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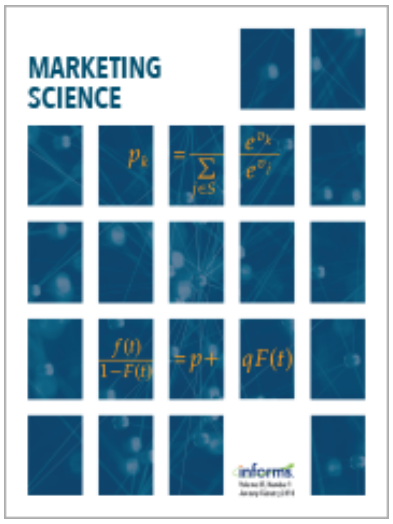

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Multiple Messages to Retain Retailers: Signaling New Product Demand

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Abstract

With the increase in new product introductions in consumer packaged goods categories, supermarkets are reluctant to accept new products. Therefore, it is very important for manufacturers to convince retailers of the high-demand potential of their products. We study how a high-demand manufacturer can use advertising, slotting allowances, and wholesale prices to signal its high demand to retailers.

Specifically, we examine the relative importance of advertising and slotting allowance in signaling demand. That is, when is it optimal for the manufacturer to use high advertising support, and when is it optimal for it to offer slotting allowance as a signal of its demand? We show that when a high-demand manufacturer is trying to signal its demand to retailers, advertising and slotting allowance are partial substitutes of one another in the sense that the manufacturer can increase one in order to compensate for a reduction in the other. We find that the high-demand manufacturer's signaling strategy depends on three factors: the retailer's stocking costs, the intensity of retail competition, and the advertising response rate in the given product market.

We begin with a model of one manufacturer dealing with one retailer. The manufacturer has private information about the potential demand for its new product. The retailer is uncertain about the likely demand of the new product and is willing to accept the product only if it is convinced that the demand is high. We characterize the high-demand manufacturer's separating equilibrium strategies. We find that the slotting allowance plays an important role in signaling when the retailer's stocking costs are high and the advertising effectiveness is low. On the other hand, the manufacturer does not offer any slotting allowance, and advertising plays a bigger role when the stocking costs are low or the advertising effectiveness is high.

We then examine the effects of retail competition on the manufacturer strategy. We find that the slotting allowance plays a more important role when the retail level competition is very intense. The manufacturer may have to offer a positive slotting allowance even in the absence of retailers' demand uncertainty when the retail competition is sufficiently intense. This result shows that the slotting allowance may have an important role to play even in the absence of signaling or screening considerations. Thus, our analysis of competitive setting provides an alternative explanation for slotting allowances. It also offers support to the views of many retailers who believe that slotting allowances can help retailers recover high stocking costs in highly competitive retail markets. In the presence of retailers' demand uncertainty, the manufacturer offers a higher slotting allowance in order to signal its high demand.

We also investigate the effect of retailer's uncertainty about the effectiveness of the manufacturer's advertising. We show that if the high-demand manufacturer also has a higher advertising response rate, the manufacturer provides even higher advertising support to alleviate the retailer's advertising-related uncertainty. By increasing the advertising support, the manufacturer credibly tells the retailer; that it would not be optimal for the manufacturer to provide such high advertising support unless it had high enough advertising effectiveness.

(*Channels of Distribution*; *Game Theory*; *New Product Introductions*; *Signaling*)

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1. Introduction

Demand signaling issues have been attracting the attention of marketing researchers in recent years. Based on this emerging stream of research, we know that a manufacturer can signal its high demand by changing certain key decision variables from their symmetric information levels. Specifically, a manufacturer can signal its high demand by increasing the wholesale price and advertising (Chu 1992), increasing the wholesale price and decreasing the fixed fee (Tirole 1988, Desai and Srinivasan 1995), or increasing the wholesale price and offering a slotting allowance (Lariviere and Padmanabhan 1997). These papers establish the important role of the wholesale price in signaling product demand. However, none of these papers allows the manufacturer the choice of both a slotting allowance and productive advertising. Therefore, it is not clear what is the optimal strategy for a manufacturer who can use both advertising and slotting allowances to signal its demand. Should it use only one of the two, or both? When and why can advertising as a signal be better or worse than slotting allowances?

The importance of advertising and slotting allowance in gaining retail entry is also voiced by supermarket executives. However, the issue of which one is more useful is not clearly resolved. Although many supermarket executives emphasize the need for slotting allowances (*Supermarket Business* 1997), some executives feel that media advertising is more important than slotting allowances. Consider, for example, the following quotes.

> . . . A slotting allowance plays the last part in decision to buy. The first factor is media {advertising}.
>
> Pete Manos, senior vice president of food operations, Giant Stores. (Mayer 1989).

> . . . Other considerations are more major, especially the type of promoting a company will do. How much of TV, radio, couponing will a new product get?
>
> Anne Cokrell, Safeway Supermarkets (Mayer 1989).

It's not clear why different retailers seem to place different emphasis on advertising versus slotting allowances in their decisions to accept a new product.

We address this issue of the relative importance of advertising and slotting allowance in signaling demand. Another important issue that we investigate is the effect of retail competition on the manufacturer's signaling strategy.

We study these issues in a model of a manufacturer planning to introduce a new product. We model the retailer's uncertainty about the product's demand by considering two demand states—high and low—and letting the retailer have prior beliefs about the two demand states. We derive the high-demand manufacturer's optimal wholesale price, advertising and slotting allowance in the least-cost separating equilibrium. We show that when manufacturers are trying to signal their high demands, advertising and slotting allowance are partial substitutes of one another in the sense that manufacturers can increase one to compensate for a reduction in another. We characterize conditions under which slotting allowance plays a more important role than advertising in helping manufacturers signal their demand. These conditions depend on three factors: (1) the retailer's stocking costs, (2) the intensity of retail competition, and (3) the advertising response rate. This way, we can explain why some retailers give more importance to advertising support and others give more importance to slotting allowances in accepting new products. We also unify and generalize Chu's (1992) and Lariviere's and Padmanabhan's (1997) results. In particular, separating equilibria analyzed by these authors emerge as special cases of our model. Thus, we reconcile different predictions and recommendation offered by these two papers. Finally, our results indicate a new rationale for slotting allowance which is not based on screening (Chu 1992), signaling (Lariviere and Padmanabhan 1997), or manufacturer competition (Shaffer 1991). Our results show that, consistent with views of many retailers, slotting allowances can help retailers recover high stocking costs in the presence of intense retail competition.

1.1. Literature Review

Our paper is in the general stream of analytical model of distribution channels which look at contractual means of resolving vertical and horizontal channel conflicts (see, for example, McGuire and Staelin 1983, Lal 1990, Desai 1997).

Chu (1992), Desai and Srinivasan (1995), and Lariviere and Padmanabhan (1997) are closely related to our work. Chu (1992) finds that a high-demand

manufacturer signals its types by acting like a still higher-demand manufacturer, charging a higher wholesale price and increasing its advertising spending. Desai and Srinivasan (1995) show that a high-demand franchisor signals its demand by increasing the royalty and decreasing the franchise fee from their symmetric information levels. They also find that a three-part contract involving quantity discounts can result in costless signaling. Lariviere and Padmanabhan (1997) argue that the empirical evidence on retailers having a greater power is at best mixed, and therefore the practice of slotting allowances cannot be attributed solely to retailers extracting a greater surplus from manufacturers or screening manufacturers (Chu 1992). They show that even when a manufacturer has greater power than its retailer, the manufacturer may offer a slotting allowance to signal its demand when the retailer's stocking costs are sufficiently high. They also show that slotting allowance is better than dissipative advertising in signaling demand.

Cannon and Bloom (1991) argue that the use of slotting allowances could violate the Robinson-Patman Act for promotional discrimination if these fees are not available to all retailers. Shaffer (1991) shows that slotting allowances could result in collusive outcomes. In Chu and Messinger (1993), the retailer screens products by auctioning-off shelf-space. The manufacturers of the most profitable n products offer slotting allowances to enter the retail market. Sullivan (1997) shows that slotting allowances could have emerged as a result of increased supply of new products. Her analysis shows that slotting allowances are consistent with competitive behavior. Desiraju (1997) identifies conditions under which a retailer should discriminate by brands in asking for slotting allowances. Kim and Staelin (1999) show that manufacturers offer allowances to retailers who spend the allowances in competing against other retailers.

The rest of the paper is organized as follows. In §2 we describe our model. Section 3 gives the analysis. We conclude in §4.

2. Model

We consider a manufacturer planning to introduce a new product through a retailer. The manufacturer has a better knowledge about the product demand through prelaunch marketing research and because of its more complete knowledge of the product's attributes and quality. We model this information asymmetry by assuming that the manufacturer's demand is one of two possible types: high demand (h) and low demand (l). We also allow for the retailers facing uncertainty about the quality of the manufacturer's advertising. The manufacturer knows its "true" type, but the retailer is uncertain. The retailer believes that the manufacturer has high-demand potential and high advertising effectiveness with probability ρ and low-demand potential and low advertising effectiveness with probability $1 - \rho$.

The product demand, $\tilde{d}_j$, $(j = h, l)$ is affected by the retail price p, the retailer's value-added services s, and the manufacturer's advertising a. Specifically, $\tilde{d}_j = T_j - p + f(s) + x_j g(a) + \tilde{\epsilon}$, where $T_j (T_h > T_l)$ represents the demand potential, $f(s)$ is the effect of the retailer's value-added services, $g(a)$ represents the product-market-specific advertising effectiveness, $x_h \geq x_l$ is the firm-specific advertising effectiveness and $\tilde{\epsilon}$ is an exogenous random shock with mean zero. We assume that $f'(\cdot) > 0$, $g'(\cdot) > 0$, $f''(\cdot) < 0$, $g''(\cdot) < 0$, and $f(s = 0) = 0$, $g(a = 0) = 0$. The expected demand of type-j manufacturer is $d_j = T_j - p + f(s) + x_j g(a)$. For simplicity, we set $x_h = 1$ and $x_l = l$ such that $l \leq 1$. Thus, we allow for the possibility that the firm with higher market potential (demand intercept) may also have higher advertising effectiveness.[1] This can happen when the higher demand firm has superior management and marketing skills so that it is very good in managing all of its marketing activities. Specifically, the firm may be very good not only in managing new product development processes, but also in managing communication processes. This correlation can also arise when advertising plays an informative role (Nelson 1974) and educates customers about a product's attributes. The high-demand firm's advertising may generate greater response if its advertising educates customers about superior attributes of its product.

[1]We thank an anonymous reviewer for suggesting this additional source of uncertainty. Note that our model also includes the possibility that both manufacturer types have the same advertising effectiveness.

We assume a constant marginal cost of production and set it to zero. The costs of advertising and service are assumed to be a and s, respectively. The retailer's cost of stocking the product, including the opportunity cost of shelf space to be allocated to the new product, is $\underline{\pi}$. We assume that the retailer will not stock the product if it does not expect to earn at least $\underline{\pi}$ from stocking and selling the product. This requirement ensures that the retailer's participation in the trade is voluntary and is referred to as the *voluntary participation constraint*. The manufacturer charges a per-unit wholesale price (w) and may offer a lump-sum slotting allowance (L).

We restrict attention to those cases in which the retailer will not knowingly stock the low-demand product but will knowingly stock the high-demand product. To examine interesting signaling situations, we consider only those cases in which the low-demand manufacturer has incentives to (falsely) claim high demand. These cases arise when the low-demand manufacturer can earn positive profits if the retailer mistakenly believes that the manufacturer is a high-demand type and accepts its product.

The sequence of events is as follows. At the beginning of the game, the retailer has prior beliefs (ρ and $1 - \rho$) about the manufacturer's demand type. In Stage 1, the manufacturer offers terms of trade (wholesale price, advertising, and slotting allowances) to the retailer. In Stage 2, based on the offer the retailer (i) updates its prior beliefs and forms posterior beliefs ($\bar{\rho}$ and $1 - \bar{\rho}$), and (ii) based on its posterior beliefs, decides whether or not to accept the offer and stock the product. If the retailer does not accept the offer, the game ends. If the retailer accepts the offer, the game proceeds to the next stage. In Stage 3, the retailer chooses the retail price and retail value-added services based on the posterior beliefs. In Stage 4, the demand is realized.

3. Analysis

3.1. Symmetric Information

We briefly discuss the symmetric information case where the manufacturer and the retailer have identical information about the new product's prospects. Because we have ruled out parameter values for which the retailer knowingly stocks the low-demand manufacturer's product, we consider only the high-demand manufacturer's optimal contract.

An important result of the symmetric information case is as follows.

Result 1. The high-demand manufacturer does not offer any slotting allowance in the symmetric information case.

Proof. All proofs are in an appendix that is posted on the *Marketing Science* website, which is currently located at http://www.smeal.psu.edu/mktg/MktgSciJournal.

Result 1 is consistent with Lariviere and Padmanabhan (1997).

3.2. Asymmetric Information

We now consider the case in which the retailer is uncertain about the new product's demand. We restrict our attention to the least-cost separating equilibrium. Details of the pooling equilibria are available from the author.

3.3. Separating Equilibrium

Here the high-demand manufacturer chooses $\{w^{**}, a^{**}, L^{**}\}$ such that the low-demand manufacturer does not gain anything by choosing the same terms of trade. In particular, the low-demand manufacturer's profit, $\Pi_l(\cdot)$ from implementing these terms of trade is weakly negative. That is, $\Pi_l(w^{**},a^{**},L^{**}) \leq 0$. Recall that the low-demand manufacturer makes zero profit if its true demand is revealed. The above condition requires that the low-demand manufacturer prefers to reveal itself rather than claim to be a high-demand manufacturer by choosing $\{w^{**}, a^{**}, L^{**}\}$. When the retailer observes the manufacturer offering $\{w^{**}, a^{**}, L^{**}\}$, it concludes that the contract can only come from the high-demand manufacturer, and it accepts the product. Thus, $\{w^{**}, a^{**}, L^{**}\}$ results in separation of the two manufacturer types.

$\{w^{**}, a^{**}, L^{**}\}$ solve the following maximization problem.

$$\max_{w,a,L} \prod_h (w, a, L) = w \frac{[T_h - w + f(s^*) + g(a)]}{2} - a - L, \quad (1)$$

$$\text{s.t. } \prod_r (w, a, L) = \left[\frac{[T_h - w + f(s^*) + g(a)]^2}{4} - s^* + L\right] \geq \Pi, \quad (2)$$

$$\prod_l (w, a, L) = \left[w\frac{[2T_l - T_h - w + f(s^*) + (2l - 1)g(a)]}{2} - a - L\right] \leq 0. \quad (3)$$

The optimal solution depends on whether or not the voluntary participation constraint (2) is binding in the equilibrium. Let the value of stocking cost above which the voluntary participation constraint is binding be $\underline{\Pi}^{**}$. We first discuss the solution when $\underline{\Pi} < \underline{\Pi}^{**}$.

Proposition 1. *If $\underline{\Pi} < \underline{\Pi}^{**}$, the high-demand manufacturer offers a higher wholesale price and a higher advertising level in the separating equilibrium than in the symmetric information case. It does not use a slotting allowance.*

Proposition 1 shows that when the retailer's stocking cost is sufficiently low, the high-demand manufacturer prefers deviations in advertising and wholesale price to deviations in slotting allowance. The reason for this is as follows. An increase in the wholesale price from its symmetric information level hurts both types of manufacturer. However, the high-demand manufacturer, with its high demand, is hurt less by a given increase in wholesale price than the low-demand manufacturer. There are two reasons why the high-demand manufacturer increases its advertising level in the separating equilibrium. The first is that when $l < 1$, the high-demand manufacturer is hurt less by increasing advertising than the low-demand manufacturer. While the cost of advertising is the same for both manufacturer types, the high-demand manufacturer enjoys a higher increase in sales for a given increase in advertising. Essentially, by increasing the advertising level the manufacturer is signaling to the retailer that if it had low advertising effectiveness, it would be very costly for it to advertise at such high levels. There is another reason for the high-demand manufacturer increasing advertising in the separating equilibrium. As the high-demand manufacturer increases its wholesale price beyond the symmetric information level, its advertising incentives also change. The reason is that the marginal benefits of increasing advertising increase as the wholesale price (margin) increases. Advertising increases demand, and an increase in demand is more valuable when the wholesale price (margin) is greater. Therefore, an increase in the wholesale price is also accompanied by an increase in advertising. This second reason for the high-demand manufacturer increasing advertising is true even when $l = 1$, that is, there is no advertising uncertainty.

The reason for high-demand manufacturer's not using any slotting allowance in the current case is twofold. First, slotting allowance hurts both types equally. Second, the retailer's profits are still high enough (voluntary participation constraint is not binding), and therefore slotting allowance is not needed to ensure the retailer's participation either.

Proposition 1 blends elements of Chu (1992), Desai and Srinivasan (1995), and Lariviere and Padmanabhan (1997). As in all these papers, the high-demand manufacturer increases the wholesale price to signal its demand. As in Chu (1992), the high-demand manufacturer also increases advertising in the separating equilibrium; and as in Lariviere and Padmanabhan (1997), the high-demand manufacturer does not use any slotting allowance for low levels of stocking cost. Proposition 1 also provides new insights about the high-demand manufacturer's advertising strategy in the separating equilibrium. It may appear that when the retailer is uncertain about the effectiveness of the manufacturer's advertising, the manufacturer may be better-off reducing its advertising level. However, Proposition 1 shows that in the presence of this advertising effectiveness uncertainty, the high-demand manufacturer increases its advertising even more.

The separating equilibrium described in Proposition 1 is supported by the following posterior beliefs of the retailer. $\bar{\rho} = 1$ if $\{w, a, L\} = \{w_1^{**}, a_1^{**}, L_1^{**}\}$, and $\bar{\rho} = 0$ otherwise, where $\{w_1^{**}, a_1^{**}, L_1^{**}\}$ is the high-demand manufacturer's separating equilibrium solution.

We now turn to higher levels of stocking costs: $\underline{\Pi} \geq \underline{\Pi}^{**}$.

Proposition 2. *When $\underline{\Pi} \geq \underline{\Pi}^{**}$, the high-demand manufacturer offers a higher wholesale price and a higher advertising level in the separating equilibrium than in the symmetric information equilibrium. If the rate of advertising*

response ($g'(a)$) is sufficiently high, the high-demand manufacturer does not use any slotting allowance; otherwise, it also uses slotting allowance in the separating equilibrium. Slotting allowances are less likely to be observed in the separating equilibrium when $l < 1$.

Proposition 2 states that there are two possible solutions when $\Pi \geq \Pi^{**}$. In both solutions, the high-demand manufacturer increases wholesale price and advertising from their symmetric information levels. However, the two solutions differ in terms of the use of slotting allowance and the amount of advertising. If the advertising response rate is sufficiently high, the high-demand manufacturer does not use any slotting allowance. On the other hand, if the advertising response rate is relatively low, the high-demand manufacturer uses slotting allowance in addition to increasing wholesale price and advertising.

The rationale for the increase in wholesale price is the same as in the previous case. In addition to the reasons for increased advertising discussed in the previous case, there is a new reason for increased advertising here. A higher level of advertising also helps to compensate for a decrease in retailer profit with the higher wholesale price. Here, the retailer's voluntary participation constraint is tight; and the negative effect of increased wholesale price has to be offset for the voluntary participation constraint to be satisfied. When the advertising response rate is sufficiently high, the high-demand manufacturer uses only advertising to offset the adverse impact of higher wholesale price on the retailer's profit. When the advertising response rate is lower, using only advertising to compensate for the higher wholesale price is too expensive. Therefore, the high-demand manufacturer uses a combination of slotting allowance and advertising to ensure adequate profits to the retailer.

Proposition 2 also shows an interesting effect of retailer's uncertainty about advertising response rate. The range of parameters for which the slotting allowance is positive shrinks when the retailers faces advertising uncertainty. In the presence of this additional uncertainty ($l < 1$), the high-demand manufacturer has greater incentives to advertise than in the absence of advertising uncertainty ($l = 1$). Increasing advertising affects the two manufacturer types differently, whereas the slotting allowance affects them in the same way. When l falls below 1, this effect is stronger—increasing advertising hurts the low-demand manufacturer even more. As a result, slotting allowances are less likely to be observed in the presence of advertising uncertainty.

Our results offer insights into when advertising is more important and when slotting allowances are more important in retailers accepting new products. In particular, slotting allowances are more important when the retailers' stocking costs are high, the product market is such that advertising is not very effective in stimulating sales ($g'(a)$ is low), and when the retailer is less uncertain about the firm's advertising quality (l is closer to one). Advertising plays a larger role when these conditions are not satisfied. It is easy to see that when $\underline{\Pi} < \underline{\Pi}^{**}$, slotting allowances play no role in ensuring retailers' accepting the new product. When $\underline{\Pi} \geq \underline{\Pi}^{**}$, slotting allowances are offered only when $g'(a)$ is sufficiently low. It is easy to see that when $g'(a) \to 0$, advertising spending will be minimal and slotting allowances will be high. On the other hand, when $g'(a)$ is high enough, slotting allowances will be zero and advertising spending will be higher. Thus, there will be a critical value of $g'(a)$ such that the manufacturer's advertising expenditure will be lower (higher) than the slotting allowance for values of $g'(a)$ lower (higher) than this critical value.

These results also unify and generalize the Chu (1992) and Lariviere and Padmanabhan (1997) results. In particular, results of these papers emerge as special cases of our results. When $g'(a)$ is sufficiently high or if $\underline{\Pi} < \Pi^{**}$, then as in Chu (1992), the manufacturer will increase the wholesale price and advertising from their symmetric information levels. On the other hand, if the advertising response rate is zero, the optimal advertising is always zero; and our results collapse to Lariviere's and Padmanabhan's (1997) results of separation by increasing the wholesale price and a positive slotting allowance when the stocking cost is high. Thus, we are able to reconcile the differences between predictions and recommendations of these two papers.

The separating equilibrium described in Proposition 2 is supported by the following posterior beliefs of the retailer. When $g'(a)$ is low: $\bar{\rho} = 1$ if $\{w, a, L\} = \{w_2^{**}, a_2^{**}, L_2^{**}\}$, and $\bar{\rho} = 0$ otherwise, where $\{w_2^{**}, a_2^{**}, L_2^{**}\}$ is

the high-demand manufacturer's separating equilibrium solution for low $g'(a)$. When $g'(a)$ is high, $\bar{\rho} = 1$ if $\{w,a,L\} = \{w_3^{**}, a_3^{**}, L_3^{**}\}$, and $\bar{\rho} = 0$ otherwise, where $\{w_3^{**}, a_3^{**}, L_3^{**}\}$ is the high-demand manufacturer's separating equilibrium solution for high $g'(a)$.

3.4. Retail Competition

We now consider a situation in which the manufacturer deals with two differentiated, competing retailers. In this section, we use specific functional forms for the effects of advertising and retailer service on the demand: $f(s) = \phi\sqrt{s}$ and $g(a) = \gamma\sqrt{a}$. We denote the two retailers by subscripts 1 and 2. The new demand functions are: $d_{1j} = T_j - p_1 + \phi\sqrt{s_1} + \gamma\sqrt{a} + e(p_2 - \phi\sqrt{s_2})$, and $d_{2j} = T_j - p_2 + \phi\sqrt{s_2} + \gamma\sqrt{a} + e(p_1 - \phi\sqrt{s_1})$, where $j = h,l$ denote the manufacturer type, and $e \in [0,1)$ represents the degree of competition between the two retailers as in McGuire and Staelin (1983).[2] We assume that the two retailers are symmetric in all respects. The rest of the model is the same as before.

Before discussing the separating equilibrium, we consider the symmetric information solution.

Proposition 3. *In the presence of retail competition, the high-demand manufacturer may offer a slotting allowance in the symmetric information equilibrium when the retailers' stocking costs, $\underline{\Pi}$, and the degree of the competition between the two retailers, e, are sufficiently high, and the advertising effectiveness γ is sufficiently low.*

Proposition 3 is interesting because it shows that the symmetric information solution qualitatively changes when the high-demand manufacturer is dealing with two competing retailers. Recall that the high-demand manufacturer does not use any slotting allowance in the symmetric information case when dealing with a single retailer. The reason for the reversal of that result is as follows. When the retailers' stocking costs are very low, the retailers derive rents—profits in excess of their stocking costs (minimum expected profit), $\underline{\Pi}$. As the stocking costs increase, retailers progressively derive less rents. After stocking costs reach a certain point, retailers cannot enjoy any rents, and the manufacturer needs to ensure that retailers stock the product by ensuring that their profits from stocking the manufacturer's product at least cover their stocking costs. Therefore, the manufacturer may try to reduce the wholesale price or increase the advertising support in order to provide higher profits to retailers. However, both of these strategies have limitations. When the advertising response rate is low, increasing advertising is costly. In addition, the effect of advertising on sales flattens as advertising level increases. These two factors limit the value of increasing advertising to the manufacturer. The value of wholesale price reduction is limited by the behavior of retailers in very competitive markets. A reduction in wholesale price induces retailers to reduce retail prices. As the competition between retailers becomes more and more intense, retailers pass on more and more of the savings from the wholesale price reduction to consumers in terms of retail price reductions. As a result, a reduction in the wholesale price has limited impact on the retailers' profits when they face intense competition in the product market. Therefore, when the retail competition is very intense and advertising effectiveness is relatively low, the manufacturer finds it optimal to improve retailer profits through slotting allowance which is a lump-sum transfer to the retailers.

We now consider the separating equilibrium with retail competition. The high-demand manufacturer's optimization problem is similar the problem described in Equations (2) through (4). For the separating equilibrium message to be credible, the high-demand manufacturer has to choose $\{w, a, L\}$ such that the low-demand manufacturer makes weakly negative profit if it chooses to adopt the same terms of trade. As in the previous cases, the high-demand manufacturer chooses to increase wholesale price and advertising from their symmetric information levels. The more interesting issue in the present case is the level of slotting allowance for a high-demand manufacturer who would use a positive slotting allowance in symmetric information equilibrium. Does the high-demand manufacturer maintain the same level of slotting allowance or increase it in the separating equilibrium?

Proposition 4. *If the high-demand manufacturer uses slotting allowance in both symmetric information and separating equilibria, slotting allowance in the separating equilibrium is higher than that in the symmetric information equilibrium.*

[2]We show Proposition 3 result for more general demand functions in the appendix.

Proposition 4 is consistent with our earlier results of Proposition 2: Under certain conditions, separation may involve increasing wholesale price, advertising, and slotting allowance from their symmetric information levels. Proposition 4 also shows that slotting allowance plays a greater role in securing retail entry for a new product in the presence of intense retail competition and high stocking costs. Proposition 4 also helps us understand how high stocking costs and demand uncertainty interact. Recall that Proposition 3 showed that even in the absence of demand uncertainty, the high-demand manufacturer may have to provide slotting allowance to retailers to ensure retail entry. Proposition 4 shows retailers' demand uncertainty exacerbates the manufacturer's problem in that it needs to offer greater slotting allowance to the retailers.

Propositions 3 and 4 together also imply that slotting allowances play an important role, both for helping retailers recover their stocking costs as well as in alleviating retailers' uncertainties about the likely success of the product. In other words, mere existence of slotting allowance cannot be interpreted as an evidence of either signaling or screening.

4. Conclusions

Resolving retailers' uncertainty about a new product's demand and its eventual success is an important task for the manufacturer. We show that advertising and slotting allowances can act as partial substitutes for each other in helping a manufacturer gain retail entry for its new products. However, for a given situation, there is an optimal combination of the two. Our analysis has identified the conditions under which these instruments play important roles. Our results also offer an explanation as to why some retailers place a greater emphasis on the manufacturer's advertising while others consider slotting allowances in deciding whether or not to accept a new product. Retailers with high stocking costs, retailers in markets where manufacturer advertising plays a limited role, or retailers in very competitive markets are likely to place a greater emphasis on slotting allowances than on advertising in their decisions to accept a new product.

Our analysis also shows that retail competition has a very important effect both on the symmetric and asymmetric information equilibria outcomes. In particular, our results offer a new explanation for slotting allowances. In highly competitive retail markets, manufacturers may need to offer slotting allowances in order to allow the retailers to recover high costs of stocking the products. In other words, slotting allowances have functions other than signaling or screening. This explanation is also consistent with many retailers' view of slotting allowances.

Our results also unify and generalize earlier results of Chu (1992) and Lariviere and Padmanabhan (1997) and help reconcile the differences between the two papers. When the stocking costs are low or advertising effectiveness is high, our results are identical to those of Chu (1992). When the stocking costs are high and the advertising effectiveness is very low, our results are identical to the results of Lariviere and Padmanabhan (1997).

By considering retailers' uncertainty about how advertising affects sales, we derive an interesting and somewhat counterintuitive insight. It may seem that when the retailers are uncertain about the advertising effectiveness, the manufacturer may be better-off by not spending too much money on advertising. We find that the high-demand manufacturer spends more money on advertising to show its confidence in the high effectiveness of its advertising. The high-demand manufacturer's overadvertising conveys the fact that if it had low advertising effectiveness, such high advertising levels would be prohibitively expensive for it. In addition, advertising uncertainty also makes slotting allowances less likely.

Our analysis has not addressed some important issues related to demand signaling and slotting allowances. For example, how would the separating equilibrium solution change if the low-demand manufacturer had higher advertising effectiveness than the high-demand manufacturer? It's possible that we might find that the high-demand manufacturer may underadvertise rather than overadvertise in the separating equilibrium. Another interesting possibility is to investigate how the manufacturer's bias may affect the retailer's likelihood of accepting new products. It would also be interesting to empirically test some of

our results. We hope to address these issues in future research.[3]

Appendix

The appendix is posted on the *Marketing Science* at ⟨http//mktsci.pubs.informs.org⟩.

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