm that produces a low-quality new product will be punished by lost consumer sales even on its old product. Swaminathan, Fox and Reddy (2001) provide an empirical example: a food product with a large market share that introduced a new product under the same brand name that turned out to be a failure and was withdrawn. Sales of the original product suffered. In Choi (1998), a firm launches a new product each period that it then sells for two periods. The new product exogenously has high or low quality, and as in the Klein-Leffler model, future profits incentivize present quality, but the firm is building a reputation for honesty rather than high quality. Choi (2003) follows up on this with attention to the implications for the timing of new products. Hakenes and Peitz (2008) look at a two-period model in which a monopolist makes a one-time quality and branding choice and low-quality products fail with some probability. They show that umbrella brand-

ing affects the monopolist's quality choice in interesting ways: one of the branded products might be sold at a loss, and quality might be too low instead of too high.

The existing literature has focussed on umbrella branding by monopolies—that is, by firms with market power. 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—a key insight in Klein & Leffler (1981)—they cannot leverage these reputations into other markets, unlike monopolies. As a result, a monopoly may, under particular circumstances, be able to capture a competitive market by introducing umbrella branding.

Since 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 that is surveyed by Rey and Tirole (2006). The reason for foreclosure closest to that in the present paper is in the tying model of Whinston (1990), in which a monopoly ties its monopolized product with 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 own 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. 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 to not 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.

If $v > c$ we will say that low quality is viable: it is more efficient for consumers to buy low quality than not to buy at all. If $v \leq c$ we will say that low quality is unviable.

Infinitely repeated games have an infinite number of subgame perfect equilibria. We will focus on one, the simplest which exhibits a reputation effect. Note that in any such equilibrium, consumer strategies must deter the firms both from (a) choosing low quality, and (b) deviating from the equilibrium price.

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 chooses low quality at some price $p \geq c$. A consumer's strategy is to choose the maximum of the three payoffs from buying at the price p' of the lowest-price firm selling high quality, buying at the price p'' of the lowest-price firm 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. The present discounted value of the profits from perpetual high quality is

$$\pi(\text{high quality}) = \frac{(p - c(1 + \gamma))x}{r}. \quad (2)$$

If the firm chooses low quality, it earns just that one period of high profits, since no consumer buys from it thereafter:

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

Equating equations (2) and (3) and solving for p yields

$$p^*(comp) = c + (1 + r)\gamma c. \quad (4)$$

For the high-quality equilibrium to exist requires that consumers prefer buying high quality at price $p^*(comp)$ to not buying at all or to buying low quality at price c , since otherwise a firm could profitably deviate to producing low quality with price $p = c + \epsilon$ for some small ϵ . Thus, we need

$$(1 + \theta)v - p^*(comp) > \text{Max}(0, v - c). \quad (5)$$

Replacing $p^*(comp)$ using equation (4) and simplifying yields the condition for a reputation equilibrium to exist in a competitive market:

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

If (6) is true we will say that high quality is viable. Otherwise, the high-quality equilibrium fails to exist. High quality is efficient by assumption, but consumers

are not willing to pay a price enough above marginal cost to incentivize the firms.

In equilibrium, consumers believe the product is high quality and so are willing to buy at $p^*(comp)$. If a firm deviates with a lower price, they will not buy from it because their out-of-equilibrium belief is that the product's quality is low and the viability condition (6) tells us that his payoff is higher from buying high quality at p^* .

A firm that charges the equilibrium price $p^*(comp)$ will earn positive profits since $p^*(comp) > (1 + \gamma)c$ from equation (4). Any firm that deviated to a lower price would sell nothing, nor, for that period, would any firm that deviated to a higher price. Thus, firms will deviate neither in quality nor in price.

Monopoly

The high-quality equilibrium under monopoly differs in three respects. First, the equilibrium price is $(1 + \theta)v$, the consumer reservation price for high quality. Second, the deviation price is $Max(v, c)$ rather than c , because the monopoly faces no competition for selling low quality. Third, the Klein-Leffler price, $p^*(mon)$ is different from $p^*(comp)$ if low quality is viable.

First, if $v \leq c$, the quality-guaranteeing price is same as under competition. The monopolist's incentive compatibility constraint is then identical to the competitive firm's, a permanent profit from p^* versus a one-time deviation gain and zero profits thereafter, so $p^*(mon) = p^*(comp)$.

If $v > c$, then even after deviation the monopoly earns positive profits from selling low quality. The monopoly's incentive compatibility constraint compares the payoff from high quality at p to the payoff from low quality at p the first period and v thereafter:

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

which when reduced to an equality and solved yields $p^*(mon) = v + (1 + r)\gamma c$.

Combining the two cases, we have

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

Equation (8) says that when $v > c$ the monopoly Klein-Leffler price is greater than the competitive Klein-Leffler price from equation (4). When low quality is 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 that 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, as Proposition 1 tells us.

Proposition 1: *Whenever parameter values make high quality viable under competition they also make it viable under monopoly.*

Proof. If $v \leq c$, the Klein-Leffler price is the same for the monopoly and the competitive industry, so the proposition is obvious. Thus, suppose $v > c$. We found in inequality (6) that for high quality to be viable in a competitive market when $v \geq c$ requires that

$$\theta v \geq (1 + r)\gamma c. \quad (9)$$

For high quality to be viable in a monopoly market 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 this price is less than his value for high quality, which requires

$$(1 + \theta)v \geq p^*(mon) = v + \gamma(1 + r)c. \quad (10)$$

Inequality (10) is true if and only if

$$\theta v \geq (1 + r)\gamma c, \quad (11)$$

which is therefore our condition for a high-quality monopoly equilibrium to exist. This, however, is identical to the viability condition for the competitive industry, inequality (9). Whenever the parameter values allow a monopoly optimistic equilibrium to exist, they also allow a competitive optimistic equilibrium to exist. ■

Even though $p^*(mon) > p^*(comp)$ if $v > c$, high quality is no less viable under monopoly. The reason is that the relevant deviation for a monopoly is for the firm to deviate to low quality to obtain a one-time gain and a steady if low profit stream. The monopoly compares the capitalized value of the high-quality social surplus (call it X) to the combination of the low-quality social surplus (Y) plus the one-time gain from cheating (Z), to see if $X > Y + Z$. The relevant deviation for the competitive industry is for the consumers to deviate from a firm selling high quality at p^* to a firm selling low quality at c . The 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 leveraging by umbrella branding works, it is not because even in a single market a monopoly has more incentive to produce high quality than a competitive firm.

3. Umbrella Branding in a Monopolized Market

Now proceed to viability when there are two goods. Let us 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 $x_i, i = 1, 2$. 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 will sell them at prices $(1 + \theta_1)v_1$ and $(1 + \theta_2)v_2$. If neither is viable, the firm would 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, i.e.,

$$(1 + \theta_1)v_1 > p_1^*(mon) = c_1 + (1 + r)\gamma c_1 + K_1(v_1 - c_1) \quad (12)$$

and

$$(1 + \theta_2)v_2 < p_2^*(mon) = c_2 + (1 + r)\gamma c_2 + K_2(v_2 - c_2) \quad (13)$$

Monopoly 1 would produce high quality and monopoly 2 would either not produce at all or produce low quality. A two-product monopolist might be able to produce both products at high quality, however, 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.” These beliefs cannot be justified by standard equilibrium refinements, but they are simple and represent a good benchmark case for showing what happens when reputation links two markets. This is what was found by Andersson (2002) and Cabral (2009). We will restate it as Proposition 2.

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 post-entry profit from producing both products with high quality is

$$\frac{((1 + \theta_1)v_1 - (1 + \gamma_1)c_1)x_1}{r} + \frac{(p_2 - (1 + \gamma_2)c_2)x_2}{r}, \quad (14)$$

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:

$$\frac{((1 + \theta_1)v_1 - c_1)x_1}{1 + r} + (K_1x_1)\frac{1}{1 + r}\frac{v_1 - c_1}{r} + \frac{(p_2 - c_2)x_2}{1 + r} + (K_2x_2)\frac{1}{1 + r}\frac{v_2 - c_2}{r}. \quad (15)$$

The profit from high quality is higher than from deviation if expression (14) is greater than (15), which is true if

$$[1 + r][(1 + \theta_1)v_1 - (1 + \gamma_1)c_1]x_1 - r[(1 + \theta_1)v_1 - c_1]x_1 - K_1(v_1 - c_1)x_1 > r(p_2 - c_2)x_2 - (1 + r)(p_2 - (1 + \gamma_2)c_2)x_2 - K_2(v_2 - c_2). \quad (16)$$

Solving this as an equality yields the umbrella-branding Klein-Leffler price:

$$\tilde{p}_2 = [1 + (1 + r)\gamma_2]c_2 - K_2(v_2 - c_2) - \left(\frac{x_1}{x_2}\right) ((1 + \theta_1)v_1 - (1 + (1 + r)\gamma_1)c_1 - K_1(v_1 - c_1)) \quad (17)$$

The stand-alone monopoly price is $p_2^*(monopoly) = c_2 + (1 + r)\gamma_2c_2 + K_2(v_2 - c_2)$ from equation (13). That price is greater than \tilde{p}_2 in equation (17) as a direct result of high quality being viable for product 1 standing alone, inequality (12). 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 \tilde{p}_2 in equation (17). 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. ■

What makes umbrella branding most useful is when high quality is particularly important to product 1 and its market is large, and when the discount rate and the cost of high quality are low. Then, the total profit from selling high-quality product 1 is 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 it not only makes 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 $p_1 = (1 + \theta_1)v_1$ —the extension is 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 Bertrand 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 (2),

$$\frac{(p_1 - (1 + \gamma_1)c_1)x_1}{r} + \frac{(p_2 - (1 + \gamma_2)c_2)x_2}{r} \quad (18)$$

compared with a deviation payoff, following equation (3), of

$$\frac{(p_1 - c_1)x_1}{1 + r} + \frac{(p_2 - c_2)x_2}{1 + r} \quad (19)$$

Equations (18) and (19) 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 to sell just product 1 at $p = p_1^*$ and steal away the entire market from the umbrella-branding firm—which would then lose its credibility for producing high quality in its low-priced market, product 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 (18) and (19), 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 (18) and (19) requires greater profit from product 1, so $p_1 > p_1^*$. The umbrella branding firm cannot do that, however, 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 in 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 viable in both markets and then look at the case where it is unviable in the competitive market.

Let there be 2 monopolies and 3 products, all strictly viable for high quality, with demand and cost parameters $v_i, \gamma_i, \theta_i, c_i$, and $x_i, i = 1, 2, 3$. Monopoly 1 and monopoly 2 are the only possible producers of products 1 and 2, while 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 Klein-Leffler price for product 3 will be different for the two monopolies

and the competitive firms. Thus, let us clarify the out-of-equilibrium beliefs being assumed. On observing an out-of-equilibrium price, consumers believe a firm chose low quality if its price is below the Klein-Leffler 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.

If the monopolies are not allowed to sell product 3, the market prices are, from (4),

$$\begin{aligned}
 p_1 &= (1 + \theta_1)v_1 \\
 p_2 &= (1 + \theta_2)v_2 \\
 p_3 &= p_3^*(comp) = c_3 + (1 + r)\gamma_3c_3
 \end{aligned} \tag{20}$$

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

$$\frac{((1 + \theta_1)v_1 - (1 + \gamma_1)c_1)x_1}{r} + \frac{(p_3 - (1 + \gamma_3)c_3)x_3}{r} \tag{21}$$

Under umbrella beliefs, the most tempting deviation for monopolist 1 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 (22) below), 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):

$$\frac{((1 + \theta_1)v_1 - c_1)x_1}{1 + r} + \frac{(K_1(v_1 - c_1))}{r(1 + r)} + \frac{(p_3 - c_3)x_3}{1 + r}. \tag{22}$$

Equating the last payoffs and solving for p_3 yields

$$\begin{aligned}
p_3^*(mon. 1) &= (1 + \gamma_3)c_3 + r\gamma_3c_3 - \frac{[(1+\theta_1)v_1 - (1+(1+r)\gamma_1)c_1 + K_1(v_1 - c_1)]x_1}{x_3} \\
&= p_3^*(comp) - \frac{[(1+\theta_1)v_1 - (1+(1+r)\gamma_1)c_1 + K_1(v_1 - c_1)]x_1}{x_3}
\end{aligned} \tag{23}$$

Product 1's high-quality viability implies that $(1 + \theta_1)v_1 > (1 + (1 + r)\gamma_1)c_1$ by equation (12). Comparing the Klein-Leffler prices in equations (20) and (22), we can conclude that $p_3^*(mon. 1) < p_3^*(comp)$.

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

Now open up product 3 to sales by monopoly 2. We know that monopoly 2's Klein-Leffler price for good 3 would, by the same reasoning as for monopoly 1, be $p_3^*(mon.2) < p_3^*$. Suppose, without loss of generality, that $p_3^*(mon.2) < p_3^*(mon.1)$, as would be the case if the cost of product 2 were lower, or its reservation price higher, its market bigger. Then in the price competition between monopolies 1 and 2, monopoly 2 will 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's belief that it has high quality. Since $p_3^*(mon.1) < p_3^*(comp)$, product 3's price has fallen, benefiting consumers. 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 monopoly created by umbrella branding leaves consumers better off.*

Note that Proposition 4 does depend on the strict viability of high quality 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.

Now look at the case where high quality is unviable in the competitive market. We can continue with the same model and the same values of $p_3^*(comp)$, $p_3^*(mon\ 1)$, and $p_3^*(mon\ 2)$, but now the high-quality viability condition (5) is violated. Rearranging that condition to put $p_3^*(comp)$ on the left-hand side, we have:

$$p_3^*(comp) > (1 + \theta_3)v_3 + Max(0, c_3 - v_3), \quad (24)$$

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

$$p_3^*(mon\ 1) < (1 + \theta_3)v_3 + Max(0, c_3 - v_3), \quad (25)$$

and high quality is viable for the umbrella branding monopolist even though it is not for the competitive industry. Let us assume that inequality (25) is true.

If low quality is not viable, the competitive market was not selling any of good 3, and after entry the monopolist will sell at $p_3(mon.\ 1) = (1 + \theta_3)v_3$. If low quality is viable, then before the monopolist's entry the competitive market was selling low quality at $p_3 = c_3$, but after entry the monopoly is selling high quality. The monopoly cannot charge $p_3(mon.\ 1) = (1 + \theta_3)v_3$ because it must leave consumers with at least the same surplus, $v_3 - c_3$. Thus,

$$p_3(mon.1) = (1 + \theta_3)v_3 - (v_3 - c_3), \quad (26)$$

which we know exceeds $p_3^*(mon\ 1)$ under assumption (25).

As at the start of this section, suppose, without loss of generality, that $p_3^*(mon.\ 2) < p_3^*(mon.\ 1)$. Then if monopoly 2 also enters the market, 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 $p = c$. 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.

A Comparison with the Whinston (1990) Model of Monopoly Leverage

Anti-trust law has long struggled with whether to worry about the leveraging of monopoly in one market to acquire a monopoly in a second market. 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 could be seen as an economy of scope, but it is a demand-side phenomenon, not a supply-side one.

This kind of monopoly leveraging is distinguishable from improper leveraging in two ways. First, it does not involve any kind of complex contract that ties the two markets together, unlike bundling or exclusive dealing. Second, the monopoly does not charge less than the cost of the competitive firms. Instead, it outcompetes them because consumers feel safer paying a low price to the monopolist than to the competitive firms because even at the lower price the monopoly still has incentive to maintain its reputation across markets.

The intuition is easy to extend to a market in which high quality is not viable but in which consumers are willing to buy even low quality if necessary ($v > c$). In that case, if its reputation in the initially monopolized market is a sufficiently valuable bond, an umbrella-pricing monopolist could enter with high quality and capture the market even if its price were higher than what the competitive firms were charging for low quality.

The introduction mentioned the tying model of Whinston (1990), which has interesting similarities and differences from the reputation leveraging in the present paper. 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 .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 potential way to relax the constraint. This can be done only by 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 do have valuable reputations for high quality in individual products, but they cannot leverage the reputation they have 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 by so doing can outcompete competitive firms producing that product. This is not the monopoly leveraging of bundling models, where the puzzle is why the monopoly is willing to lose profits on one product in order to capture the market for another. Rather, it is a costless leveraging of credibility, based on the ability of the monopoly to use its 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 this reputation leveraging will hurt the competitive firms that used to sell the product at a quality-ensuring premium above cost, it will actually 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 benefit consumers by increasing quality even if the price rises at the same time.

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