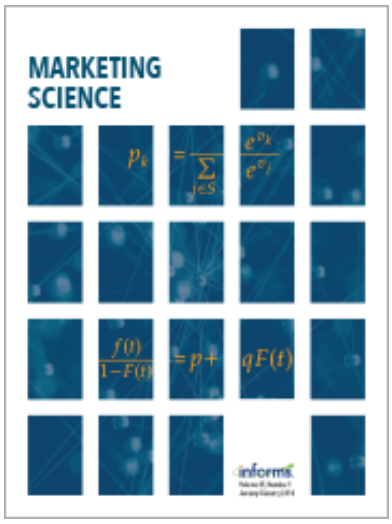

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Strategic Manufacturer Response to a Dominant Retailer

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The growing dominance of large retailers has altered traditional channel incentives for manufacturers. In this paper, we present a theoretical model to illustrate a strategic manufacturer response to a dominant retailer. In our model, a dominant and a weak retailer compete for the sale of a single product supplied by a single manufacturer. The dominant retailer has the power to dictate the wholesale price, but the manufacturer sets the wholesale price for the weak retailer. The manufacturer also has partial ability to transfer demand between retailers. In the strategic manufacturer response, the manufacturer begins by raising the wholesale price for the weak retailer over that for the dominant retailer. This makes the weak retailer the high-margin channel. The manufacturer then transfers demand to the weak retailer by engaging in joint promotions and advertising. We then use this strategic response model to derive a testable hypothesis that may guide future research in determining the source of dominant retailers' low prices.

Key words: channels of distribution; channel power; retailing; game theory
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1. Introduction

In a growing number of industries, a few retailers, such as Wal-Mart, Tesco, and Home Depot, are determining how consumer products are made and sold in the United States and Europe. These dominant retailers, also known as "category killers" or "power retailers," have been enormously successful. For example, Wal-Mart, with its $285 billion sales, is one of the largest companies in the world (Maier 2005). Tesco is the number one grocer in the United Kingdom, accounting for almost 30% of the supermarket sales and, by some accounts, taking in $1 out of every $11 spent on retail (Carney 2004). In the home improvement market, the total market share of Home Depot and Lowe's is more than 50% (Knight 2003).

Emergence of the dominant retailers is a result of the shift of channel power from manufacturers to retailers. This trend has been attributed to increased use of information technology by retailers, insufficient shelf space due to a large number of new product introductions, increased concentration of the retailing industry, and introduction of successful private-label brands (Kadiyali et al. 2000). Other commonly cited causes include a decline in advertising and improved quality of retail management (Messinger and Narasimhan 1995). Butaney and Wortzel (1988) show that distributors have more power when industry competition is strong and industry sales are equally distributed among industry manufacturers. Dominant retailers use finely tuned product line selections and, most importantly, competitive pricing to attack weaker channel players and attract more customers. For example, *Business Week* reports that on a comparable basket of grocery items, Wal-Mart's prices were, on the average, 20% lower than those of other stores (Koretz 2002).

To keep prices low, these retailers enjoy advantages that traditional retailers do not. For example, Home Depot's state-of-the-art inventory system makes it very difficult for regional firms to be competitive with Home Depot (Dunne and Kahn 1997). It has been argued that Wal-Mart's superior operating margins leave plenty of room for Wal-Mart to offer lower prices (Neff 2003). Logistical efficiencies have been attributed to Wal-Mart's cost advantage (Facenda 2004).

However, it has also been argued that the retail giant systematically uses its channel power with the manufacturers to buy products at the lowest cost possible and pass the gains on to the consumer through

extremely low prices (Useem 2003). Many argue that Wal-Mart has a reputation for getting favorable wholesale terms via aggressive negotiating tactics with their suppliers (Facenda 2004, Munson and Rosenblatt 1999). For example, *Business Week* reported that "One multinational supplier . . . says Wal-Mart buyers in Mexico were aggressive and abusive pulling his product off shelves for several months when he objected to a deep price cut that would have wiped out his profits" (Smith 2002). *Fortune*'s report was similar: "[Wal-Mart's] suppliers are expected to give their best price period. It is not even negotiated anymore says . . . of a consulting company that helps manufacturers sell to big retailers" (Useem 2003).[1]

As in the case of Wal-Mart, Tesco's remarkably low grocery prices have also been attributed to its ability to squeeze supplier margins (Carney 2004). This squeeze has been so severe, in fact, as to cause street protests against Tesco in sympathy with milk suppliers. According to a group of independent music retailers, Best Buy uses its clout to extract price concessions from major record companies, which enables it to sell new albums at lower prices (Christman 2003).

Why do these retailers have such power over the manufacturers? Potential benefits may arise for manufacturers when they work with dominant retailers. First, dominant retailers' sheer size and the velocity at which they sell their inventory allow them to sell large volumes. This helps their suppliers to benefit from scale economies in transaction costs. For example, the marginal cost of transacting with the retailer may be smaller the bigger the shipped lot. This could take the form of transportation costs or billing costs. In the home-repair category, for instance, Home Depot has won the favor of suppliers by consolidating regional buying offices into a single entity, which streamlines purchasing and helps Home Depot to pay its vendors faster (Foust 2004). Another source of suppliers' distribution efficiency is made possible by the dominant retailers' sophisticated information technologies.[2] For example, Wal-Mart in the early 90s was known to develop its "retail link," which gave many of its suppliers access to inventory positions of their products at its retail locations (Bradley and Ghemawat 2002). Wal-Mart is well known for its technological innovations. In the 1990s, Wal-Mart was a leader in applying electronic data interchange (EDI), which allows retailers and suppliers to readily exchange data. Now it is leading the industry in applying RFID, Internet-based, and scan based-trading technologies, which will bring further efficiencies not only to Wal-Mart but also to its suppliers.[3] Competing retailers of the dominant players do not enjoy the same kind of leverage with their suppliers, and therefore are at a competitive disadvantage. For example, a group of more than 100 auto parts retailers claimed that category killers, including Wal-Mart and Pep Boys, induced price discrimination and purchased auto parts from the suppliers at prices 40% less than the other retailers (Balto 2002).

How manufacturers might manage such asymmetric channel relationships is the main focus of this research. Our results indicate that when faced with a dominant retailer who dictates wholesale terms, hard-pressed manufacturers and nondominant retailers have an incentive to mitigate the power of the dominant retailer. Our analysis suggests that joint marketing initiatives with selected channel members can be used as a way to deal with the threat imposed by a power retailer in a particular industry or product category. We refer to this type of general marketing activity as a *strategic manufacturer response to a dominant retailer*. We make a distinction between a dominant and a weak retailer and examine the dominant retailer/manufacturer/weak retailer channel structure, in which the dominant retailer dictates the wholesale price to the manufacturer. The manufacturer then sets the wholesale price for the weak retailer in combination with joint advertising or promotion.

Our study, however, does not foreclose the notion that the dominant retailer's low prices come from its operational efficiencies. Rather, we isolate from the cost efficiency explanation the dominant retailer's ability to obtain favorable supply terms via its tough negotiating leverage. By doing so, we are able to separate the consequence of its raw ability to dictate channel terms from that arising from an efficiency advantage.

[1] An issue is whether or not such lower prices to one retailer results in violation of the Robinsom-Patman Act. *Business Week* reports, "Wal-Mart appears to be in no imminent danger of running afoul of federal antitrust statutes. The Robinson-Patman Act of 1936 was passed in large part to protect mom-and-pop grocers from the Great Atlantic & Pacific Tea Co., the Wal-Mart of its day. But contemporary antitrust interpretations eschew such David-and-Goliath populism. Giants like Wal-Mart have wide latitude to do as they wish to rivals and suppliers so long as they deliver lower prices to consumers. 'When Wal-Mart comes in and people desert downtown because they like the selection and the low prices, it's hard for people in the antitrust community to say we should not let them do that,' says New York University law professor Harry First." (Bianco et al. 2003). This is a complex legal issue that is beyond the scope of the paper and the capabilities of the authors.

[2] We thank an anonymous reviewer for suggesting to us these benefits that dominant retailers provide to their suppliers.

[3] Wal-Mart is leading the charge to eventually eradicate EDI in favor of an Internet-based XML product. While EDI demands that each retailer/supplier relationship utilize individualized technology products, Internet-based XML is faster, easier, and can be used with multiple trading partners. Wal-Mart is also experimenting with scan-based trading. This technology makes it possible for inventory to remain the property of Wal-Mart's vendors until the product is actually sold (Stankevich 2003).

In our theoretical analysis, the weak retailer and the dominant retailer compete for the sale of a single product supplied by a manufacturer. The dominant retailer dictates the wholesale price to the manufacturer, who then sets the wholesale price for the weak retailer. The manufacturer has the ability to transfer demand from one retailer to another. The analysis reveals insights for a strategic manufacturer response to the dominant retailer pricing pressures. Specifically, by raising the wholesale price for the weak retailer over that for the dominant retailer and transferring demand from the low-margin (dominant) channel to the high-margin (weak) channel, the manufacturer can shift the distribution of channel profits away from the dominant retailer. By raising the weak retailer's wholesale price (which raises the weak retailer's consumer prices), the manufacturer induces higher prices by both retailers due to strategic complementarity, which results in higher consumer prices. Thus, the retailers are able to extract more surplus from the consumers. The manufacturer gets some part of this increased surplus through its higher wholesale price in the weak retail channel. Given this higher wholesale price for the weak retailer, the manufacturer is able to make more profits by transferring demand to this high-margin (weak retailer) channel.

The manufacturer can transfer demand from the dominant retailer to the weak retailer using different tools. For example, it can give the weak retailer cooperative advertising allowances that induce the weak retailer to promote its product. Alternatively, the manufacturer can shift some demand from the dominant retailer to the weak retailer by collaborative advertising and promotions.[4, 5]

[4] There are different ways a manufacturer can help a retailer through such collaboration. For example, Kellogg's developed TV commercials that had the company in tandem with a local retailer, talking about support for certain community programs (Fusaro 2000). Here is the message in another collaborative ad: "The laundry is almost done when the young woman moans that crayons in the dryer melted over her expensive jeans. To the rescue: Tide . . . and Vons Club" (*The Plain Dealer* 1995). In the summer of 1995, Keebler ran local advertising spots in addition to its national advertising for its Salty Snacks brands to promote both the brands and local grocery stores in more than 50 major markets (Marx 1995a). Retailers could also tie in with Keebler's national promotions with vacation and entertainment partners by awarding free prizes from Keebler's marketing partners to local shoppers (Marx 1995b). *Billboard* reported that EMI launched its channel concept in 1996 to help small stores compete with major chains. Under the EMI channel initiative, the retailers had access to listening posts, an in-store marketing unit, and special promotions (Ferguson 1996). According to *Advertising Age*, to help small retailers, Kodak is reported to issue a handbook containing marketing insights and to give direct-mail materials and provide co-op ad dollars (Wilke 1997).

[5] There are indications in the marketplace suggesting that this might be the case. For example, according to an article in *Billboard*, alarmed by the increased dominance of large retailers (e.g., Wal-Mart, Target, and Best Buy), the major record labels in the music industry are now supporting independents (weaker retailers) with a greater flow of cooperative advertising dollars (Christman 2002). Moreover, according to an ex-brand manager of Heinz via informal discussion, to balance the power of dominant retailers such as Wal-Mart, manufacturers help weaker retailers such as Kroger and Safeway via promotions and collaborative advertising. The reader, however, should not interpret these examples as suggesting that manufacturers assist weaker retailers only. Although here we only mention those examples suggesting exclusive advertising support, manufacturers also provide advertising support to the dominant retailers. What is relevant is that our objective in this paper is to explain why exclusive advertising support to weak retailers might occur in some, *but not all*, instances. (Please see §4 for complete details.)

The incentive to transfer demand to a weak retail channel has implications for detecting the source of the power retailers' low prices. A purely efficiency view would suggest that retailing efficiencies singularly enable these retailers to keep costs low. Alternatively, a channel power view would imply that the dominant retailers' ability to dictate channel terms provides an explanation to these low prices. In §4, we derive a testable hypothesis that suggests the following. If it is empirically observed that manufacturers provide exclusive support for weak retailers, then dominant retailers' power in bargaining with suppliers is a contributing factor to their low prices. Otherwise, if manufacturers do not offer exclusive assistance to weak retailers, then dominant retailers' low prices are likely not a consequence of their ability to induce favorable wholesale prices from their suppliers.

There has been a sustained interest in game-theoretic modeling of marketing channels (e.g., Choi 1991, Chu and Desai 1995, Coughlan 1985, Jeuland and Shugan 1983, Kim and Staelin 1999, Lal and Narasimhan 1996, Lee and Staelin 1997, McGuire and Staelin 1983, Moorthy 1988, Purohit 1997), and different channel structures have been introduced. For example, McGuire and Staelin (1983) characterized the manufacturer Stackelberg model, in which the manufacturer sets the wholesale price for the retailer. Jeuland and Shugan (1983) described the vertical Nash model, where there is a balance between the manufacturer and the retailer in the sense that they set their prices simultaneously. Choi (1991) and Lee and Staelin (1997) used the retailer Stackelberg model, in which the retailer dictates its margin to the manufacturer. In our model, we incorporate power asymmetry between retailers. In the channel structure analyzed here, the dominant retailer has the power to dictate the wholesale price to the manufacturer, but the weak retailer does not have such power.

There is also literature in marketing on power within the channel. For example, Butaney and Wortzel (1988) demonstrate that customer market power as

well as manufacturer market power play a role in determining distributor power in industrial goods markets. Messinger and Narasimhan (1995) investigate whether there has been a power shift in the supply channel by investigating the change in profitability of manufacturers and retailers. Banks et al. (2002) and Iyer and Villas-Boas (2003) more recently examine the consequence of reputation and bargaining power, respectively, in one-on-one channel relationships. Our research, alternatively, considers how the power in one channel affects the manufacturer's behavior in other channels.

A recent study that recognizes the relevance of asymmetric channel relationships in retail competition is Dukes et al. (2006). This research focuses on characterizing the impact of asymmetric retailing costs on wholesale bargaining and on the distribution of profits. Alternatively, in this paper, we consider a dominant retailer whose ability to dictate channel terms may or may not derive from a cost advantage. In addition, unlike Dukes et al. (2006), we examine a manufacturer's marketing strategy beyond that of just pricing. Another study that examines asymmetric channels is that of Raju and Zhang (2005). They investigate how a manufacturer can best coordinate a channel in the presence of a dominant retailer. In their paper, the asymmetry is in price leadership (i.e., the dominant retailer sets its price and the other retailers take this price as the market price), while in ours asymmetry arises from one retailer's ability to dictate the wholesale price to the manufacturer.

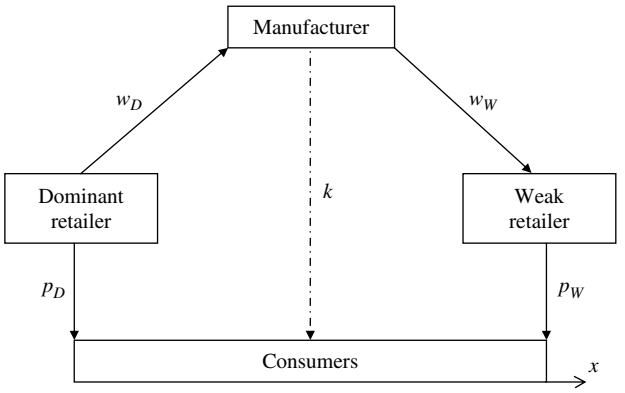
Subsequent sections are organized as follows. Section 2 provides the basic modeling framework and characterizes the equilibrium that defines the strategic manufacturer response. In §3, we examine several properties of the strategic manufacturer response. Section 4 derives a test for detecting the source of the power retailers' competitive advantage. Section 5 evaluates the robustness of the manufacturer's strategic response when we relax two modeling assumptions. In concluding, §6 summarizes the results, outlines the limitations of the study, and proposes directions for future research.

2. Strategic Manufacturer Response

2.1. Manufacturer's Pricing Response

In this section, we develop a two-stage equilibrium model to illustrate the basic incentives behind strategic manufacturer response. Consider an industry with two differentiated retailers who compete for the sale of a single product supplied by a common manufacturer. Initially, the manufacturer and the two retailers play a two-stage pricing game in which the manufacturer moves in Stage 1 and the two retailers compete in retail prices in Stage 2.

Figure 1 Arrangement of Agents



The two retailers differ with respect to the manufacturer's control over wholesale prices. The manufacturer is unable to directly influence the wholesale price for one of the retailers, which we refer to as the *dominant retailer* (D). Denote by $w_D \geq 0$ the unit price paid to the manufacturer for each unit sold to the dominant retailer. This price is assumed to be exogenous.[6] For the other retailer, the *weak retailer* (W), the manufacturer is endowed with the ability to dictate the channel terms by offering a take-it-or-leave-it wholesale price w_W. This occurs in Stage 1.

Note that our notion of channel dominance is defined as the ability of one retailer to dictate its wholesaling costs upstream to its supplier. The quotes given in the introduction illustrate this notion of dominance. We take channel dominance by a retailer as an assumption. In our model, we do not aim to explain where this dominance comes from. This is a substantive and interesting issue, but beyond our research scope. We are interested in how the manufacturer responds given this dominance.[7]

After observing the manufacturer's choice of w_W in Stage 1, retailers simultaneously chose retail prices p_D and p_W in Stage 2. Figure 1 illustrates model's timing and the arrangement of the agents. The retailers' marginal costs of retailing are c_W and c_D, respectively. In order to isolate the intuition for the manufacturer's strategic response, we initially set $c_W = c_D = 0$. Later, in §3.2, however, we relax this assumption in order to investigate the impact of retailer cost asymmetry ($c_W > c_D \geq 0$) on the manufacturer's ability to

[6] Because our focus concerns manufacturer behavior, we do not model the determination of w_D in the model discussed here. Our results are general in that they hold for all values $w_D \geq 0$. However, as we illustrate in §5, incorporating the full control of wholesale price to the retailer does not qualitatively alter our results.

[7] The reader should not interpret our model as a one-for-one match with the Wal-Mart case. We do not intend to model any specific dominant retailer, but rather we aim to derive a testable hypothesis that will suggest which modeling assumption (*channel power* versus *cost efficiency*) generates the observed outcome (dominant retailers' low retail prices).

implement its strategic response. The manufacturer's marginal cost of production is normalized to zero. Fixed costs for all firms are also set to zero, without loss of generality.

Consumers have different preferences over the two retailers. We model this differentiation as consumers being uniformly distributed along a straight line of unit length with retailers located at both ends. Each consumer visits exactly one retailer and buys one unit of the product. When visiting a retailer, a consumer incurs a "transportation" cost of $t > 0$ times the length traveled. This transportation cost parameter captures the extent of differentiation between the two retailers. A useful interpretation is that retailers are differentiated by the various attributes of the store. For example, stores might differ with respect to location, store layout, or product assortment.[8]

Formally, let $x \in [0, 1]$ represent the location of a consumer by denoting her distance to retailer D. Given retail prices p_D and p_W, this consumer's utility from each retailer as a function of location x is

$$U(i; x) = \begin{cases} v - tx - p_D, & i = D \\ v - t(1-x) - p_W, & i = W, \end{cases} \tag{1}$$

where $v > 0$ is the gross benefit from consuming the manufacturer's product. It is assumed that v is sufficiently large so that $U(i; x) > 0$ for all possible p_D, p_W, and x. Specifically, this assumption takes the following form:

Assumption 1. $v > 11t/2 + (2c_W + c_D)/3 + w_D$.

The consumer located at x chooses retailer i to maximize (1). Consequently, retailer i's demand can be expressed as

$$q_i = \frac{1}{2} + \frac{p_j - p_i}{2t}, \quad i = D, W;\ j \neq i, \tag{2}$$

and Stage 2 profits as

$$\Pi_i = (p_i - w_i)\left[\frac{1}{2} + \frac{p_j - p_i}{2t}\right], \quad i = D, W;\ j \neq i. \tag{3}$$

Retailer i's optimal pricing in Stage 2, as a function of wholesale prices w_D and w_W, is then given by

$$p_i(w_W; w_D) = t + \frac{2w_i}{3} + \frac{w_j}{3}, \quad i = D, W;\ j \neq i, \tag{4}$$

which are determined by maximizing (3) with respect to p_i for $i = D, W$. Stage 2 pricing functions, given by (4), suggest that an increase in the weak retailer's wholesale price leads to higher prices by *both* retailers. Because wholesale price w_W is retailer W's marginal cost, an increase causes the weak retailer to increase p_W. In addition, because retailer D observes changes in wholesale price w_W, retailer D strategically anticipates an increase in p_W and raises p_D accordingly. This effect endows the manufacturer with the ability to coordinate retail prices even though he has control in only one channel.[9]

The manufacturer exploits this effect to her benefit when choosing the wholesale price w_W in order to maximize profit, which is expressed by

$$\Pi_m(w_W; w_D) = \sum_{i=D,W} w_i q_i, \tag{5}$$

and incorporates Stage 2 responses in retail prices. The solution to manufacturer's Stage 1 optimization yields the wholesale price in equilibrium presented in the following proposition. Equilibrium variables in the pricing response model are denoted with the notation $\sim$.

Proposition 1. *Given $w_D \geq 0$ and Assumption* 1, *the equilibrium is characterized as follows*.

1. *The manufacturer charges the weak retailer a wholesale price $\tilde{w}_W = 3t/2 + w_D$.*
2. *Retailers set retail prices*

$$\tilde{p}_W = 2t + w_D \quad \textit{and} \quad \tilde{p}_D = 3t/2 + w_D.$$

3. *Retailer and manufacturer profits are*:

$$\tilde{\Pi}_W = \frac{t}{8}, \quad \tilde{\Pi}_D = \frac{9t}{8}, \quad \textit{and} \quad \tilde{\Pi}_m = \frac{3t}{8} + w_D.$$

What is important to note from this proposition is that, in equilibrium, the manufacturer sets its wholesale price $\tilde{w}_W > w_D$. If the manufacturer were to set w_W less than the exogenously set w_D, the strategic effect discussed above would lead to less retail price coordination. This could only be beneficial to the manufacturer if it resulted in *more* overall sales for the manufacturer. However, because we consider a fixed set of consumers, the manufacturer does not gain anything by keeping retail prices low.

Also, it follows from the fact $\tilde{w}_W > w_D$ that the dominant retailer sets the price lower than the weak retailer: $\tilde{p}_W > \tilde{p}_D$. As a result, a greater volume of the manufacturer's sales occurs through the dominant retail channel. Hence, the dominant retailer has a larger market share than the weak retailer solely as a result of its channel position vis-à-vis the manufacturer.[10]

[8] The demand specification in our model assumes a fixed set of consumers. As we show in §5, this is not necessary for our results.

[9] Note that such coordination of retail prices by a manufacturer through take-it-or-leave-it pricing is previously well established in the marketing literature (McGuire and Staelin 1983, Coughlan 1985, Moorthy 1988).

[10] If the dominant retailer possessed some additional retailing cost efficiencies relative to its rival retailer, then the dominant retailer's market share would be even greater. For expositional clarity, we have equated retailers' marginal costs. In §3.2, we discuss the implication of asymmetric costs.

The manufacturer would prefer the distribution of market share to be opposite. In particular, because it earns higher margins through the weak retailer, she would like to shift consumers away from the dominant to the weak retailer. This is precisely the motive of the manufacturer to engage in some sort of marketing activity, which encourages consumers to choose the weak retailer over the dominant one. We expand on this point in the following section.

2.2. Strategic Manufacturer Response

In the previous section, it was argued that the manufacturer, when facing a dominant retailer, obtains a higher margin from the weak retailer. Consequently, if the manufacturer had the ability to influence consumers' retailer choice, then she would encourage them to choose the weak retailer. In this section, we formalize this reasoning by extending the model to allow the manufacturer to engage in marketing activities, such as collaborative advertising with the retailer, which can influence consumers' retailer choices. Extending the model in this way permits us to investigate the extent to which the manufacturer should invest in such an activity. In addition, we can use the model to predict how industry parameters, such as retailer differentiation, affect the incentive to induce consumers to switch retailers.

Suppose that in Stage 1 the manufacturer can invest in some marketing activity that encourages consumers to shop at a particular retailer. For example, the manufacturer can develop commercials that encourage shoppers to visit the retailer. (Please also see Footnote 4.) Let $k \in (-\infty, +\infty)$ denote the manufacturer's investment choice. (For simplicity of exposition, from now on we will refer to this as the manufacturer's advertising investment.) If $k > 0$, the manufacturer invests k to encourage shoppers to choose the weak retailer. If $k < 0$, the manufacturer spends $-k$ to encourage shoppers to choose the dominant retailer.[11] Let $A(k)$ be a component of the consumer's utility, which measures the degree to which consumers are predisposed toward a particular retailer. For example, if $A(k) > 0$, then consumers gain an additional benefit when shopping at the weak retailer. To incorporate this additional factor into the model, we extend the utility specification in (1) as follows:

$$U(i;x) = \begin{cases} v - A(k)I_{[k<0]} - tx - p_D, & i = D \\ v + A(k)I_{[k\geq 0]} - t(1-x) - p_W, & i = W, \end{cases} \tag{6}$$

where

$$A(k) = \begin{cases} \delta\sqrt{k}, & k > 0 \\ -\delta\sqrt{-k}, & k < 0 \end{cases}$$

$\delta > 0$ and $I_{[\cdot]}$ is an indicator function, which takes on the value of one when the bracketed condition holds, and takes on zero otherwise. The parameter δ denotes the sensitivity consumers have toward the advertising. We further assumed that δ is not too large, so that the manufacturer cannot advertise so high as to direct all consumers to one retailer. Formally, we make the following assumption.

Assumption 2. $18t > \delta^2$.

This assumption ensures that the manufacturer's profit maximization problem has an interior solution. Note, in addition, that our specification of $A(\cdot)$ is chosen to exhibit decreasing returns, which is in line with standard notions of advertising (Agrawal 1996, Kim and Staelin 1999).

With the ability to affect some of the consumers' retailer choices, we must reexamine the manufacturer's pricing decision. Relative to the model described in the previous section, for a given amount of advertising $k \neq 0$, some consumers are induced to switch retailers and this alters retailers' pricing strategies. For example, if $k > 0$, the dominant retailer concedes market share to the weak one. To retain consumers, the dominant retailer must compete more aggressively with price while the weak retailer can afford to raise its price. Optimal retail prices, given k and w_W, lead to the following distribution of market shares

$$q_D = \frac{1}{2} + \frac{w_W - w_D}{6t} - \frac{A(k)}{6t} \quad \text{and} \quad q_W = \frac{1}{2} + \frac{w_D - w_W}{6t} + \frac{A(k)}{6t}. \tag{7}$$

Note that in the above formulation, three possibilities are allowed. If we find in equilibrium that $k < 0$, then demand is transferred to the dominant retailer (via manufacturer's advertising). If we find $k > 0$, then demand is transferred to the weak retailer (via manufacturer's advertising). If we find $k = 0$, then there is no transfer of demand between the retailers.

The quantities given by (7) fully describe the demand facing the manufacturer in each channel. The manufacturer's Stage 1 problem in the strategic response model can thus be described as follows. Given w_D, the manufacturer chooses k and w_W to maximize

$$\Pi_m = \sum_{i=D,\,W} w_i q_i - |k|, \tag{8}$$

[11] In reality, of course, manufacturers may aid both retailers to some degree. However, because our focus is on joint marketing activities that are preferential, we model k as the amount devoted to exclusive aid to one of the two retailers. In fact, in this fixed total demand model, the manufacturer would not have any incentive to engage in positive marketing activities for both retailers simultaneously, because total quantity is fixed and any increase in willingness to pay v is competed away in a Hotelling model, i.e., retail prices do not depend upon v.

subject to (7). The maximizers of (8) constitute the unique equilibrium strategy of the manufacturer in the strategic response model.

As seen in §2.1, the manufacturer responds by raising the weak retailer's wholesale price w_W over w_D in order to help coordinate retail prices. The same effect applies here, but with its advertising support, the manufacturer can transfer demand to the weaker channel, which is the high-margin channel. Equilibrium variables in the strategic response model are denoted with * and expressed in Proposition 2.

Proposition 2. *Under Assumptions* 1 *and* 2, *the strategic response in equilibrium is characterized as follows*.

1. *The manufacturer chooses* $k^* > 0$ *in support of the weak retailer*:

$$k^* = \left[\frac{\delta(w_W^* - w_D)}{12t}\right]^2 = \left(\frac{3\delta t}{24t - \delta^2}\right)^2.$$

2. *The manufacturer charges the weak retailer a wholesale price, which is higher than in the pricing response model*:

$$w_W^* = \frac{3t}{2} + \frac{\delta\sqrt{k^*}}{2} + w_D = \frac{36t^2}{24t - \delta^2} + w_D > \tilde{w}_W.$$

3. *Retail prices are*:

$$p_W^* = \left(\frac{48t}{24t - \delta^2}\right)t + w_D > \tilde{p}_W \quad \textit{and}$$

$$p_D^* = \left(\frac{36t - 2\delta^2}{24t - \delta^2}\right)t + w_D < \tilde{p}_D.$$

4. *Retailer and manufacturer profits are*:

$$\Pi_W^* = 2t\left(\frac{6t}{24t - \delta^2}\right)^2, \quad \Pi_D^* = 2t\left(\frac{18t - \delta^2}{24t - \delta^2}\right)^2, \quad \textit{and}$$

$$\Pi_m^* = \frac{9t^2}{24t - \delta^2} + w_D.$$

Part 1 of Proposition 2 states that, in equilibrium, the manufacturer will aid the weak retailer by shifting demand in its favor ($k^* > 0$), as just discussed. The second part of the proposition says that the manufacturer will claim the additional channel profits brought forth by her investment in k through an increase in wholesale price w_W. Finally, part 3 of Proposition 2 shows that the consequent shift in market share from the dominant retailer to the weak one results in an increase in p_W and a decrease in p_D.[12] Hence, the price differential between retailers increases as a result of manufacturer advertising.

It can be directly verified that $\Pi_m^* > \tilde{\Pi}_m$. Thus, profits of the manufacturer are higher in the strategic response model because the manufacturer has more strategic degrees of freedom. The implication is that manufacturers with the ability to influence consumer retailer choice have an opportunity to respond to a dominant retailer. And, in order to capitalize on this effect, the manufacturer must raise its wholesale price to the weak retailer. It can also be further verified that $\Pi_W^* > \tilde{\Pi}_W$ and $\Pi_D^* < \tilde{\Pi}_D$. The manufacturer, by aiding the weak retailer through advertising, shifts profits from the dominant to the weak retail channel. These additional channel profits are then shared between the weak retailer and manufacturer.[13]

From Proposition 2, we observe that the dominant retailer's price is lower compared to that of the weak retailer.[14] This characteristic closely depicts dominant retailers like Wal-Mart, which are famous for their low prices and high profits.[15] We emphasize here that the observed lower prices of dominant retailers are not necessarily due to their operational efficiencies (we assume marginal retailing costs of the retailers are equal to each other so far); as we show in both the pricing response and strategic response models, these retailers' low prices may emerge solely as a result of their power in marketing channels.

3. Properties of Strategic Manufacturer Response

The analytical model presented in the previous section illustrates the basic principle behind the strategic manufacturer response: When faced with a dominant retailer who dictates wholesale terms, a manufacturer can strategically react by raising margins in competing channels and transferring demand from the dominant to the weaker channels. In this section, we explore some of the properties of the model to

[12] Note that, in equilibrium, the weak retailer's market share is greater than that of the dominant retailer for high values of the advertising sensitivity parameter. However, in most of the allowable parameter space (as restricted by Assumption 2), this does not occur. Specifically, the dominant retailer has more demand (for $12t > \delta^2$) in this range. Note also that given our notion of dominance (see §2.1), the dominant retailer is dominant *not* because of the resultant market share. Rather, we assume the dominant retailer has ex ante channel power—it has this power before the product is actually sold.

[13] Note that our strategic manufacturer response is similar in spirit to Liu and Zhang's (2006) direct selling and personalized pricing. They show that direct selling and personalized pricing favor manufacturers at the expense of retailers, and thus can help manufacturers to regain leverage lost to retailers. While Liu and Zhang's (2006) study focuses on a dyadic channel with one manufacturer and one retailer, our research examines an asymmetric channel in which one retailer has the power to dictate the wholesale price to the manufacturer, but the other retailer does not have such power.

[14] This result is similar to that of He and Chen (2006). They find that in an e-marketplace with symmetric online stores offering competing products, the featured store on average has a higher price. In our study, however, we dismiss symmetry of retailers in order to understand the impact of asymmetric retail dominance.

[15] According to a price survey of 215 items in 2002, prices at other retailers were, on the average, 35%–38% higher than those at Wal-Mart in the Dallas market (Taylor 2003).

see how the manufacturer's incentives change with respect to changes in the industrial environment.

3.1. Retailer Loyalty and Advertising Sensitivity

In this section, we investigate the impact of retail loyalty and advertising sensitivity parameters on strategic manufacturer response, as defined in the previous section. We ask, for example, if strategic manufacturer response would be more effective if consumers are more loyal to one retailer, and how this might relate to the sensitivity of manufacturer advertising.

To investigate the this issue, we appeal to Proposition 2 and examine the comparative statics of the equilibrium outcome with respect to the parameters t and δ. A large value of t can be interpreted as a case in which consumers are relatively loyal to a particular retailer. This might be due to location, customer service, or some idiosyncratic characteristics of the retail stores. It can be shown that advertising spending increases with a decrease in the loyalty parameter t. When the consumers are less loyal to the retailers, because advertising is more effective in transferring demand, the manufacturer has more incentive to spend on advertising. Thus, when loyalty to the retailers is low, the manufacturer spends more on advertising and transfers more demand to the high-margin (weak retailer) channel.

The loyalty parameter has two opposing effects on wholesale price w_W. First, as consumers become more loyal to the retailers, the weak retailer's demand loss—due to a higher price—decreases. Hence, the manufacturer is able to increase w_W without significant loss of the weak retailer's market share. Second, as consumers' loyalty to the retailers increases, manufacturer advertising becomes relatively less effective in transferring demand to the weak retailer. Thus, the manufacturer is not able to compensate for lost demand due to the higher weak retailer wholesale price—via advertising—when loyalty to the retailers is high. The high degree of loyalty to the retailers causes the manufacturer to lose its flexibility to raise w_W without hurting the weak retailer demand. When $12t > \delta^2$, the first mentioned loyalty effect dominates, and w_W is increasing in t. Otherwise, when $18t > \delta^2 > 12t$, w_W is decreasing in t.

A similar intuition applies to the sensitivity parameter δ. A low value of δ corresponds, for instance, to a setting where consumers are not responsive to the manufacturer's advertising and joint promotions. The strategic manufacturer response suffers as a result. The following corollary summarizes these results.

Corollary 1. *If* $18t > \delta^2 > 12t$, *then*

$$\frac{\partial k^*}{\partial t}, \frac{\partial w_W^*}{\partial t} < 0 < \frac{\partial k^*}{\partial \delta}, \frac{\partial w_W^*}{\partial \delta};$$

and if $12t > \delta^2$, *then*

$$\frac{\partial k^*}{\partial t} < 0 < \frac{\partial k^*}{\partial \delta}, \frac{\partial w_W^*}{\partial t}, \frac{\partial w_W^*}{\partial \delta}.$$

3.2. Differences in Retail Costs

The second property we investigate concerns asymmetric cost differences between the two retailers. A manufacturer might recognize that the dominant retailer not only has the advantage in setting channel terms, but also has significant cost advantages over the weak retailer. In this case, a manufacturer might ask: How does this cost advantage affect the efficacy of the strategic response derived above? Indeed, some dominant retailers are famous for their operating efficiencies. For example, according to *Business Week*, Wal-Mart holds its operating and selling expenses to 15% of sales, versus 28% for Sears, Roebuck & Co (Schiller et al. 1992).

To examine how strategic manufacturer response is affected by the presence of a cost advantage in favor of the dominant retailer, we specify nonzero retailing costs c_W, c_D. Furthermore, we allow for the possibility that the dominant retailer might enjoy an advantage. Specifically, we assume $c_W > c_D \geq 0$. The retailers' pricing decision is then to maximize

$$\Pi_i = (p_i - w_i - c_i)q_i(p_W, p_D, k), \quad i = D, W.$$

We further assume that the cost difference $c_W - c_D$ is not very large, because a large cost difference may result in consumer prices that encourage all the consumers to buy from the dominant retailer. Formally, this assumption takes the following form:

Assumption 3. $3t > (c_W - c_D)$.

This assumption guarantees nondegenerate demands ($0 < q_W < 1$ and $0 < q_D < 1$), and the profit maximization problem has an interior solution.

Recall that the dominant retailer's ability to dictate price w_D endows it with a lower wholesale price than that of its rival. The dominant retailer was then able to set the price more competitively, $p_D < p_W$, which resulted in a larger market share. With an additional cost advantage, this market share is even more lopsided in favor of the dominant retailer:

$$q_D - q_W = \frac{1}{3t}[(w_W - w_D) + (c_W - c_D) - A(k)].$$

(See the appendix for more details.) The manufacturer is less inclined to invest in the strategic response now that the weak retailer is less competitive, and therefore it is more difficult to get consumers to switch to the higher-priced retailer.

Proposition 3. *Under Assumptions* 1–3, *when retailers face marginal costs* $c_W > c_D \geq 0$, *the strategic manufacturer response is less effective. That is, the equilibrium*

response

$$k^* = \left[\frac{\delta(w_W^* - w_D)}{12t}\right]^2 = \left(\frac{\delta(3t - (c_W - c_D))}{24t - \delta^2}\right)^2,$$

$$w_W^* = \frac{12t(3t - (c_W - c_D))}{24t - \delta^2} + w_D$$

is decreasing in $c_W - c_D$.

There are two important implications of this proposition. The first is that some degree of strategic response remains profitable for the manufacturer despite the cost asymmetry. However, the manufacturer's return is diminished when a cost advantage exists.

Second, note that it is the *cost difference* only, rather than the presence of positive marginal costs, that drives this detrimental result. Therefore, *industrywide* cost factors will not alter the incentives for strategic manufacturer response. For example, if trucking cost increases, thereby affecting all retailers equally, then the strategic manufacturer response remains as effective as before the cost increase.

3.3. Incorporating Benefits to the Manufacturer When Working with the Dominant Retailer

As mentioned in the introduction, potential benefits for manufacturers may arise when dealing with dominants retailers if there are scale economies in transaction costs. Also, the dominant retailers' information systems, such as Wal-Mart's Retail Link, can make manufacturers more efficient. These cost savings may offset the benefits of the strategic manufacturer response of §2.2, if sufficiently large. In this section, we briefly evaluate the impact of these cost savings on the incentive for strategic manufacturer response.

Suppose that when dealing with the dominant retailer D, the manufacturer obtains a cost savings of s per unit sold. It is not necessary to assume that there are no cost savings when dealing with the weak retailer W. Rather, $s > 0$ represents a *net* savings across the two retailers. If s is sufficiently large, then the manufacturer would prefer to deal exclusively with the dominant retailer. Hence, we shall place bounds on the transaction cost savings: $3t > s > 0$. Represented this way, s is saved for each unit sold to D, so that the manufacturer's profits can be written as

$$\Pi_m = (w_D + s)q_D + w_W q_W - |k|,$$

where q_D and q_W are given in (7). This modification to the model does not alter the retailers' price reactions as functions of wholesale price w_W and advertising support $|k|$ relative to the case in §2.2. Using these reaction functions, the equilibrium can be derived directly by maximizing Π_m above with respect to w_W and k. This leads to the outcome in the following proposition.

Proposition 4. *Suppose the manufacturer accrues a net marginal benefit* $s > 0$ *from transacting with the dominant retailer. Under Assumptions* 1 *and* 2, *if* $3t > s$, *then the manufacturer's optimal strategic response is characterized as follows.*

(i) *Advertising support*

$$k^* = \left(\frac{\delta(3t - s)}{24t - \delta^2}\right)^2 > 0$$

is decreasing in s.

(ii) *Wholesale price*

$$w_W^* = \frac{36t^2 + (12t - \delta^2)s}{24t - \delta^2} + w_D$$

is increasing in s.

It is worthwhile to point out that if $s \downarrow 0$ we get the basic result in Proposition 2. To see the intuition for Proposition 4, recall that in the original model, with $s = 0$, the manufacturer wants to shift demand to the weak channel where the margin is large. However, with $s > 0$, there is an opportunity cost of shifting demand away from the dominant retailer. The manufacturer thus balances this trade-off by reducing k (the amount it spends to provide support to the weak retailer). In addition, the manufacturer raises wholesale price w_W^* when transaction cost savings are present. This forces the weak retailer to react with a higher retailer price, thereby pushing more units through the dominant retailer, which generates the transaction cost savings.

4. Detecting the Source of Competitive Advantage

It is debatable whether dominant retailers' low consumer prices are attributable to their ability to dictate wholesale prices to the manufacturers. In simplistic terms, for example, a purely *efficiency* view would suggest that retailing efficiencies singularly enable these retailers to keep costs low. Alternatively, a *channel power* view admits that costs may also be held in check by hard-nosed bargaining with manufacturers. By marginally modifying the notion of dominance in the previous models, we can derive a testable hypothesis to determine whether a tough stance with suppliers contributes to dominant retailers' competitive advantage. Specifically, we contrast equilibrium outcomes in two related models, one with a dominant retailer who can dictate favorable wholesale terms and one without. We will see that simply by modifying only this assumption, the models lead to distinct differences in the form of the strategic manufacturer response.

To derive this test, we require two related models with the following properties. Both models should

yield equilibrium outcomes, with the dominant retailer pricing more competitively then the weak retailer. However, the models should differ with respect to the source of the dominant retailer's ability to keep its costs low. In the model representing the channel power view, the dominant retailer has the ability to dictate favorable wholesale terms with the manufacturer (i.e., low wholesale price w_D). The retailers may otherwise have identical retailing costs (i.e., $c_W = c_D$), or the dominant retailer may have a cost advantage ($c_D < c_W$).

The efficiency view, alternatively, is represented by a model in which the dominant retailer has a certain cost advantage (i.e., $c_D < c_W$), but is otherwise unable to control wholesale terms. In this case, the manufacturer freely chooses a wholesale price. As we show below, the two models yield different outcomes with respect to advertising support for the weak retailer. By making empirical observations regarding advertising support to the weak retailer, one can deduce which modeling assumption generates the observed outcome.

The channel power (CP) view corresponds to the models discussed in §2.2 (when $c_W = c_D$) and in §3.2 (when $c_W > c_D$). In these models, we assume that the dominant retailer dictates wholesale price w_D. The consequence of this assumption is that the manufacturer aids the weak retailer through its advertising support (i.e., $k^{\mathrm{CP}} > 0$) and charges the weak retailer a higher wholesale price (i.e., $w_W^{\mathrm{CP}} - w_D > 0$).

To accommodate the model for the *efficiency* (E) view, we suppose that the dominant retailer has lower costs, as in §3.2, but can no longer dictate wholesale terms. That is, suppose that $c_W - c_D > 0$ and that the wholesale price w is chosen optimally by the manufacturer.[16] Otherwise, all agents and their decisions are as in the model of §2.2. The corresponding objective for the manufacturer is

$$\max_{w,\,k} \; w(q_D + q_W) - |k|,$$

$$\text{subject to} \quad q_D = \frac{1}{2} - \frac{A(k)}{6t} + \frac{c_W - c_D}{6t} \quad \text{and}$$

$$q_W = \frac{1}{2} + \frac{A(k)}{6t} - \frac{c_W - c_D}{6t}.$$

Recall from the analysis in §2.2 that the manufacturer's incentive to use cooperative advertising allowances is strictly to shift demand toward its preferred channel. However, when the manufacturer sets a uniform wholesale price, it is indifferent between the channels and therefore optimally avoids exclusive ad support to either retailer: $k^E = 0$.[17]

In addition, it can be readily confirmed that in this efficiency view setting, the dominant retailer sets its price lower than that of the weak retailer:

$$p_W^E - p_D^E = \tfrac{1}{9}(c_W - c_D) > 0.$$

Thus, the equilibrium ordering of retail prices for the efficiency view is consistent with that of the channel power view. A comparison of these two models is given in Table 1.

Table 1 Test to Detect Source of Dominant Retailers' Ability to Set Low Prices

	View	
	Channel power	Efficiency
Model assumptions		
w_D chosen by	Dominant retailer (D)	Manufacturer
Retail cost difference	$c_W - c_D \geq 0$	$c_W - c_D > 0$
Equilibrium outcome		
D has lower retail price $p_D < p_W$	Yes	Yes
Manufacturer provides support to the weak retailer $k > 0$	Yes	No

To summarize, the efficiency view interpretation of the model implies that the manufacturer provides no advertising support for the weak retailer. In contrast, the channel power interpretation of the model (§2.2) suggests advertising support for the weak retailer while favoring the dominant retailer in wholesale price. Thus, if it is empirically observed that manufacturers provide exclusive support for weak retailers, then our results imply that the dominant retailers' power in bargaining with suppliers is a contributing factor to their low prices. Otherwise, if manufacturers do not offer exclusive assistance to weak retailers, then the dominant retailers' low prices are likely not a consequence of their ability to induce favorable wholesale prices from their suppliers. It is important to note that we do not claim that this testable hypothesis can be used to detect the sole factor in explaining dominant retailers' low prices. More succinctly, rather, our test can be used to determine whether the ability to induce wholesale price discrimination is a part of the explanation.

5. Extensions and Robustness

The results of the previous sections rely on the following two modeling assumptions.

1. Wholesale price w_D is not strategically chosen.
2. Total demand is fixed (e.g., $q_D + q_W = 1$).

[16] It might be suggested to allow the manufacturer to price discriminate between the two retailers in the efficiency view. Recall, however, that our intention in this setting is to remove the ability of a retailer to elicit favorable wholesale terms from the manufacturer. In fact, in a scenario with different retail costs, it is the inefficient retailer who obtains a lower wholesale cost than the dominant one. Moreover, the efficient retailer would set higher retail prices (for all $\delta^2 > 18t/7$), which violates a condition for our test, namely $p_D < p_W$.

[17] Although not used in the subsequent discussion, the corresponding optimal uniform wholesale price is $w^E = v - 3t/2 + (c_W - 3c_D)/6$.

These were invoked in order to convey the main aspects of the strategic manufacturer response. To get a sense of the general conditions under which our results hold, we consider in this section the implications when relaxing them. We illustrate, in particular, that our results are qualitatively robust to the relaxation of these assumptions. To do so, we consider a model in which total demand is not fixed and the dominant retailer chooses the wholesale price w_D strategically.

It is instructive to note that under the original consumer choice model any wholesale price w_D is optimal for the dominant retailer. The reason can be seen by examining the profit expressions for the dominant retailer, given in Propositions 1 and 2. None of the objectives are functions of the dominant retailer wholesale price w_D. This is an artifact of the demand functions implied by our consumer choice specification. For the derived demand functions of §2, a unit increase in the dominant retailer wholesale price w_D results in an equal unit increase in both the dominant retailer consumer price p_D and the weak retailer's price p_W. Consequently, the dominant retailer is indifferent to changes in the wholesale price because neither its margin nor its demand depends on w_D. Obviously, such a consequence is unlikely to hold for specifications in which total demand is not fixed. Therefore, in this section we consider nonfixed demand when determining the dominant retailer's strategic choice of w_D.

By a nonfixed demand specification, we simply mean that consumers have an outside alternative to the two retailers. Therefore, consumers may enter or leave the market for the manufacturer's product depending on retail prices. We implement this consumer model in reduced form using the following linear demand functions

$$q_W = \alpha - p_W + \beta p_D + A(k), \tag{9}$$

$$q_D = \alpha - p_D + \beta p_W - A(k), \tag{10}$$

where $A(k)$ is the advertising component defined as in §2.2 and $\alpha > 0$, $0 < \beta < 1$.

As before, the manufacturer can help either retailer via advertising. Again, $k \in (-\infty, +\infty)$ denotes the manufacturer's investment choice with $k > 0$ encouraging shoppers to choose the weak retailer, and $k < 0$ encouraging shoppers to choose the dominant retailer. We assume that the advertising parameter δ entering in A is not so large that the manufacturer does not wish to advertise so much as to send all consumers to one of the retailers.

Assumption 4. $2\beta(2+\beta)/(2-\beta) > \delta^2$.

We also assume that the retailers' marginal costs of retailing and the manufacturer's marginal cost of production is zero. Fixed costs for all firms are again set to zero, without loss of generality. The game is played in three stages. First, the dominant retailer selects the wholesale price. Then the manufacturer chooses the wholesale price for the weak retailer and its advertising (which retailer to help and how much), given the dominant retailer's wholesale price. Finally, given wholesale prices w_D and w_W, each retailer simultaneously chooses its price:

$$p_i^*(w_D, w_W) = \arg\max_p (p_i - w_i) q_i, \quad i = D, W,$$

where q_i are given in (9) and (10).

In Stage 2, the manufacturer chooses the wholesale price w_W and its advertising k in order to maximize profit, which is expressed by (8) and incorporates Stage 3 responses in retail prices. The solution to the manufacturer's Stage 2 optimization yields the wholesale price and advertising spending as functions of w_D (details are provided in the appendix):

$$\begin{aligned} w_W(w_D) &= \frac{\alpha(2+\beta) + 2\beta w_D + (2-\beta)\delta\sqrt{k}}{2(2-\beta^2)} \\ &= \frac{2(2+\beta)^2\alpha + (4\beta(2+\beta) - \delta^2(2-\beta))w_D}{4(2+\beta)(2-\beta^2) - \delta^2(2-\beta)} \end{aligned} \tag{11}$$

$$\begin{aligned} k(w_D) &= \frac{\delta^2(w_W - w_D)^2}{4(2+\beta)^2} \\ &= \frac{\delta^2(2+\beta)^2(\alpha - 2(1-\beta)w_D)^2}{(4(2+\beta)(2-\beta^2) - \delta^2(2-\beta))^2}. \end{aligned} \tag{12}$$

From (11) we observe that regardless of the dominant retailer's choice of w_D, the optimal response of the manufacturer yields that $w_W(w_D) > w_D$ for $w_D \geq 0$. Thus, as in the case with Hotelling demand functions, the manufacturer claims the additional channel profits brought forth by her investment in $k > 0$ through an increase wholesale price w_W. This is consistent with the results in Propositions 1 and 2 in that the manufacturer charges a higher wholesale price for the weak retailer than for the dominant one. This result holds, in particular, for the dominant retailer's optimal choice w_D^*.

Proposition 5. *Consider a modified extension of the game from §2 in which*

(i) *the dominant retailer chooses an observable wholesale price w_D before the manufacturer moves; and*

(ii) *consumer demand at each retailer is given by* (9) *and* (10).

Then, under Assumption 4, *the unique equilibrium outcome has $k^* > 0$ and $w_W^* > w_D^* = 0$.*

In Stage 1, the dominant retailer incorporates the third-stage pricing rules as well as the second-stage manufacturer's responses (11) and (12) in its

wholesale price decision. It can be seen that the dominant retailer's profit is a decreasing function of the wholesale price it dictates to the manufacturer ($\partial\Pi_D/\partial w_D < 0$). Thus, in equilibrium the dominant retailer chooses a wholesale price that is equal to zero (the marginal cost of the manufacturer). Obviously, an incentive to lower wholesale price for the dominant retailer is to reduce its costs. Recall also the incentive to keep wholesale price high to facilitate price coordination at the retail level. However, because demand is not fixed, lowering w_D creates the additional benefit of increasing total demand.[18]

From this result, we conclude that when endogenizing the dominant retailer's wholesale price and incorporating nonfixed demand, the strategic manufacturer response remains characterized by advertising that aids the weak retailer ($k^* > 0$) and a higher wholesale price for the weak retailer ($w_W^* > w_D^*$).[19, 20]

6. Conclusion

The issue of channel conflict and the question of power within the channel are not new. The growth of the grocer the Atlantic & Pacific Tea Company (A&P) in the early 20th century, for example, caused concern among competitors (as well as antitrust authorities) because of its unprecedented dominance and growth in the grocery industry. Later, in the 60s, the growth of the department store format, and recently the power-retailer phenomenon, has further provoked this question. We have proposed a modeling framework that provides insights about channel relations in an asymmetric retail setting. In our model, the dominant retailer has power over the manufacturer, while the weak retailer does not. The analysis suggests that the manufacturer can respond strategically to the dominant retailer's pricing pressures by raising the wholesale price for the weak retailer over that for the dominant retailer, while simultaneously transferring demand to the high-margin (weak retailer) channel via advertising.

We find that the benefit to the manufacturer from this strategic response increases from either an increase in customers' sensitivity to advertising or from a decrease in the differentiation between the retailers. Both have the effect of making the strategic manufacturer response marginally more effective with respect to the manufacturer's investment in joint advertising.[21] The analysis also shows that an increase in the cost asymmetry between the retailers reduces the effectiveness of the strategic manufacturer response. Higher retailing costs for the weak retailer prevent it from pricing competitively against the dominant one. The lower market share that results erodes the incentive for investment in strategic manufacturer response.

Our analysis also suggests that a contributing factor to a dominant retailer's cost advantage might be its ability to induce favorable wholesale terms from their suppliers. Even if retailers such as Wal-Mart benefit from operational efficiencies, their raw ability to dictate supply prices can be an additional factor in achieving low costs. We compared two models that differ only with respect to whether the dominant retailer has this ability. These two models led to different equilibrium predictions regarding the strategic manufacturer response. Thus, our analysis offers a testable hypothesis that can be used to determine whether dominant retailers' hard-nosed tactics vis-à-vis their suppliers play a role in explaining their competitive prices.

It is important to point out that the manufacturer's strategic response involves setting different prices to retailers, which may raise legal concerns.[22] Specifically, there is a potential violation of the law when a supplier price discriminates to competing retailers. We stress, therefore, that the intent of our research is to understand the incentives behind marketing phenomena and derive a testable hypothesis regarding the source of dominant retailers' competitive advantage in the market place rather than to advocate legally questionable behavior.

Our analysis points to new questions about channel strategy in the presence of a dominant retailer. Of particular interest is how channel members handle private information, such as demand conditions, cost parameters, or promotional activities. The channel management literature examined various incentives for sharing and withholding information within and across the channel (Chu and Messinger 1997, Gu and Chen 2004, Li 2002). Still unexplored, however, is how these incentives change when one retailer carries significantly more channel power than other channel members. In an earlier version of this paper, we examined the implication when the dominant retailer has

[18] Anecdotes from the trade press are consistent with our result of such low wholesale prices dictated by the dominant retailer. For example, as mentioned before, 100 auto parts retailers claimed that category killers including Wal-Mart and Pep Boys purchase auto parts from suppliers at prices 40% less than those of other retailers (Balto 2002). "They take your guts out to get the best price says a small toymaker of Wal-Mart" (Schiller et al. 1992, p. 2).

[19] We also conducted the same analysis for the manufacturer's pricing response and differential costs of the retailers. Our analysis showed that the manufacturer's strategic response when the retailers have asymmetric costs is robust to the exogenous dominant retailer wholesale price and fixed total demand assumptions. Please contact the authors for details.

[20] The results of §4 are also robust to this modeling extension.

[21] An exception is the effect of differentiation when $12t > \delta^2$; please refer to §3.1.

[22] The relevant laws are the Robinson-Patman Act in the United States and the Treaty of Rome, Article 82(c), in the European Union.

sole possession of information regarding the advertising sensitivities of their customers (parameter δ in our model). By not obtaining this information, the manufacturer faces uncertain demand and is unable to as effectively implement its strategic response.

Other important questions remain, however. For example, suppose that the manufacturer, through its market research, has knowledge of consumer preferences for its product. The manufacturer might ask whether this information should be shared and, if so, with whom. In the presence of a dominant retailer, the manufacturer may have incentives to share this information only with select channel members. We hope to address these issues in future research efforts.

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Appendix

Proof of Proposition 1. The result follows by maximizing the profit expression (5), using Stage 1 pricing functions (4). The second-order condition for the maximization is satisfied at $\widetilde{w}_W$ because

$$\frac{d^2\Pi_m}{d(w_W)^2} = \frac{d}{dw_W}\left[q_W - \frac{1}{6t}w_W + \frac{1}{6t}w_D\right] = -\frac{1}{3t} < 0. \quad \text{Q.E.D.}$$

Proof of Proposition 2. To derive the equilibrium outcome, we start with the consumer's decision given retail prices p_W, p_D, then determine the retailers' optimal prices, and finally derive the manufacturer's Stage 1 choices of w_W and k. The indifferent consumer is located at $\bar{x}$ such that $U(D, \bar{x}) = U(R, \bar{x})$, or

$$\bar{x} = \frac{1}{2t}[t + (p_W - p_D) - A(k)].$$

Then $q_D = \bar{x}$ and $q_W = 1 - \bar{x}$. Retailer i sets retail price $p_i = \arg\max_p pq_i$, which leads to

$$\begin{aligned} p_W(w_W, k) &= t + \frac{2w_W + w_D}{3t} + \frac{A(k)}{3} \\ p_D(w_W, k) &= t + \frac{2w_D + w_W}{3t} - \frac{A(k)}{3}. \end{aligned} \tag{A1}$$

The subsequent channel quantities are given by (7). The manufacturer's optimal choice, (w_W^*, k^*), maximizes (8), and must satisfy

$$\begin{aligned} w_W^* - w_D &= 3t + A(k^*) \\ w_W^* - w_D &= \frac{6t}{A'(k^*)}, \end{aligned}$$

which follow from the first-order conditions for maximization. First assume $k > 0$. Using $A'(k) = (\delta/2)k^{-1/2}$, one obtains the expressions for w_W^* and k^* given in the proposition. This is the maximization if the leading principle minors of

$$\nabla^2\Pi_m = \begin{bmatrix} \dfrac{-1}{3t} & \dfrac{\delta}{12t}k^{-1/2} \\ \dfrac{\delta}{12t}k^{-1/2} & \dfrac{-\delta(w_W - w_D)}{24t(k^{3/2})} \end{bmatrix}$$

evaluated at (w_W^*, k^*) alternate in sign, starting with negative. The first leading principle minor is readily verified as negative at (w_W^*, k^*). The second leading principle minor, expressed as

$$|\nabla^2\Pi_m| = \frac{\delta}{72t^2k}\left[\frac{w_W - w_D}{k^{1/2}} - \frac{\delta}{2}\right],$$

is positive at (w_W^*, k^*) if and only if $\delta^2 < 24t$, which holds under the condition of Assumption 2. The above analysis assumed that $k > 0$. If $k < 0$, the same analysis leads to a positive sign for $|\nabla^2\Pi_m|$. Hence, we conclude the stated maximizer (w_W^*, k^*) constitutes the unique equilibrium choice of the manufacturer. Substitution of the expressions for w_W^* and k^* into (A1) gives the expressions for equilibrium retail prices as stated in the proposition. The equilibrium profits of the manufacturer are derived using (8), and of the retailers using $\Pi_i = (p_i - w_i - c_i)q_i(p_W, p_D, k)$, $i = D, W$. Q.E.D.

Proof of Corollary 1. Differentiating the expressions for w_W^* and k^* as given in Proposition 2 with respect to t and δ gives the stated result.

Proof of Proposition 3. The previous analysis of the retailers' choice of price that can be applied here using the retailers total marginal cost is $w_i + c_i$, instead of w_i. This leads to channel quantities expressed by

$$\begin{aligned} q_W &= \frac{1}{6t}[3t + (w_D + c_D) - (w_W + c_W) + A(k)] \\ q_D &= \frac{1}{6t}[3t + (w_W + c_W) - (w_D + c_D) - A(k)]. \end{aligned} \tag{A2}$$

The manufacturer's problem is to maximize (8) subject to (A2). Assuming $k > 0$, k^* and w_W^*, as defined in the proposition, solve the following first-order conditions,

$$\begin{aligned} w_W^* - w_D &= 3t + (c_D - c_W) + A(k^*) \\ w_W^* - w_D &= \frac{6t}{A'(k^*)}. \end{aligned}$$

Because it follows from an argument analogous to that in the proof of Proposition 2, we omit the details that show that (w_W^*, k^*) is the unique maximum. Q.E.D.

Proof of Proposition 4. Use the previous analysis of the retailers' choice of price as given in (A1). Then, solve the manufacturer's problem of choosing w_W and k using $w_D + s$ instead of w_D in the manufacturer's objective function. Deriving the stated results is analogous to the derivation used in Proposition 2, and is thus omitted. Q.E.D.

Proof of Proposition 5. Retailers' optimal pricing in Stage 3, as a function of wholesale prices w_D and w_W, is then given by

$$p_i = \frac{\alpha}{2-\beta} + \frac{\beta w_{-i} + 2w_i}{4-\beta^2} + \frac{A(k)}{2+\beta}, \tag{A3}$$

where $i = D, W$ and $i \neq -i$. Substituting these best response functions into Equations (9) and (10), we can express the manufacturer's objective $\Pi_m(w_W, k; w_D)$ and derive the following first-order conditions with respect to its choice of w_W and k:

$$\frac{\partial\Pi_m}{\partial w_W} = \frac{\alpha}{2-\beta} + \frac{2\beta w_D}{4-\beta^2} - \frac{2(2-\beta^2)w_W}{4-\beta^2} + \frac{A(k)}{2+\beta} = 0 \tag{A4}$$

$$\frac{\partial\Pi_m}{\partial k} = \frac{\delta}{2\sqrt{k}(2+\beta)}(w_W - w_D) - 1 = 0 \quad \text{for } k > 0 \tag{A5}$$

with the corresponding Hessian matrix

$$\begin{bmatrix} \frac{\partial^2 \Pi_m}{\partial w_W^2} & \frac{\partial \Pi_m}{\partial w_W \partial k} \\ \frac{\partial^2 \Pi_m}{\partial k \partial w_W} & \frac{\partial \Pi_m}{\partial k^2} \end{bmatrix} = \begin{bmatrix} \frac{-(4-2\beta^2)}{4-\beta^2} & \frac{\delta}{2\sqrt{k}(2+\beta)} \\ \frac{\delta}{2\sqrt{k}(2+\beta)} & \frac{\delta}{4(2+\beta)}(w_D - w_W)k^{-3/2} \end{bmatrix}$$

for $k > 0$.

The first leading principle minor is readily verified as negative. The second leading principle minor, expressed as

$$|\nabla^2 \Pi_m| = \frac{\delta}{2(2+\beta)^2}\left(\frac{(2-\beta^2)(w_W - w_D)}{(2-\beta)\sqrt{k}} - \frac{\delta}{2}\right),$$

which is positive at the solution of the first-order conditions given by (11) and (12) provided the following two conditions hold:

$$\alpha > 2w_D \tag{A6}$$

$$\delta^2 < 4(2+\beta). \tag{A7}$$

The concavity condition (A7) is implied by Assumption 4, and it will be shown that (A6) holds in equilibrium. The above analysis assumed that $k > 0$. If $k \leq 0$, the same analysis leads to a negative sign for $|\nabla^2 \Pi_m|$. Hence, the expressions in (11) and (12) are unique maximizers of the manufacturer's problem under the conditions (A6) and (A7).

Note that

$$w_W - w_D = \frac{2\alpha(2+\beta)^2 + 4(2+\beta)(\beta - 2 + \beta^2)w_D}{4(2+\beta)(2-\beta^2) - \delta^2(2-\beta)}.$$

The denominator is positive by (A7) and the numerator is positive under (A6). Hence, (A7) and (A6) are sufficient for $w_W > w_D$.

The remainder of the proof is establishes that the optimal wholesale price chosen in the first stage by the dominant retailer is $w_D^* = 0$. The dominant retailer chooses its retail price $w_D \geq 0$ to maximize its profits:

$$\Pi_D = (p_D - w_D)\left(\alpha - p_D - \beta p_W - \delta\sqrt{k}\right)$$

subject to (A3), (11), and (12). The first-order derivative, after substitution, is expressed as

$$\begin{aligned} \frac{\partial \Pi_D}{\partial w_D} = &\left\{(2-\beta)[\delta^2(2-\beta-\beta^2) + (2+\beta)(1-\beta)\right. \\ &\left.\cdot(-4(2+\beta)(1+\beta) + 2\delta^2)]\right\} \\ &\times [4(2+\beta)(2-\beta^2) - \delta^2(2-\beta)]^{-1} \\ &\times (p_D - w_D + q_D) \end{aligned} \tag{A8}$$

where

$$\begin{aligned} p_D - w_D &= q_D \\ &= \frac{\alpha(2\beta(2+\beta)^2 - \delta^2(4-\beta^2))}{4(2+\beta)(2-\beta^2) - \delta^2(2-\beta)} \\ &\quad + \frac{w_D(2(1-\beta)\delta^2(4-\beta^2) + 4\beta^2(2+\beta) - \delta^2\beta(2-\beta))}{4(2+\beta)(2-\beta^2) - \delta^2(2-\beta)}. \end{aligned}$$

In order to establish that $w_D^* = 0$, we show that the derivative in (A8) is negative for $w_D \geq 0$. From the above expression, we have that $p_D - w_D > 0$ and $q_D > 0$ under the conditions $\alpha > w_D$ and $\delta^2 < 2\beta(2+\beta)/(2-\beta)$, which are implied by (A6) and Assumption 4, respectively. The denominator in (A8) is positive under (A.11), which, recall, is implied by Assumption 4. The numerator of the fractional expression of (A8) is less than zero if and only if

$$\delta^2 < \frac{4(2+\beta)^2(1-\beta^2)}{3(2-\beta-\beta^2)}. \tag{A9}$$

However, (A9) holds under Assumption 4, which can be seen as follows. The difference

$$\frac{4(2+\beta)^2(1-\beta^2)}{3(2-\beta-\beta^2)} - \frac{2\beta(2+\beta)}{2-\beta}$$

can be rewritten as

$$\frac{2(2+\beta)}{3(2-\beta)(2-\beta-\beta^2)}[(2-\beta)^4 + 20\beta(1-\beta) + 14\beta^3 + 3\beta^4],$$

which is readily observed as being greater than zero given $\beta > 0$. Therefore, Assumption 4 is stricter than (A9). Hence, we conclude that $d\Pi_D/dw_D < 0$. Therefore, $w_D^* = 0$ is the equilibrium as long as the concavity condition (A6) holds, but this last condition is automatically satisfied because $\alpha > 2w_D^* = 0$. Q.E.D.

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