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Harmful Upward Line Extensions: Can the Launch of Premium Products Result in Competitive Disadvantages?

Companies often extend product lines with the goal of increasing demand for their products and responding to competitive threats. Although line extensions may lead to cannibalization and reduction of overall profit, the bulk of theoretical and empirical research has suggested that product line extensions result in a net gain of overall demand and market share. To mitigate cannibalization, the extant literature prescribes the addition of premium versions of products, or "upward line extensions," with the intention of achieving gains not only in demand and market share but also in overall profit. In this research, the authors employ analytical and empirical methods to make the case that upward line extensions aimed at matching a competing product's attribute may lead consumers to reassess their perceptions about the brand and the attributes of products in the market in a way that erodes the advantages of the extending firm. Ultimately, this can result in a loss of demand, market share, and profit for the extending firm.

Keywords: anchoring, consumer learning, line extension, positioning, spillover effects

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In many product categories, market challengers attack the position of established market leaders with the intent of stealing sales and revenues and gaining market share. Frequently, these attacks take the form of a challenger improving a key product feature that made a leading product successful. Take, for example, the stain-removal laundry detergent category and the competitive pressure that the market leader, Procter & Gamble's Tide, faced in the early 2000s. For years, Tide had successfully persuaded consumers of the superiority of its antistain bleach alternative as an efficient nonchlorine-based stain remover. OxiClean attacked Tide's market position by communicating the benefits associated with oxi-action stain removal power. Some established players in the category immediately followed suit and extended their product lines to include laundry detergents featuring oxi-action. For example, Sun Products extended the product lines of its brands All and Wisk to include laundry detergents featuring an oxi-active ingredient (e.g., Wisk Oxi Complete). Tide, however, did not counteract OxiClean's move and instead continued to invest in supporting claims about the superiority of its stain-removing ingredient (Neff 2003) for more than a decade.

This decision by Sun Products is in line with the generally accepted notion that the addition of new products to a product line may not only prevent loss of customers but also increase the overall demand and market share for the firm. Numerous theoretical and empirical analyses have provided support for this prescription (e.g., Bayus and Putsis 1999; Kadiyali, Vilcassim, and Chintagunta 1998; Kekre and Srinivasan 1990; Smith and Park 1992). Procter & Gamble's decision not to extend Tide's product line thus is intriguing given what the literature has recommended.

The expected net gains in demand and market share predicted by the extant literature arguably provide a strong incentive for firms to launch new products as a way to counter a competitor threat such as the one described previously. Such gains, however, are not without risk. Line extensions can drive consumers to migrate from the firm's premium products to its cheaper products if the firm performs a downward line extension. If this form of cannibalization occurs, the overall profitability of the firm decreases despite the increase in demand and market share (Desai 2001). A product-extension strategy that may prevent consumers from migrating to cheaper products is the addition of a premium version of a product—an upward line extension. This approach, also known as "increase price and improve quality"

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(Kotler and Armstrong 2011; Loudon, Stevens, and Wrenn 2005), prescribes that firms should target segments composed of customers with high willingness to pay. The appeal of launching a premium product with attributes similar to those of a competitor's product (and dissimilar to the main brand's current attribute offering) lies in the intuition that firms can mitigate cannibalization, shield profit, and increase market share by becoming a close substitute of the challenging firm. However, contrary to the dominant view in the literature, is it possible that such a move could backfire and lead to further decreases in market share and profit for the leader?

In this research, we aim to investigate the outcomes of the "increase price and improve quality" strategy. Firms frequently introduce new products that share a subset of attributes with competing products in the market. We examine how an upward line extension that positions such an item as a premium subbranded product relative to the firm's legacy offering can affect the firm's demand, market share, and profit. Drawing on the information-based theory of umbrella branding, we develop an analytical model that predicts that the introduction of the new subbrand will cause spillover effects across brand reputations and product attributes, which may lead to losses of demand, market share, and profit for the extending firm. We test the theoretical model using data from an experiment in a virtual environment consisting of consumer choices in pre- and postlaunch scenarios. The empirical model, based on consumer utility maximization theory, enables us to empirically verify the impact of a new product launch on consumer preferences for both brand and product attributes.

The analytical model analysis and empirical results provide several important contributions to the product line extension literature. First, in contrast to the great majority of findings in the literature, we find that the introduction of a premium subbrand with attributes that match those of competing products may erode the very same brand and attribute reputation the firm intended to protect. Second, we identify that the mechanisms that cause the firm to experience negative outcomes in terms of demand, market share, and profit are (1) spillovers that cause diminished positive perceptions of the legacy product, which is no longer perceived as a premium brand when the new subbrand is positioned as premium; (2) diminished positive perceptions of the value of the attributes of the legacy product as a result of the new premium product's attributes being perceived as superior; and (3) improved positive perceptions of the competing brands.

In the process of developing the analytical model, we identify the conditions under which the negative impact of brand extensions is likely to be exacerbated or attenuated as a function of the direction of the spillover effects that influence consumer perceptions. We also propose and show that the mechanism regulating firm-level outcomes—in terms of demand, market share, and profit—is based on competitive forces; thus, individual changes in consumer perceptions about the firm's legacy brand, the firm's new brand, the competitor's brand, and each brand's respective product attributes do not explain our results.

These findings are important because prior literature has prescribed upward line extensions to offset the negative effects of cannibalization stemming from downward extensions. Our findings enhance the understanding of this strategy by showing that upward product line extension decisions may lead to a loss of overall sales and market share and may negatively affect profit. These novel findings urge brand managers to be much more diligent than prior research has suggested when considering upward extensions.

The remainder of the article is organized as follows: In the next section, we review the relevant literature. Then, we develop theoretical models for the pre- and postlaunch scenarios. Subsequently, we provide an empirical model for studying the pre- and postlaunch scenarios, the parameter estimates, and the implications from the empirical analysis. We conclude with a discussion of the overall results and implications for marketing theory and practice.

Literature Review

Our research relates to the stream of new product literature that investigates the factors that influence the market performance of new products (see Henard and Szymanski 2001; Montoya-Weiss and Calantone 1994). This literature has established that the likelihood of success of a new product increases the closer the product matches consumers' preferences and the more distinguished the product is relative to competitors' products (Carpenter and Nakamoto 1990; Kleinschmidt and Cooper 1991). This stream of research, however, focuses almost exclusively on the products' performance and not on the overall performance of the entire product line of a firm, which is the focus of our research.

The literature in product portfolio management more closely relates to our research because it focuses more broadly on the performance of the firm's entire product line. Three important findings from this literature are relevant to our research. First, although a more extensive product line is often associated with higher consumer utility and larger market share, a firm may experience negative returns to product proliferation as a result of the higher costs of producing and supporting broader product lines (Bayus and Putsis 1999; Draganska and Jain 2005; Horsky and Nelson 1992; Moorthy 1984). Second, product cannibalization is an important factor to take into account when a firm attempts to optimize its product portfolio. Desai (2001) shows that monopolistic firms should refrain from launching low-value products if they want to prevent loss of profit that can occur because of the risks associated with cannibalization. This finding led to the suggestion that the "increase price and improve quality" approach (Kotler and Armstrong 2011; Loudon, Stevens, and Wrenn 2005) to launching premium versions of a product can be a suitable strategy for firms attempting to fend off competitive challenges. Third, line extensions can lead to positive outcomes, such as increases in market share, advertising efficiency (Smith and Park 1992), and sales (Reddy, Holak, and Bhat 1994). In addition, Kadiyali et al. (1998) find that firms that engage in line extensions can gain price-setting power and increase the overall demand for their products. These findings are further supported by Axarloglou (2008), who demonstrates and discusses the positive association between line extension and overall demand and market share.

Other empirical studies in the product portfolio management literature have focused on the effect of line extensions on consumer perceptions. Chintagunta (1996) shows that line extensions significantly change the brand locations and attribute importance weights on a perceptual map. Chintagunta, Bonfrer, and Song (2002) study the store-level effects on demand and prices caused by the introduction of a cheaper private label brand in a pre- and postlaunch scenario and find that preferences for the national brand are unchanged after the introduction of the private label product. Salinas and Pérez (2009) use survey data to conclude that that extensions based on an established brand enhance the likelihood of success of new products, even though they expose brand image to the risk of brand dilution.

In summary, the product portfolio management literature predicts a positive outcome for line extensions unless they cause a substantive increase in costs or the firm launches an inferior product line that triggers cannibalization. However, previous research has also suggested that changes in brand and attribute perceptions may occur. We extend these contributions by focusing on premium line extensions and showing that changes in consumer perceptions can lead to detrimental outcomes in terms of demand, market share, and profit, even when firms face negligible costs to extend or maintain the new lines.

Our research also relates to the umbrella branding and spillover effects literature streams. The cornerstone of these studies is the reciprocal spillover effects between a new product and the umbrella brand. Specifically, just as an established brand affects the success of a new product launch under the same umbrella brand, the new product reciprocates and influences consumer perceptions of the parent brand. Wernerfelt (1988) provides a rationale for this link between brand reputation and product attribute qualities. According to his model, high-quality products are likely to be branded with a high-quality brand. Therefore, consumers reason that high-quality products are likely to be associated with high-quality brands and vice versa. A recent study by Moorthy (2012) finds that line extensions aimed at signaling quality require consumers' perceptions of quality between the new and the old products to be positively correlated.

Researchers have also investigated this reciprocal spillover phenomenon empirically. Sullivan (1990), Erdem (1998), and Erdem and Sun (2002) focus on intrabrand spillovers and show that consumers' consumption experiences affect their perceptions about the parent brand. Sullivan asserts that single-product advertising may encourage consumers to substitute the advertised product for other products with the same brand name. Erdem shows that the spillover effect occurs because consumers infer the quality of a brand in one product category through consumption experience and/or through the influence of an advertisement for another product with the same brand name in a different product category. Erdem and Sun find that advertising and promotional activities also lead to spillover effects among products under the same umbrella brand, a result confirmed by Balachander and Ghose (2003). Subsequent research studying interbrand spillovers has investigated the effect of quality tier overlaps on own- and cross-brand preference using aggregate sales data. Aribarg and Arora (2008) show that cross-tier attribute overlaps enhance the preference for low-tier brands and diminish the preference for higher-tier brand. Furthermore, they show that within-tier attribute overlaps can increase preference for brands featuring similar levels of quality. Much like previous research in product portfolio management, Aribarg and Arora find that product line extensions can lead to improved market share and pricing power. Related research by Janakiraman, Sismeiro, and Dutta (2009) reports that brand spillovers can occur among competing brands and that the effect of the spillover tends to be positively correlated to the extent of similarity between brands or product attributes. These authors also find that the spillovers may help a late-entrant "me-too" product steal market share from the competition.

The behavioral literature also documents spillover effects stemming from brand extensions, in which perceptions of the new subbrand affect perceptions about the parent brand. Lei, Dawar, and Lemmink (2008) explore the asymmetric effects of positive and negative spillovers for the parent brand. Heath, DelVecchio, and McCarthy (2011) also find asymmetric spillover effects from vertical (quality) line extensions. They find that higher-quality line extensions improve overall brand perception and evaluation more than lower-quality extensions damage perceptions. The study, however, does not consider spillover effects to competing brands.

We add to the extant literature by studying spillover effects beyond the standard finding of a positive relationship between brands and their respective product attributes. We propose that spillovers can affect own-brand, cross-brand, and (overlapping) product attributes at the individual consumer level. This approach enables us not only to measure the impact of line extensions on brand and product attribute preferences but also to reach conclusions regarding the firm's overall prices, demand, and profit outcomes stemming from the line extension that are novel in this stream of literature. In addition, we find that the launch of premium products can lead to significant negative spillovers to the parent brand.

In conclusion, prior research has established that line extensions can lead to negative outcomes when the firm launches inferior subbrands because of the costs associated with launching and supporting the additional brand and with the risks associated with cannibalization (as consumers may trade from the high-quality/expensive product lines to the inferior/cheaper products, decreasing the firms' profitability). To counter the potential disadvantages associated with a downward extension, the extant literature prescribes that firms fight a challenging competitor by launching higher-quality and more expensive products. Furthermore, recent research has suggested that even if a me-too new product may not be entirely successful on its own and may risk the parent brand's reputation, line extensions are generally associated with increases in demand and market share. We add to the literature by showing that even when the costs of launching an additional premium line extension are negligible and cannibalization is not an issue, such a strategy is not immune to risks associated with declines in overall sales, market share, and profit.

In addition, the established literature has demonstrated a positive relationship between brands and product quality perceptions, which is commonly operationalized as spillovers. We draw from existing research and propose a cross-brand and cross-product attribute mechanism that explains how changes in brand and attribute perceptions can be detrimental to the relative advantage of the legacy product. In other words, we theorize and demonstrate negative spillovers originating from premium products. We also contribute by developing an individual-level empirical model that is able to test (and provide support for) our theoretical predictions. Finally, we also add to the literature by (1) showing under which conditions a premium line extension is likely to produce outcomes that are beneficial or detrimental to the firm, (2) explicating the process that drives this result, and (3) highlighting that competitive effects regulate the ultimate outcomes.

Theoretical Analysis

Overview

Consider two firms of interest in the market: a market leader and its main competitor ("challenger" hereinafter). Each firm has a product with distinct brand and distinct product attributes. Consumers have heterogeneous preferences that allow for both vertical and horizontal differentiation. Consumers are not fully informed about product performance or quality characteristics. Thus, demand for a product is influenced by reputational perceptions, as captured by a brand component and a product attribute component.

In the prelaunch scenario, the market leader has better brand and product attribute reputations than the challenger. In the postlaunch scenario, the leader introduces a new product positioned as premium in the market. This product is a line extension that shares the parent brand name with the legacy brand but offers an attribute that was initially only offered by the challenger's product (e.g., when Sun Products launched the Wisk Oxi Complete detergent featuring oxi-active stain remover to compete with OxiClean).

In light of this new premium subbrand introduction, consumers may begin to perceive the leader's legacy offering as a basic product. In this context of line extension, we expect the spillover effect to occur because the umbrella branding creates a link between the subbrands offered by the market leader and because the attributes of the new subbrand now overlap with those of the product the challenger offers.[1]

For example, it is well established in research on psychophysics that when a new stimulus is added to a set, people remap the values of stimuli to fit their internal scale values because the introduction of the new stimulus changes the standards of comparison (Mussweiler 2003; Parducci 1965; Wedell 2008). For example, adding a higher- (lower-) priced product (Cunha and Shulman 2011) or a higher- (lower-) quality product to a set (Cooke et al. 2004) changes the perceived expensiveness/quality of the remaining products in the set despite no actual changes to their objective price/quality. This occurs because the standard of comparison changes and the prices are now compared with a higher (lower) price standard. To illustrate, consumers judge a product priced at \$50 as less expensive when the highest price in the set is \$600 than when the highest price in the set is \$60, on the basis of the range principle of range-frequency theory (Parducci 1965). Thus, there are reasons to expect that the launch of a subbrand positioned as premium by the leading brand may lower the perceptions about the product currently being offered by the leading brand.

In the theoretical analysis, we consider a model that captures the main forces in a parsimonious setting in which products have only one package size and one main attribute. In the empirical analysis, we extend the model to allow the firms to offer products featuring multiple attributes and multiple package sizes. We reiterate that the focus of the current study is to investigate the case in which the new product is positioned as a premium product relative to its current premium offering, a situation that is largely understudied compared with the market situation in which a firm conducts a downward line extension. Prior literature has suggested that downward line extensions may lead consumers to migrate from the firm's premium products to its cheaper products. This form of cannibalization predicts that the extending firm's overall profitability decreases despite the increase in market share (Desai 2001). We nevertheless investigate the inferior line extension scenario in Appendix B.

Formal Model

In this subsection, we follow prior research in dynamic market settings (Desiraju and Shugan 1999; Kopalle and Lehmann 2006; Villas-Boas 2004) and formalize a two-period model that captures the dynamics of the pre- and postlaunch scenarios in a parsimonious setting. We use superscripts $^{(1)}$ and $^{(2)}$ to identify the outcomes specific to the pre- and postlaunch scenarios, respectively. This enables us to identify the ensuing outcomes if the firm does not launch the new premium subbrand (outcomes will be as those in the prelaunch scenario) and if the firm launches the new premium subbrand (outcomes will be as those in the postlaunch scenario).

Consider an economy in which there are two main firms in the market: the market leader (firm G) and its challenger (firm R). Each firm has a product with its own distinct brand name and distinct product attributes. We use the index $b \in \{G, R\}$ to identify the firms' brands. In the market, there is also an outside good, which is assumed to have a unitary price of 1. To focus on the effects of interest in this article, we consider the products to have similar marginal costs and no additional cost associated with extending the product line; thus, we assume these costs to be negligible.[2]

[1]Launching a new subbrand also means launching a new product that carries the new subbrand. Throughout the article, we use the terms "brand" and "product" to refer to the same entity when it is clear from the context that a particular product has a one-to-one correspondence with a particular brand. Because both products are in the same category, the context is slightly different from that in Aaker and Keller (1990).

[2]We adopted this assumption to show that even when costs are negligible, a premium line extension with overlapping attributes may lead to losses in demand, market share, and profit for the extending firm. The qualitative results of the model will remain the same if firms have positive costs that are not too large.

Profit for the firm can thus be written as

$$\pi_b = p_b q_b, \tag{1}$$

where q_b is the firms' demand that results from consumers' utility maximization. The overall utility for consumers (households) h who buy the product offered by brand b is

$$U_{hb} = u(w_{hb}) + u(y_b), \tag{2}$$

where $u(w_{hb})$ captures household h's idiosyncratic utility for buying w units of the product from brand b and $u(y_b)$ captures the utility from buying y units of the outside good.

We assume that consumers can buy at most one product from brands G and R; thus, $w_{hb} \in \{0,1\}$. Furthermore, we let υ_{hb} be consumer h's marginal utility for one unit of the product. It follows that $u(w_{hb}) = \upsilon_{hb} w_{hb} = \upsilon_{hb}$ if the hth household buys one unit of the product from brand b. Purchase of product b, however, requires a trade-off with respect to consumption of the outside good: the higher the price of the product, denoted as p_b, the lower the quantity y of the outside good consumers can buy. Assuming that consumers have a total spending budget of T, when they buy the product from brand b, the remaining utility for the outside good can be expressed as

$$u(y_b) = T - p_b. \tag{3}$$

With these definitions, we can rewrite the overall utility when consumer (household) h purchases one of the main brands as

$$U_{hb} = u(w_{hb}) + u(y_b) = \upsilon_{hb} + (T - p_b). \tag{4}$$

As in Desai (2001), we consider that products in the market have functional and nonfunctional characteristics and that heterogeneous consumer preferences allow for both vertical and horizontal differentiation. On the one hand, heterogeneity in vertical product qualities and preferences allows products of different qualities to be marketed to consumers with varying appreciation (and willingness to pay) for quality. On the other hand, heterogeneity in preferences for firms enables brands to compete with one another with some degree of substitution. To capture both forms of differentiation, we expand the consumers' marginal utility to

$$\upsilon_{hb} = r_h v_b - \tau|x_b - x_h|. \tag{5}$$

The term $r_h v_b$ in Equation 5 models the vertical differentiation. More specifically, v_b captures the vertical value provided by the product and is defined as $v_b \equiv B_b + A_b$, where B_b represents the perceived brand image value the brand provides and A_b is the perceived functional value that the product's attributes provide.

The parameter r_h captures consumers' heterogeneous preferences in their willingness to pay for the vertical dimension of brand and attribute values. For simplicity, we assume that the market is composed of two segments of consumers represented by a taste for quality parameter θ, which can be either $\overline{\theta}$ (high-type consumers who have full valuation for quality) or $\underline{\theta}$ (low-type consumers who have reduced valuation for quality). High-type consumers obtain the full value for the product ($r_{\overline{\theta}} = 1$), whereas low-type consumers obtain partial value for the product ($r_{\underline{\theta}} = r \in (0,1)$). The probability of a consumer being type $\overline{\theta}$ is $\lambda_{\overline{\theta}}$, where $\lambda_{\overline{\theta}} \in (0,1)$; by the same token, the probability of a consumer being type $\underline{\theta}$ is $\lambda_{\underline{\theta}} = 1 - \lambda_{\overline{\theta}}$. It is assumed that firms know these proportions, but they cannot observe whether a given consumer is low or high type (for similar models of vertical and horizontal differentiation, see Bruce, Desai, and Staelin 2005; Desai 2001; Kim, Shi, and Srinivasan 2001). Given that we are interested in contrasting situations in which a firm has a legacy product in the market with scenarios in which the firm has both the legacy and the new product in the market, two segments is the minimum number of consumer segments required so that it may be optimal for the firm to sell both the legacy and the new product. If the model were to assume a larger number of segments, the firm would still serve mostly two macrosegments of consumers.

In the prelaunch scenario, the leader (brand G) has a better brand perception than the challenger; thus, we assume that $B_G^{(1)} = B_H = B_L + \Delta_B$ and that $B_R^{(1)} = B_L$, where B_L represents a baseline brand value and Δ_B is a positive differential brand value. The product of the market leader firm has a unique attribute (which we capture with the binary dummy variable $X = 0$), whereas the product of the challenger also has a unique attribute (which we capture as $X = 1$). As a result of the linkage between brand and product quality reputations, in the prelaunch scenario, the leading brand also has a better product attribute reputation. Thus, $A_G^{(1)} = A_{X=0} = A_H = A_L + \Delta_A$ and $A_R^{(1)} = A_{X=1} = A_L$, where A_L represents a baseline attribute value and Δ_A is a positive differential attribute value. With these considerations, we can write the vertical valuations for each product in the prelaunch scenario as

$$v_G^{(1)} = B_L + \Delta_B + A_L + \Delta_A, \text{ and} \tag{6}$$

$$v_R^{(1)} = B_L + A_L. \tag{7}$$

In the postlaunch scenario, firm G launches the new subbrand G^+, which is positioned as vertically different from the parent legacy brand G. We model this scenario by assuming that consumers' perception of subbrand G^+ is $B_{G^+}^{(2)} = B_L + \gamma\Delta_B$, where γ captures the differential amount in the positioning of subbrand G^+. If $\gamma > 1$ ($\gamma < 1$), brand G^+ will be perceived as superior (inferior) to brand G. As we described in the "Overview" subsection, this may lead to changes in consumer perceptions.

Because brand G^+ possesses the same product attributes as brand R (i.e., $A_{G^+} = A_R = A_{X=1}$), it competes with the product offered by brand R. Consumer perceptions of brand G^+ may spill over to attribute $A_{X=1}$, and thus the vertical value for this attribute is revised upwardly from $A_{X=1}^{(1)} = A_L$ to $A_{X=1}^{(2)} = A_L + \bar{s}\gamma\Delta_A$, where $\bar{s} \in [-1,1]$ captures the magnitude of the spillover. In addition, because both G^+ and R offer the same set of attributes, the positive change in attribute perceptions spills over to brand R as well, and consumers revise the vertical value of this brand from $B_R^{(1)} = B_L$ to $B_R^{(2)} = B_L + \bar{s}\gamma\Delta_B$. For ease of exposition, we label the spillover $\bar{s}$ as the cross-brand spillover. Although we initially allow $\bar{s}$ to assume any value between [–1, 1], realistically we expect the spillover to be positive. The rationale for this consideration is supported by the theoretical implications of Wernerfelt (1988) and Moorthy (2012) as well as by empirical evidence presented by Aribarg and Arora (2008) and Janakiraman, Sismeiro, and Dutta (2009).[3] One could reasonably argue that

[3]As we show subsequently, our empirical tests of the theory also support this assertion.

spillovers of small magnitude could capture short-term effects, whereas spillovers of large magnitude could capture long-term effects.

The introduction of the new subbrand G^+ may also cause consumers to revise their perception of the parent brand G and its product attribute $A_{X=0}$. Thus, the vertical value of the parent brand G may receive the spillover $\underline{s} \in [-1,1]$, and its vertical value may be revised from $B_G^{(1)} = B_H$ to $B_G^{(2)} = B_H + \underline{s}\Delta_B$. By the same token, consumers revise their perceptions about attribute $A_{X=0}$ from $A_{X=0}^{(1)} = A_H$ to $A_{X=0}^{(2)} = A_H + \underline{s}\Delta_A$. For ease of exposition, we label the spillover $\underline{s}$ as the parent-brand spillover. Although we initially allow $\underline{s}$ to assume any value between [−1, 1], we expect the spillover to be negative. This prediction is consistent with range-frequency theory (Parducci 1965), a well-established psychophysical theory that predicts that the extension of the range of a distribution leads to the perceived value of the other stimuli in the distribution to contrast away from the new anchor for the range. When the range is extended upwardly, as is the case when a higher-value stimulus is added to a distribution (e.g., a premium product), the perceived value of stimuli that are below the new anchor decreases as a result of the contrast effect. Alternatively, when the range is extended downwardly, as is the case when a higher-value stimulus is added to a distribution (e.g., a low-price product), the perceived value of stimuli above the new lower anchor increases as a result of the contrast effect.

By using the aforementioned expressions, we can rewrite the overall consumer perception of the value delivered by each product in the postlaunch scenario:

(8) $$v_{G^+}^{(2)} = B_L + \gamma\Delta_B + A_L + \bar{s}\gamma\Delta_A,$$

(9) $$v_G^{(2)} = B_L + (1 + \underline{s})\Delta_B + A_L + (1 + \underline{s})\Delta_A, \quad \text{and}$$

(10) $$v_R^{(2)} = B_L + \bar{s}\gamma\Delta_B + A_L + \bar{s}\gamma\Delta_A.$$

A standard price discrimination argument (see, e.g., Desai 2001) would prescribe that, whenever possible, firm G will attempt to market the highest-valued product to the high-type consumer segment and the lowest valued product to the low-type consumer segment. As we show subsequently (in Condition 11), marketing the premium product to high-type consumers and the standard product to low-type consumers requires the magnitude of the brand positioning parameter γ to be large enough to account for the magnitude of the spillover effects $\underline{s}$ and $\bar{s}$. In line with the research objectives proposed, we focus on situations in which these parameters are such that the premium brand indeed provides greater value to consumers than the standard product (i.e., we do not discuss the case in which the premium brand has less value than the standard product; such a situation can be covered by the analysis of the launching of an inferior brand in Appendix B).

Horizontal differentiation between the brands is captured by the Hotelling-like spatial term $(-\tau|x_b - x_h|)$ in Equation 5. We assume that each consumer has an ideal preference point reflecting his or her brand preferences. These ideal points are uniformly distributed on a Hotelling market on the interval [0, 1]. Without loss of generality, we assume that firm G's brand is located at point 0 and firm R's brand is located at point 1. The parameter τ, traditionally labeled the transportation cost, represents the magnitude of the disutility experienced by a consumer from purchasing a product that does not match his or her brand preference. This feature of the model allows some consumers to strongly prefer firm G (those located near point 0), some consumers to strongly prefer firm R (those located near point 1), and some consumers to be somewhat indifferent about the firms (those located near the center of the Hotelling market). Given that we focus on the strategic interactions between firms, we observe some regularity conditions on the magnitude of the parameters. We assume that

$$\frac{\Delta_B + \Delta_A}{3} < \tau < \left(T + \frac{B_L + A_L}{2}\right).$$

This is sufficient to ensure that firms will compete for at least a few of the consumers, and it also prevents one of the firms from becoming a de facto monopolist by pricing the other firm out of the market.

The structure of the game follows the standard price competition game in spatial models with exogenous firm locations. First, firms simultaneously select prices optimally. Next, consumers decide whether to purchase a product and, if they do purchase, from which firm they will purchase.

Model Outcomes: Prelaunch Scenario

In the prelaunch scenario, each firm has one product in the market, and thus they cannot price-discriminate across consumer segments. The analysis of the model, presented in Appendix A, proceeds as in a standard analysis of spatial models. The following proposition presents the equilibrium outcomes in this scenario.

P_1: In the prelaunch scenario, equilibrium prices for the products are

(11) $$p_G^{*(1)} = \frac{3\tau + [\lambda + (1-\lambda)r]\left(v_G^{(1)} - v_R^{(1)}\right)}{3} = \frac{3\tau + [\lambda + (1-\lambda)r](\Delta_A + \Delta_B)}{3}, \quad \text{and}$$

(12) $$p_R^{*(1)} = \frac{3\tau - [\lambda + (1-\lambda)r]\left(v_G^{(1)} - v_R^{(1)}\right)}{3} = \frac{3\tau - [\lambda + (1-\lambda)r](\Delta_A + \Delta_B)}{3}.$$

Equilibrium demands are

(13) $$q_G^{*(1)} = \frac{3\tau + [\lambda + (1-\lambda)r]\left(v_G^{(1)} - v_R^{(1)}\right)}{6\tau} = \frac{3\tau + [\lambda + (1-\lambda)r](\Delta_A + \Delta_B)}{6\tau}, \quad \text{and}$$

(14) $$q_R^{*(1)} = \frac{3\tau - [\lambda + (1-\lambda)r]\left(v_G^{(1)} - v_R^{(1)}\right)}{6\tau} = \frac{3\tau - [\lambda + (1-\lambda)r](\Delta_A + \Delta_B)}{6\tau}.$$

Equilibrium profit is

$$\pi_G^{*(1)} = p_G^{*(1)} q_G^{*(1)}, \text{ and } \pi_R^{*(1)} = p_R^{*(1)} q_R^{*(1)}.$$

Proof: See Appendix A.

The outcomes presented in P_1 are all aligned with standard linear models of spatial differentiation. The attribute value difference (Δ_A) and the brand value difference (Δ_B) give a vertical value advantage to the leading brand G, enabling this brand to command higher pricing power, overall demand, market share, and profit than the challenging brand R. To further clarify, note in the numerator of the equilibrium profits and demands that firm G benefits from the vertical differences Δ_A and Δ_B (through the term $+[\lambda + (1-\lambda)r](\Delta_A + \Delta_B)$), whereas firm R's outcomes are impaired by Δ_A and Δ_B (through the term $-[\lambda + (1-\lambda)r](\Delta_A + \Delta_B)$). Although these results are straightforward, we present them here to allow for comparisons across pre- and postlaunch scenarios and for comparisons of the results of the empirical test of the model across scenarios. Next, we consider the postlaunch scenario.

Model Outcomes: Postlaunch Scenario

Although the analysis of the postlaunch scenario shares many commonalities with the analysis of the prelaunch scenario, there are important differences. First, firm G has two products in the market in the postlaunch scenario versus one product in the prelaunch scenario. As previously stated, this enables the firm to attempt to price discriminate consumers by directing the highest-valued product to the high-type consumers segment and the lowest-valued product to the low-type consumers segment. However, if consumers derive value from both brand and product attributes, the superior vertical positioning of brand G^+ to that of brand G may not be sufficient to cause the overall value $v_{G^+}^{(2)}$ to dominate $v_G^{(2)}$. Because $v_{G^+}^{(2)} = B_L + \gamma\Delta_B + A_L + \bar{s}\gamma\Delta_A$, and $v_G^{(2)} = B_L + (1+\underline{s})\Delta_B + A_L + (1+\underline{s})\Delta_A$, we can conclude that $v_{G^+}^{(2)} > v_G^{(2)}$ only when

$$\gamma > \frac{(1+\underline{s})(\Delta_A + \Delta_B)}{(\bar{s}\Delta_A + \Delta_B)}. \tag{15}$$

This condition seems to be trivial, but it has important implications for upward line extensions. It holds that, if a brand wants to launch a premium subbrand with attributes that overlap with those of a competitor's product, it needs to rely on a sufficiently large change in positioning (γ) or significant changes in consumer perceptions of brands and product attribute values (either a significant positive spillover $\bar{s}$ or a significant negative spillover $\underline{s}$). Absent those conditions, the launching of a superior premium brand will be doomed from the outset.

Our model assumptions allow us to consider that Condition 11 is indeed satisfied; therefore, we proceed by analyzing the situation in which the premium brand targets high-type consumers (the reverse situation is covered in Appendix B). The following proposition presents the equilibrium outcomes when the firm launches the premium line extension.

P_2: In the postlaunch scenario, equilibrium prices for the products are

$$p_{G^+}^{*(2)} = \frac{6\tau + (3-\lambda)\left(v_{G^+}^{(2)} - v_R^{(2)}\right) + r(1-\lambda)\left(v_R^{(2)} - v_G^{(2)}\right)}{6}, \tag{16}$$

$$p_G^{*(2)} = \frac{6\tau - \lambda\left(v_{G^+}^{(2)} - v_R^{(2)}\right) - r(2+\lambda)\left(v_R^{(2)} - v_G^{(2)}\right)}{6}, \text{ and} \tag{17}$$

$$p_R^{*(2)} = \frac{6\tau - 2\lambda\left(v_{G^+}^{(2)} - v_R^{(2)}\right) + 2r(1-\lambda)\left(v_R^{(2)} - v_G^{(2)}\right)}{6}. \tag{18}$$

Equilibrium demands are

$$q_{G^+}^{*(2)} = \lambda\left(\frac{6\tau + (3-\lambda)\left(v_{G^+}^{(2)} - v_R^{(2)}\right) + r(1-\lambda)\left(v_R^{(2)} - v_G^{(2)}\right)}{12\tau}\right), \tag{19}$$

$$q_G^{*(2)} = (1-\lambda)\left(\frac{6\tau - \lambda\left(v_{G^+}^{(2)} - v_R^{(2)}\right) - r(2+\lambda)\left(v_R^{(2)} - v_G^{(2)}\right)}{12\tau}\right), \text{ and} \tag{20}$$

$$q_R^{*(2)} = \frac{3\tau - \lambda\left(v_{G^+}^{(2)} - v_R^{(2)}\right) + r(1-\lambda)\left(v_R^{(2)} - v_G^{(2)}\right)}{6\tau}. \tag{21}$$

Equilibrium profit is

$$\pi_G^{*(2)} = p_{G^+}^{*(2)} q_{G^+}^{*(2)} + p_G^{*(2)} q_G^{*(2)} \text{ and } \pi_R^{*(2)} = p_R^{*(2)} q_R^{*(2)}.$$

Proof: See Appendix A.

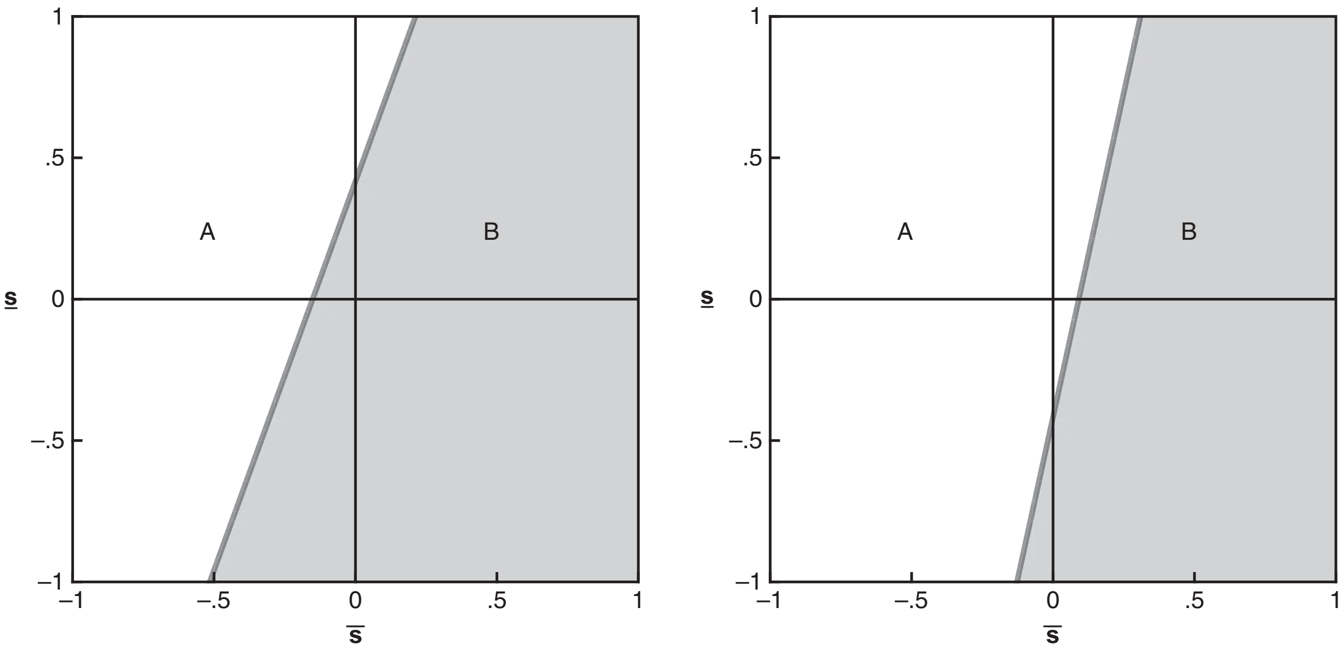
The results from P_2 enable us to explore whether the postlaunch scenario is more attractive for firm G than the prelaunch scenario. We do so by directly comparing the results from P_1 and P_2. The analysis shows that the profitability of launching the premium line extension with overlapping attributes depends on the magnitude of the cross-brand spillover effects, as exemplified in Figure 1.

In Figure 1, we vary the magnitude of the spillover effects and fix all other parameter values. In region A of the figure, we observe the well-known result that the launch of a premium subbrand can be optimal for the firm. In this range, launching a new product enables the firm to better extract value from heterogeneous consumer segments by offering the premium product (with additional image value) to the high-type market segment while offering the basic product to the low-type market segment. This has a positive influence on the leading firm's outcomes and generally leads to increase in profitability.

Conversely, in the shaded region B of the figure, the effect of the spillovers overpowers the positive effects of launching a new premium subbrand because it increases the competitive strength of the challenger's brand and product attribute. In relative terms, the spillover effect decreases the vertical value provided by the leader's legacy parent brand and increases the vertical value provided by the challenger's brand. This results in an increase in the relative attractiveness of the challenger's brand. Overall, the leading firm may experience a loss in not only demand and market share, but also profit. This result is more noteworthy because it contradicts the common wisdom that "improve quality and increase price" is likely to be a profitable strategy for firms.

FIGURE 1
Profitability Regions of the Pre- and Postlaunch Scenarios

A: Parameter γ Is Small | **B: Parameter γ Is Large**



P_3 summarizes this discussion as follows:

P_3: The optimality of the introduction of a new premium subbrand featuring attributes that overlap those of a product offered by the competitor depends on the magnitude of the spillover effects. The smaller the value of the parent-brand spillover effect ($\underline{s}$) and the higher the magnitude of the cross-brand spillover effect ($\bar{s}$), the less attractive it is to launch a premium subbrand.

Proof: See Appendix A.

To better understand the result in P_3, recall that the spillover effect on the parent brand ($\underline{s}$) affects consumers' perception of the value of the parent brand G as well as the product attribute that typifies brand G. All else being equal, negative values for the spillover $\underline{s}$ worsen consumers' perception about the overall vertical value provided by the legacy product ($v_G^{(2)}$). By the same token, positive values for the spillover $\underline{s}$ improve consumers' perception about $v_G^{(2)}$.

In addition, recall that the cross-brand spillover effect ($\bar{s}$) affects consumers' perceptions of the overlapping attribute of brands G^+ and R as well as perceptions about the value of the competing brand R. Negative values for the spillovers worsen perceptions of the overall vertical value of the products marketed under brands G^+ and R ($v_{G^+}^{(2)}$ and $v_R^{(2)}$), whereas positive values for the spillover improve perceptions about the products marketed under these brands. Thus, the direction of the spillover effect $\bar{s}$ for the new product of the leading firm G and for the product of the rival firm R is correlated.

Each of the direct effects of the spillovers $\underline{s}$ and $\bar{s}$ gives us an indication of the overall profitability of launching a premium subbrand that features attributes that overlap with those of a competing product. However, to assess the firm-level outcomes stemming from the launch of such a product, one needs to consider the joint effect of both $\underline{s}$ and $\bar{s}$. As Figure 1 illustrates, depending on the other parameters of the model, the launch of a premium subbrand can be profitable (or unprofitable) with either positive or negative values of the spillover effect on the parent brand $\underline{s}$. Similarly, depending on the other parameters of the model, the launch of a premium subbrand can be profitable (or unprofitable) with either positive or negative values of the cross-brand spillover effect $\bar{s}$.

When observing the magnitude of the two spillover effects $\underline{s}$ and $\bar{s}$ jointly, it becomes clear that when $\underline{s}$ is large or $\bar{s}$ is small, firm G is better off launching the premium subbrand. The intuition underlying this prediction is that, in this case (region A in Figure 1), the net effect of the spillovers causes either the absolute competitive strength of the legacy brand to increase significantly (when $\underline{s}$ is large) or the absolute competitive strength of the competing brand to decrease significantly (when $\bar{s}$ is small). In relative terms, this case depicts a relative strengthening of brand G over brands G^+ and R.

Conversely, when $\underline{s}$ is small or $\bar{s}$ is large, firm G is better off not launching the premium subbrand. The intuition underlying this prediction is that, in this case (region B in Figure 1), the net effect of the spillovers causes either the absolute competitive strength of the legacy brand to decrease significantly (when $\underline{s}$ is small) or the absolute competitive strength of the competing brand to increase significantly (when $\bar{s}$ is large). In relative terms, this case depicts a relative weakening of brand G over brands G^+ and R.

When firm G launches the premium subbrand, the product marketed by firm R competes against both products of the leading firm G (products of the legacy brand G and new subbrand G^{+}). When we combine the aforementioned direct and joint spillover effects, it becomes apparent why a relative increase in the competitive strength of brand R, along with a relative strengthening of brand G^{+}, could lead to a net result that is detrimental to firm G. This is expected because the aggregate market response would be a net decrease in the overall purchases of products of the extending firm G. By the same token, a relative decrease in the competitive strength of brand R as a result of the premium brand extension tends to be net beneficial to firm G even if the subbrand G^{+} also loses competitive power.

These results call for a broadening of the current understanding of product line extension effects, which predicts that upward extensions may either decrease overall profit if products are not priced correctly or cause an increase in overall costs. However, the overall demand and market share for the firm extending its line is predicted to increase. In contrast, our results show that even if firms price optimally (or near optimally) and even if the costs of the new product line are the same as the existing line and there is no cost of launching the new product line, the firm extending its product line may experience a decrease in sales, market share, and profit. The mechanism driving the firm to experience negative outcomes is the change in consumers' perceptions about the relative value of the extending firm's legacy brand and characteristic product attributes. In the next section, we present the results of an experiment designed to empirically test the implications of the proposed model.

Empirical Analysis

Data Description

We test the model using panel data collected in a pre-post experiment conducted in a virtual shopping environment for a consumer packaged goods brand in the personal hygiene segment. A Mintel (2014) report estimated sales in this category to be on the order of $4.97 billion in 2013, showing a growth rate of 5% from 2011 to 2013 and projected sales of $5.3 billion by 2018. The manufacturing costs of this type of product tend to be low because production can be outsourced to foreign manufacturers. The company conducting this experiment is a major multinational consumer goods company and is the leader in this product category. It aimed to compete with its major challenger in this product category by introducing a premium subbrand under its existing parent brand. For many years, the leading brand possessed attributes that were focused on providing convenience, whereas the challenger brand invested in attributes that, though less convenient, increased comfort. Being the leading brand, and in an attempt to avoid cannibalization, the firm conducting the study only experimented with upward line extension scenarios. The firm launched a new premium subbrand with attributes geared toward providing comfort, thus matching the challenger's offering.

To abide by the confidentiality agreement of this company and the notation consistency with the theoretical model, we use firm G to denote the leading firm conducting the product launch experiment and firm R to denote its challenger. We also use brand G to indicate the legacy product under the parent brand and brand G^{+} to indicate the premium item under the new premium subbrand. Brand R represents firm R's brand. To fully accommodate the study and to confer external validity to our empirical analysis, we also consider an additional brand, brand S, which represents the store brand. Because brands' latent utilities can only be measured relative to a baseline brand, at least three brands must be included in the empirical model. This allows for the estimation of brand and attribute preferences for both brand G and brand R.

The experiment proceeded as follows. Participants with several years of consumption experience in the product category and knowledge about the brands and their respective product attributes were selected to participate in the experiment. They were brought into a site where the company often tests new products and conducts demand forecasting. Participants were asked to choose among stockkeeping units (SKUs) of the established brands (brands G, R, and S) in four prelaunch shopping trips in a virtual shopping environment. Then, different advertising sources (e.g., television ads, print ads) were simulated on computer screens. The advertising sources provided information about the new premium subbrand G^{+}, the established brands (brands G, R, and S), and the product attributes of each brand. Participants could review product information for any of the simulated advertisements, subject to an overall time limit of 15 minutes. The content of the information was the same for all participants. Finally, participants were asked to choose again among SKUs of all brands (brands G, G^{+}, R, and S) in four postlaunch shopping trips.

Because the choice decision of each respondent occurs at the SKU level, both brand and quantity decisions are involved in a choice task. The SKU-choice data cannot be aggregated into the brand level, because SKUs with the same brand name may have different levels of product attributes. After removing respondents with no purchase records in either pre- or postlaunch scenarios, the data of 163 respondents remained for further analysis. There are 34 SKUs in the prelaunch study and 40 SKUs in the postlaunch study. All SKUs can be described by their prices and by three product attributes (attribute X with two levels, attribute Y with two levels, and attribute W with four levels). We apply binary coding to capture the different product attribute levels. Attribute X is the main differentiator between Brands G and R. For the sake of clarity, and in line with the analytical model, we operationalize this attribute as a dummy variable, where $X = 0$ designates convenience, the differentiating attribute of brand G, and $X = 1$ designates comfort, the overlapping attribute of brands G^{+} and R.

Table 1 provides descriptive statistics of the data. Table 1, Panel A, shows that brand G is the market leader and brand R is the strongest competitor in the prelaunch study. The empirical data map well on our theoretical model specification in which firm G has the leading brand and firm R is the challenger. Table 1, Panel B, shows that launching brand G^{+} leads to a decrease in the overall choice share for firm G (i.e., in the prelaunch study, brand G has 56.75%, whereas in

TABLE 1
Descriptive Statistics

A: Prestudy				
		Brand G	**Brand R**	**Brand S**
Shopping trip 1		101	50	12
Shopping trip 2		102	37	24
Shopping trip 3		82	52	29
Shopping trip 4		85	42	36
Sum		370	181	101
Choice share		56.75%	27.76%	15.49%
Usage-unit price		.158	.212	.120
Total revenue		1,766.20	1,037.09	336.99
B: Poststudy				
	Brand G^+	**Brand G**	**Brand R**	**Brand S**
Shopping trip 1	31	40	57	35
Shopping trip 2	27	68	43	25
Shopping trip 3	23	67	46	27
Shopping trip 4	42	40	52	29
Sum	123	215	198	116
Choice share	18.87%	32.98%	30.37%	17.79%
Usage-unit price	.273	.170	.203	.120
Change in choice share		23.77%	2.61%	2.30%
Total revenue	614.47	1,057.65	1,102.32	378.84

Notes: Brand G and Brand G^+ combined market share is 51.85%, and the total revenue is $1,672.12.

the postlaunch study, the combined choice share of brands G and G^+ is 51.85%) and an increase of 2.61% and 2.30% in the choice shares of the competing brands R and S, respectively. This empirical result is consistent with the theoretical model, which predicts that firm G will experience a decrease in overall demand and market share.

Table 1 also shows the changes in prices. The usage-unit price is determined by dividing the list price of a SKU by its pack size (e.g., $6.99/20 usage units) and computing a weighted average of this price across all SKUs with the same brand name. The overall price per usage unit is small because SKUs contain multiple units that are intended for a single use.

The company conducting the research (rather than the authors) determined the prices for the products. Although the prices are not from a real market equilibrium outcome stemming from the firms' competitive interaction, they reflect the expected market prices as predicted by the marketing managers of firm G. As Table 1 shows, in the postlaunch scenario, brand G^+ is priced at the highest price point, in line with the positioning as the premium product and targeting high-type consumers (Condition 11 holds). We also note that the total revenue for firm G decreased from $1,766.20 to $1,672.12. The magnitude of the difference in revenues implies that there are multiple possibilities of positive marginal costs that support a decrease in profit.

At this point it is not possible to disentangle whether the decrease in the combined market share of brands G and G^+ is indeed caused by the predicted negative spillover effect or simply by the higher price of brand G^+. In the next section, we build and analyze an empirical model that can disentangle these effects and answer this question.

Empirical Model

To specify the empirical demand model, we follow the original specifications (objective functions) of the theoretical model rather than the equilibrium conditions. The empirical model differs from the theoretical model in the following respects: First, the theoretical model is constructed at the brand level, but the empirical model must accommodate consumer choices among various brand–quantity combinations because the data consist of consumer choices made at the SKU level. Second, the theoretical model discusses the situation of two competing brands, but the empirical model includes one additional brand (brand S) to allow for the estimation of the parameters of the two focal brands, thus providing a cleaner test of the theoretical argument. We adopt the model and estimation strategy proposed by Allenby et al. (2004) to empirically analyze the data.

Given that each respondent (household h) could perform multiple shopping trips, we use index t to capture respondents' shopping trips. We let N represent the number of brands in the category (in our case, N = 3 in the prelaunch scenario and N = 4 in the postlaunch scenario) and consider that each brand b carries K_b SKUs with different levels of product attributes and package sizes.

We relax the assumption on variable w (which was fixed to be either 0 or 1 in the theoretical model) and let $w_{kbht} \geq 0$ refer to the quantity of SKU of brand b chosen by the hth respondent at shopping trip t. By the same token, variable y_{ht} refers to the quantity of outside goods purchased by the hth respondent during shopping trip t. To accommodate nonlinear pricing, we let $p(w_{kbht})$ denote the price of SKU of brand b given to the hth respondent during shopping trip t.

In addition, we allow for the fact that consumers experience diminishing returns on quantity; thus, we take logarithms of the idiosyncratic utilities from consuming the product from the main brands and the outside good. In the theoretical model, logarithms were not necessary because consumers would buy either 0 or 1 units of the product; thus, diminishing returns were not a concern. As a result, we write the overall utility for a household that chooses one item among all brand-pack combinations as

$$u(w_{kbht}, y_{ht}) = \alpha_{1h} \ln u(w_{kbht}) + \alpha_{2h} \ln u(y_{ht}). \tag{22}$$

Equation 22 is the extended version of the utility function of the theoretical model (Equation 2). We include the coefficients α_{1h} and α_{2h} to empirically capture the utility contribution from the product consumption and the outside goods, respectively. Both the theoretical and empirical models allow a consumer to choose only one item among the available SKUs. As in the theoretical models (Equation 3), we assume that the price of the outside good equals 1. A respondent expenditure on the N brands and outside goods is subject to the budget constraint

$$u(y_{ht}) = T_h - p(w_{kbht}), \tag{23}$$

where T_h is the total expenditure of respondent h, and $p(w_{kbht})$ is the price of the kth SKU of brand b purchased by the hth respondent during shopping trip t.

We follow the standard random utility model and assume that $u(w_{kbht}) = \psi_{kbht} w_{kbht}$ and the log-marginal utility $\ln(\psi_{kbht}) = \upsilon_{kbht} + \varepsilon_{kbht}$, where υ_{kbht} is the deterministic portion of marginal utility as defined in Equation 5 and ε_{kbht} is the stochastic term for which the distribution assumption is used to derive the likelihood function. We substitute Equation 23 for the outside goods and obtain

$$\begin{aligned} u(w_{kbht}) &= \alpha_{1h}[\ln(\psi_{kbht} w_{kbht})] + \alpha_{2h} \ln[T_h - p(w_{kbht})] \\ &= \alpha_{1h}(\upsilon_{kbht} + \varepsilon_{kbht}) + \alpha_{1h}(\ln w_{kbht}) \\ &\quad + \alpha_{2h} \ln[T_h - p(w_{kbht})]. \end{aligned} \tag{24}$$

Because not all parameters in Equation 24 can be identified, we follow the guidelines from Allenby et al. (2004) and assume that $\alpha_{1h} = 1$ and $\beta_h = \alpha_{2h}/\alpha_{1h}$; we specify the log-utility function for the empirical study as

$$u(w_{kbht}) = \upsilon_{kbht} \ln(w_{kbht}) + \beta_h \ln[T_h - p(w_{kbht})] + \varepsilon_{kbht}. \tag{25}$$

We replace the determinist part of marginal utility υ_{kbht} in Equation 25 by the marginal utility specified in Equation 5 to get

$$\begin{aligned} u(w_{kbht}) &= (r_h v_{kbht} - \tau|x_b - x_{bh}|) + \ln w_{kbht} \\ &\quad + \beta_h \ln[T_h - p(w_{kbht})] + \varepsilon_{kbht}, \end{aligned} \tag{26}$$

where τ is the hth respondent's transportation cost, x_b is the location of brand b, and x_{bh} is respondent h's location in the space of preferences for brand b. Individual consumer preferences are captured by the heterogeneous vertical consumer preference r_h and the horizontal brand location preference $\tau|x_b - x_{bh}|$. The product characteristics are captured by the vertical value v_{kbht}.

We further consider that the vertical differentiation v_{kbht} and consumers' heterogeneous vertical valuation parameter r_h in Equation 25 can be characterized by the intrinsic brand preference and product attributes of the kth SKU of brand b (y_{kbht}). Note that in Equation 26, the true location of brand b x_b and the true location of respondent h's brand preferences x_{bh} are not observed by the researchers. The parameters τ, x_b, and x_{bh} cannot be jointly identified with the intrinsic brand preference; therefore, Equation 26 can be rewritten as

$$u(w_{kbht}) = z_{kbht}\beta_{zh} + \ln w_{kbht} + \beta_h \ln[T_h - p(w_{kbht})] + \varepsilon_{kbht}, \tag{27}$$

where the subutility $z_{kbht}\beta_{zh}$ is the component that captures both vertical and horizontal values of the kth SKU of brand b obtained by each household. The term z_{kbht} captures the characteristics of brand intercept and product attributes of the kth SKU of brand b, and the term β_{zh} captures all the intrinsic taste preferences for brands and product characteristics.

We follow Allenby et al.'s (2004) solution procedure and assume that the SKUs with the same brand name have the same error realizations. That is, $\varepsilon_{kbht} = \varepsilon_{bht}$ for $k = 1, 2, \ldots, K_b$. This assumption enables us to determine the utility-maximizing quantity of brand b (with the notation w_{bht}) by searching all available SKUs of brand b:

$$\begin{aligned} w^*_{bht} &= \arg\max_k \{z_{kbht}\beta_{zh} + \ln w_{kbht} + \beta_h \ln[T_h - p(w_{kbht})] + \varepsilon_{bht}\} \\ &= \arg\max_k \{z_{kbht}\beta_{zh} + \ln w_{kbht} + \beta_h \ln[T_h - p(w_{kbht})]\}. \end{aligned} \tag{28}$$

The brand-pack choice implies that the utility of observed choice is the maximum among all available brand-pack combinations in the product category. Assuming that $\varepsilon_{bht} \sim N(0, \sigma^2_b)$, the probability of observing the decision of purchasing w_k quantities of brand b is

$$\Pr(w_{kbht}) = \Pr[u(w_{kbht} = w^*_{bht}) > \max\{u(w^*_{b'ht}) \forall b' \neq b\}]. \tag{29}$$

A conventional multivariate probit model is known to have location and scale identification problems. We solve the location identification problem by forming the differenced system of latent utilities and solve the scale identification problem by fixing the first diagonal element of the covariance of latent utility at 1. An in-depth discussion of the estimation of a multivariate probit model appears in Allenby, Rossi and McCulloch (2005). Because the likelihood function (Equation 29) is derived from the outcome of the maximization in Equation 28, and the SKUs in the optimal set vary with Markov chain Monte Carlo iterations, the conventional solution for the location and scale identifications is not applicable to the proposed model. To solve the location identification problem, we fix the intercept of brand S, the store brand, as 0. To solve the scale identification problem, we assume that the covariance matrix of latent utilities is identical. We test and validate the proposed model and algorithm through multiple simulation exercises.

Results

We analyzed pre- and postlaunch data according to the model specified in Equations 27 and 29. We carried out estimation using a Bayesian algorithm and used draws from the posterior distributions to evaluate the means and variances of parameter estimates. The chain ran for 30,000 iterations, and the last 10,000 iterations were used to obtain the parameter estimates. We assessed convergence by setting the chain from multiple points and inspecting time series plots of log-likelihood as well as model parameters. The Web Appendix provides estimation algorithms for the proposed model.

We employed Bayesian methods, rather than multinomial logit or probit methods, for the reasons discussed in Allenby et al. (2004). First, because the firms are selling multiple SKUs of the same products with different unit prices, reorganizing the data to fit classical models can lead to a biased estimation. Second, we adopted the hierarchical Bayes approach because each respondent only has four observations in the pre- and postlaunch study. The reason we did not use the maximum likelihood estimation is primarily asymptotic: given the maximum likelihood estimation's small sample property, we cannot ensure unbiased estimates. Conversely, the Bayesian approach can provide exact estimation. Third, because Brand G^+ was introduced to the choice set, we need to treat potential independence of irrelevant alternatives problems. Therefore, we use the probit version of Allenby et al. (2004) to analyze this data set.

Table 2 reports the posterior estimates of the pre- and postlaunch scenarios ($\overline{\beta}^{(1)}$ and $\overline{\beta}^{(2)}$, respectively). The result shows that, in the prelaunch scenario, brand G is preferred over brand R. However, after brand G^+ is launched, respondents view it as the most preferred brand, whereas preferences for brand G decrease and those for brand R increase (to a point that preferences for brands G and R become equivalent). Firm R benefits from firm G's upward line extension because preferences for brand R move from being inferior to those for brand G and on par with those of the store brand S to being on par with brand G and superior to brand S. These results are further supported by the choice shares discussed previously (presented in Table 1).

Notice that preference changes observed in Table 2 provide strong support to our theoretical analysis and demonstrate the spillover effects on brand preferences[4]: because consumers prefer brand G over brand R in the prelaunch study, we can state that brand G is perceived as a high-value brand ($\overline{\beta}_G^{(1)} = B_H$) and brand R is perceived as a low-value brand ($\overline{\beta}_R^{(1)} = B_L$). In the poststudy, following firm G's launch of brand G^+ positioned as a premium product, consumers revise their beliefs and perceive brand G^+ as a high-value brand, whereas the parent brand G loses the initial advantage it had over brand R. The intercept estimates presented in Table 3 support this result and show that, in the postlaunch study, brand intercept of brand G^+ has the largest magnitude ($\overline{\beta}_{G^+}^{(2)} = B_H + \gamma\Delta_B$), followed by the magnitude of the intercepts of brands G and R, which are approximately the average of a low and a high brand valuation ($\overline{\beta}_G^{(2)} \cong \overline{\beta}_R^{(2)} \cong B_L + (\Delta_B/2)$).

Table 2 also shows that a firm's upward line extension leads to changes in consumer preferences for product attributes, as predicted by the theoretical analysis. The empirical model considers three main attributes (attributes W, Y, and X). As mentioned previously, we include product attributes W and Y to better describe the difference among SKUs for different brands and to avoid empirical identification issues. The level of product attribute W is chosen on the basis of the usage context, not the respondents' preferences. In addition, although level 1 of product attribute Y is preferred in the prelaunch study, consumer choices are driven primarily by brand preferences and preference for product attribute X. Thus, we discuss changes in preferences for this attribute.

In the prelaunch study, respondents prefer convenience over comfort (attribute X = 1 significantly decreases utility). However, brand G's upmarket line-stretching strategy makes respondents feel much less negatively toward comfort in the poststudy,[5] as captured by the relative magnitude of attribute X (X = 1). In the prestudy, attribute X is statistically significantly negative, but this is not true in the poststudy. This result is consistent with our theoretical predictions, given that, in the prestudy, consumers value brand G with convenience ($\overline{\beta}_{X=0}^{(1)} = A_H$) more highly than they value brand R with comfort ($\overline{\beta}_{X=1}^{(1)} = A_L$). In the poststudy, the launch of brand G^+ makes consumers feel uncertain about the brand and the attribute values of brand G, because firm G now positions brand G^+ as a premium product and advocates the benefits of comfort (X = 1). The information revealed by the positioning of brand G^+ contradicts what consumers believed in the prestudy. Because both brand G^+ and brand R now offer comfort, the launch of brand G^+ makes consumers connect the premium image of a brand with the presence of comfort. Therefore, consumers revise their previous beliefs and form a posterior belief that comfort is more valuable ($\overline{\beta}_{x=1}^{(2)} \cong A_L + \bar{s}\gamma\Delta_A$).

Tables 3 and 4 report the pre- and postlaunch covariance of consumer heterogeneity, respectively. The information in these tables shows that, after the launch of brand G^+, the positive correlation between brand G and brand R becomes substantially stronger, More importantly, the correlation between brand G^+ and brand R become very strong, which supports our theory that the shared attribute and positioning around comfort (X = 1) causes a linkage between these brands. The shared parent brand explains the correlation between brands G and G^+.

Policy Analysis

In the previous section, we empirically demonstrate that consumers indeed change their perceptions about brands and product attributes. Whether the changes in perceptions are strong enough to lead to a decrease in market share after the launch of a new premium product remains to be identified. To control for the impact of price changes in the choice shares, we conduct a policy simulation (we describe the algorithm for this simulation in the Web Appendix) by generating consumer

[4]In particular, the result that consumers view brands G and R as similar can be accommodated when a negative spillover for brand G and a positive spillover for brand R occur.

[5]Similar to the case for brand preferences, the indifference to product attribute preferences can be accommodated with a negative spillover for convenience and a positive spillover for comfort.

TABLE 2
Posterior Estimates of the Pre- and Poststudy Scenarios $\overline{\beta}^{(1)}$ and $\overline{\beta}^{(2)}$

	Prestudy				Poststudy			
	5%	50%	95%	Variance	5%	50%	95%	Variance
Brand G^{+}					1.26	2.09	3.13	.33
Brand G	1.68	2.49	3.39	.27	.83	1.64	2.37	.21
Brand R	–.75	.44	1.35	.42	1.01	1.70	2.51	.21
Attribute X	–.78	–.44	–.14	.04	–.78	–.32	.05	.07
Attribute Y	–.78	–.21	.33	.11	–.34	–.11	.11	.02
Attribute W-1	.10	.38	.75	.04	.00	.19	.37	.01
Attribute W-2	–.34	.00	.38	.05	–.21	.00	.21	.02
Attribute W-3	–.13	.22	.63	.05	–.36	–.05	.26	.03
log(T – p)	2.43	2.91	3.45	.10	2.33	2.94	3.60	.15

TABLE 3
Posterior Estimates of $V_{\beta}^{(1)}$

	Brand G	Brand R	Attribute X	Attribute Y	Attribute W-1	Attribute W-2	Attribute W-3	log(T – p)
Brand G								
50%	9.85	6.59	–.26	.20	.19	–.31	.56	–.34
Variance	7.59	18.24	.67	.74	.36	.42	.60	.76
Correlation	1.00	.38	–.09	.06	.08	–.13	.21	–.11
Brand R								
50%	6.59	30.53	2.26	2.12	.25	–.15	.01	–1.18
Variance	18.24	90.71	2.24	7.00	1.25	1.22	1.89	3.27
Correlation	.38	1.00	.42	.37	.06	–.03	.00	–.22
Attribute X								
50%	–.26	2.26	.96	.20	.02	.02	–.07	–.07
Variance	.67	2.24	.15	.13	.04	.04	.06	.07
Correlation	–.09	.42	1.00	.20	.02	.03	–.08	–.07
Attribute Y								
50%	.20	2.12	.20	1.05	.02	.00	–.03	–.07
Variance	.74	7.00	.13	.37	.04	.04	.07	.09
Correlation	.06	.37	.20	1.00	.03	.00	–.04	–.07
Attribute W-1								
50%	.19	.25	.02	.02	.56	.14	.15	–.01
Variance	.36	1.25	.04	.04	.03	.02	.03	.02
Correlation	.08	.06	.02	.03	1.00	.24	.23	–.01
Attribute W-2								
50%	–.31	–.15	.02	.00	.14	.60	.08	.02
Variance	.42	1.22	.04	.04	.02	.03	.02	.03
Correlation	–.13	–.03	.03	.00	.24	1.00	.13	.02
Attribute W-3								
50%	.56	.01	–.07	–.03	.15	.08	.72	–.01
Variance	.60	1.89	.06	.07	.03	.02	.09	.04
Correlation	.21	.00	–.08	–.04	.23	.13	1.00	–.01
log(T – p)								
50%	–.34	–1.18	–.07	–.07	–.01	.02	–.01	.99
Variance	.76	3.27	.07	.09	.02	.03	.04	.10
Correlation	–.11	–.22	–.07	–.07	–.01	.02	–.01	1.00

choices given the posterior draws of pre- and postlaunch study model parameters. In this policy simulation, prices are set so the postlaunch study price of brand G is the same as that in the prelaunch study. We apply the same price-setting procedure for brand R. We assume that marginal costs are equal and negligible for all products. Table 5 presents the results.

The result of our policy simulation shows that even if the prices of brands G and R were kept the same in the pre- and postlaunch scenarios, the overall market share of firm G would indeed decrease (from 56.75% in the prestudy to 53.37% in the poststudy). Meanwhile, the market share of firm R would increase from 26.92% to 29.34%. By the same

TABLE 4
Posterior Estimates of $V_{\beta}^{(2)}$

	Brand G^{+}	Brand G	Brand R	Attribute X	Attribute Y	Attribute W-1	Attribute W-2	Attribute W-3	log(T − p)
Brand G^{+}									
50%	13.07	9.02	12.22	.18	.18	−.27	−.14	−.27	−1.02
Variance	17.32	9.29	21.41	1.15	.33	.23	.25	.54	1.21
Correlation	1.00	.75	.75	.05	.07	−.12	−.06	−.09	−.28
Brand G									
50%	9.02	11.06	8.56	−.50	−.19	−.15	−.08	.25	−1.20
Variance	9.29	10.42	14.07	1.14	.28	.21	.22	.47	1.34
Correlation	.75	1.00	.57	−.15	−.08	−.07	−.04	.09	−.35
Brand R									
50%	12.22	8.56	20.44	.71	.53	−.24	−.08	−.75	−1.51
Variance	21.41	14.07	45.74	2.05	.67	.43	.46	1.07	2.07
Correlation	.75	.57	1.00	.16	.16	−.08	−.03	−.20	−.33
Attribute X									
50%	.18	−.50	.71	1.00	.10	−.02	.00	−.16	.04
Variance	1.15	1.14	2.05	.18	.03	.02	.02	.04	.08
Correlation	.05	−.15	.16	1.00	.15	−.03	.00	−.19	.04
Attribute Y									
50%	.18	−.19	.53	.10	.51	−.01	−.01	−.07	.00
Variance	.33	.28	.67	.03	.02	.01	.01	.02	.02
Correlation	.07	−.08	.16	.15	1.00	−.03	−.01	−.12	.01
Attribute W-1									
50%	−.27	−.15	−.24	−.02	−.01	.42	.09	.07	.03
Variance	.23	.21	.43	.02	.01	.01	.01	.01	.02
Correlation	−.12	−.07	−.08	−.03	−.03	1.00	.20	.13	.04
Attribute W-2									
50%	−.14	−.08	−.08	.00	−.01	.09	.43	.06	.01
Variance	.25	.22	.46	.02	.01	.01	.01	.01	.02
Correlation	−.06	−.04	−.03	.00	−.01	.20	1.00	.10	.01
Attribute W-3									
50%	−.27	.25	−.75	−.16	−.07	.07	.06	.71	−.01
Variance	.54	.47	1.07	.04	.02	.01	.01	.06	.04
Correlation	−.09	.09	−.20	−.19	−.12	.13	.10	1.00	−.01
log(T − p)									
50%	−1.02	−1.20	−1.51	.04	.00	.03	.01	−.01	1.06
Variance	1.21	1.34	2.07	.08	.02	.02	.02	.04	.17
Correlation	−.28	−.35	−.33	.04	.01	.04	.01	−.01	1.00

token, revenue for firm G would also decline from $1,797.92 to $1,717.49, implying a necessary decrease in profit when marginal costs are small.

One may argue that the decrease in demand and profitability perhaps occurs because the managers conducting the experiment set the price of subbrand G^{+} to a value that was too high. However, this should not have caused a loss of demand and profit, because consumers still had the option of buying the legacy brand G at the same lower price. Table 5 shows that even with 18.2% of consumers trading up to the most expensive brand G^{+}, firm G still experiences an overall decrease in profit because of the net loss of consumers who, in the postlaunch scenario, find the products from the other firms relatively more attractive. This result provides strong support to our theoretical predictions that when a firm launches a subbrand whose product features overlap those of a competitor's products, the resulting spillover effect can cause an overall loss of demand, market share, and profit.

General Discussion

Firms routinely expand their product lines to improve their market position and respond to competitive threats. Thus, understanding the potential benefits and pitfalls of such decisions is of great relevance to marketing theory and practice. In this article, we investigate the situation in which a leading firm expands its product line with a premium subbrand to compete directly with the offerings of a challenging firm. To that extent, the leading firm matches the product attributes of the competing brand as a way to protect its product line from an offering that is unique to the competing brand.

TABLE 5
Policy Simulation

A: Prestudy	Brand G	Brand R	Brand S
Shopping trip 1	93.76	45.46	23.79
Shopping trip 2	93.80	45.59	23.61
Shopping trip 3	93.72	45.59	23.69
Shopping trip 4	94.01	45.37	23.63
Total	375.28	182.01	94.71
Choice share	57.56%	27.92%	14.53%
Usage-unit price	.16	.212	.12
Total revenue	1,797.92	1,051.54	349.32

B: Poststudy	Brand G^+	Brand G	Brand R	Brand S
Shopping trip 1	29.74	57.31	47.78	28.17
Shopping trip 2	29.73	57.36	47.79	28.11
Shopping trip 3	29.76	57.36	47.71	28.16
Shopping trip 4	29.44	57.30	48.01	28.25
Total	118.67	229.33	191.30	112.69
Choice share	18.20%	35.17%	29.34%	17.28%
Usage-unit price	.27	.16	.212	.12
Change in choice share		–22.38%	1.43%	2.76%
Total revenue	599.27	1,118.23	1,118.09	400.44

Notes: Brand G and Brand G^+ combined market share is 53.37%, and the total revenue is $1,717.49.

Our theoretical and empirical analyses offer important contributions to the literature of new products, line extensions, and spillover effects. We show that upward line extensions, through the addition of a premium subbranded product that features attributes that overlap with those of a competing product, change consumers' perceptions about the value provided by the brand and product attributes of the firm's current offerings as well as perceptions about the competitors' offerings. These changes in perceptions can be detrimental to the firm conducting the upward line extension and beneficial to the challenging firm. The fundamental mechanism behind our model can be described as follows. Because the product attributes of a new subbrand with a successful premium positioning are perceived as superior, consumer perception of the competing brand with the same product attributes are likely to improve. Conversely, perceptions about the parent brand and its product attributes are likely to decrease as consumers remap stimuli onto their knowledge structure as a consequence of the change in the consideration set.

In addition, our findings reveal that, depending on the magnitude of the changes in consumer perceptions about brands and product attributes, a leading firm's advantages may erode, making it unprofitable to launch the premium subbrand. The full assessment of whether the changes are beneficial or detrimental to the firm cannot be made simply by identifying the isolated effect of absolute changes in consumer perceptions about the extending firm's brand and characteristic product attributes; it must also consider the changes in perceptions about competing products.

Our theoretical and empirical models convey that the overall outcomes—in terms of profitability, demand, and market share—are governed by competitive effects. Consequently, it is possible that even if the extending firm launches a new subbrand that consumers perceive as premium, the extending firm may still experience detrimental outcomes in terms of overall demand, market share, and profit if consumer perceptions about rival brands and their characteristic product attributes improve significantly, even if the parent brand benefits from an improvement in consumer perceptions. Conversely, our models predict that a premium brand extension can be net positive for the firm even if the new subbrand does not benefit much from improved consumer perceptions. This is expected as a result of limited improvement in perceptions about the rival brands that share the same subset of product attributes. Ultimately, the overall success of the premium line extension is regulated by whether the extending firm portfolio of branded products improves its competitive strength relative to competing products.

Managerial Implications

Our results have important managerial implications. Managers of leading brands who face competitive threats must consider carefully whether they should tackle competitors by launching premium subbrands with product attributes that are similar to those of the competitor and aimed at neutralizing potential gains of the competing product. Contrary to the optimistic predictions by practitioners and a large portion of the product line literature, our analyses show that the "increase price and improve quality" strategy should only be adopted when the expected spillover effects on the parent brand are likely to be null or positive and when expected cross-brand spillover effects are likely to be null or negative.

This is recommended because, in these cases, the extending firm can expect that eventual changes in consumer perceptions owing to spillovers will not be detrimental to the competitive position of the firm. Alternatively, if the extending firm believes that launching the premium subbrand with attributes overlapping with those of a competing product is likely to cause negative spillovers on the parent brand or positive spillovers on competing brands, the firm is better off forgoing the launch of a premium product, as changes in consumer perceptions due to spillovers can be damaging to the firm's overall competitive position in terms of market share and profit.

One potential alternative to circumvent spillover effects that are expected to be detrimental is to steer clear from using overlapping attributes, as illustrated by the Tide example in the introduction. This way, changes in consumer perceptions due to cross-brand spillovers should be minimized. Even if the new product cannibalizes some of the current market share of the firms' existing products, it does not help the competitive position of other firms. When a company makes such a decision, we expect changes in consumer perceptions to be less likely to benefit the competing firm, resulting in a more positive outcome for the extending firm in terms of demand, market share, and profit. Firms could also consider extensions by developing novel attributes that do not overlap with those of the competing brand and could take advantage of their leader status to communicate innovation. In this case, firms should be aware of increased costs in research and development and marketing to develop the new product and to persuade consumers about the benefits associated with the innovation.

If the firm is unsure about what to expect in terms of spillover effects and still wants to launch products featuring attributes that overlap with those of the competing brand, the prudent course of action is to assess the risk of this strategy by estimating the resulting change in consumers' perceptions of brands and product attributes. This will enable the firm to gain insights into whether the strategy is likely to produce beneficial or detrimental outcomes. An experiment and empirical analysis such as the one we report herein can be used to obtain expected changes in consumers' perceptions. This information can, in turn, be interpreted in light of our theoretical results and/or serve as the input for a policy analysis to estimate the real-world impact of the product line extension before committing the resources to execute it.

Limitations and Further Research

The theoretical and empirical models intentionally assumed that firms had zero marginal costs and no additional costs for extending the product line. We adopted this assumption to show that even when such costs are negligible, a premium line extension with overlapping attributes may imply that the extending firm may experience loss of demand, market share, and profit (we restate here that there are many possibilities of positive product launch costs and marginal costs that support the qualitative results of our research). Our prediction contrasts with the existing literature, which states that the launch of new product lines will increase overall demand and market share. This discrepancy indicates that this general prediction from the product portfolio management literature is contingent on specific characteristics of the extension.

In the analysis of the theoretical model, we focused mainly on the situation in which product values and consumer preferences were such that all of the firms' products actually would be in the market without the need for costly price distortions. We adopted this modeling approach because it enabled us to focus on our research question without the distractions of investigating all possible price-discrimination outcomes. If the extending firm had to implement price distortions, extending the line would exacerbate the decrease in profitability, thus amplifying the strength of our results. In addition, the empirical evidence we reported provides support for the theoretical outcomes we analyzed, which shows that our modeling approach is appropriate to the real-world problem under investigation. Nevertheless, we presented the theoretical conditions that could switch outcomes to either pooling (all consumers buy the same product from a firm) or reverse vertical positioning (the premium product delivers less value than the basic product). Researchers exploring these topics could employ the expressions from our model as a starting point for further analyses.

We acknowledge that, relative to actual sales or panel data, our data are not as externally valid. However, the controlled nature of the experiment, which simulates as closely as possible actual in-store decisions at a fraction of the cost of an actual launch in test markets, enables us to more precisely test the theory we put forward while controlling for endogeneity issues stemming from actual purchase data sets. One of the advantages of the experiment is that it decreases the chances of selection biases related to capturing data about actual line extensions (i.e., some companies may conduct tests like the one we report herein but only launch a subset of the products tested, whereas less market-oriented companies may launch products without more thorough testing). Moreover, the type of test conducted by the sponsoring firm is frequently used to estimate potential downstream consequences of an actual product launch without facing the risks and costs associated with an actual launch. We encourage future studies to use different data sets to observe the extent to which the effect we document replicates in different product categories and competitive environments.

Our theoretical analysis considered two focal brands, including one with two different products. Our empirical analysis added a store brand, which enabled us to more clearly express the change in the brand and product attributes of the focal brands. The empirical analysis also considered multiple SKUs of the brand's products. A potential avenue for further research is to extend the frameworks we developed herein to investigate a product category with multiple brands and subbrands.

Appendix A: Proofs of Propositions

Proof of P_1

The analysis of the model proceeds as in a standard analysis of spatial models. We obtain the demands by employing the traditional method of finding the indifference point between the utilities provided by the two firms. In other words, by solving the equality $u_G = u_R$ for x_h,

$$x^{indif*} = \frac{1}{2} + \frac{r_\theta\ (\Delta_B + \Delta_A) - (p_G - p_R)}{2\tau}, \text{ for } \theta \in \{\underline{\theta}, \overline{\theta}\}.$$

Consequently, we express the demands q_b as

$$q_G = \sum_\theta \int_0^{x^{indif*}} \lambda_\theta dx = \sum_\theta \lambda_\theta \left[\frac{1}{2} + \frac{r_\theta\ (\Delta_B + \Delta_A) - (p_G - p_R)}{2\tau}\right], \text{ and}$$

$$q_R = \sum_\theta \int_{x^{indif*}}^1 \lambda_\theta dx = \sum_\theta \lambda_\theta \left[\frac{1}{2} - \frac{r_\theta\ (\Delta_B + \Delta_A) - (p_G - p_R)}{2\tau}\right].$$

Because we assume marginal cost to be zero, the profit expressions for the firms are

$$\pi_G = p_G \sum_\theta \lambda_\theta \left[\frac{1}{2} + \frac{r_\theta\ (\Delta_B + \Delta_A) - (p_G - p_R)}{2\tau}\right], \text{ and}$$

$$\pi_R = p_R \sum_\theta \lambda_\theta \left[\frac{1}{2} - \frac{r_\theta\ (\Delta_B + \Delta_A) - (p_G - p_R)}{2\tau}\right].$$

By taking derivatives with respect to prices and simultaneously solving for the first-order conditions, it is possible to find that the optimal prices are

$$\text{(A1)} \qquad p_G^{*(1)} = \frac{3\tau + [\lambda + (1-\lambda)r]\left(v_G^{(1)} - v_R^{(1)}\right)}{3} = \frac{3\tau + [\lambda + (1-\lambda)r](\Delta_A + \Delta_B)}{3}, \text{ and}$$

$$\text{(A2)} \qquad p_R^{*(1)} = \frac{3\tau - [\lambda + (1-\lambda)r]\left(v_G^{(1)} - v_R^{(1)}\right)}{3} = \frac{3\tau - [\lambda + (1-\lambda)r](\Delta_A + \Delta_B)}{3}.$$

We substitute the optimal prices on the original demand expressions to obtain

$$\text{(A3)} \qquad q_G^{*(1)} = \frac{3\tau + [\lambda + (1-\lambda)r]\left(v_G^{(1)} - v_R^{(1)}\right)}{6\tau} = \frac{3\tau + [\lambda + (1-\lambda)r](\Delta_A + \Delta_B)}{6\tau}, \text{ and}$$

$$\text{(A4)} \qquad q_R^{*(1)} = \frac{3\tau - [\lambda + (1-\lambda)r]\left(v_G^{(1)} - v_R^{(1)}\right)}{6\tau} = \frac{3\tau - [\lambda + (1-\lambda)r](\Delta_A + \Delta_B)}{6\tau}.$$

Finally, equilibrium profit for the firms can be left implicit as

$$\text{(A5)} \qquad \pi_G^{*(1)} = p_G^{*(1)} q_G^{*(1)}, \text{ and } \pi_R^{*(1)} = p_R^{*(1)} q_R^{*(1)}. \blacksquare$$

Proof of P_2

With the consideration that Condition 11 holds, consumers perceive that $v_{G^+}^{(2)} > v_G^{(2)}$ and the leading firm will target product G^+ to high-type consumers and product G to low-type consumers. Thus, we proceed by first determining the indifference point x^{indif}. To keep expressions simple, we only expand the expressions for $v_{G^+}^{(2)}$, $v_G^{(2)}$, and $v_R^{(2)}$ when needed.

The indifference points for the high- and low-type consumers are, respectively,

$$\overline{x}^{indif*} = \frac{1}{2} + \frac{\left(v_{G^+}^{(2)} - v_R^{(2)}\right) - (p_{G^+} - p_R)}{2\tau}, \text{ and}$$

$$\underline{x}^{indif*} = \frac{1}{2} + \frac{\left(v_G^{(2)} - v_R^{(2)}\right) - (p_G - p_R)}{2\tau}.$$

The demands for firm G's products from each segment are

$$\overline{q}_G = \int_0^{\overline{x}^{indif*}} \lambda\, dx = \lambda \left[\frac{1}{2} + \frac{\left(v_{G^+}^{(2)} - v_R^{(2)}\right) - (p_{G^+} - p_R)}{2\tau}\right], \text{ and}$$

$$\underline{q}_G = \int_0^{\underline{x}^{indif*}} (1-\lambda)\, dx = (1-\lambda) \left[\frac{1}{2} + \frac{\left(v_G^{(2)} - v_R^{(2)}\right) - (p_G - p_R)}{2\tau}\right].$$

Similarly, firm R's demands from each segment are

$$\overline{q}_R = \int_{\overline{x}^{indif*}}^1 \lambda\, dx = \lambda \left[\frac{1}{2} - \frac{\left(v_{G^+}^{(2)} - v_R^{(2)}\right) - (p_{G^+} - p_R)}{2\tau}\right], \text{ and}$$

$$\underline{q}_R = \int_{\underline{x}^{indif*}}^1 (1-\lambda)\, dx = (1-\lambda) \left[\frac{1}{2} - \frac{\left(v_G^{(2)} - v_R^{(2)}\right) - (p_G - p_R)}{2\tau}\right].$$

Therefore, the profit functions for the firms can be written as

$$\pi_G = p_{G^+} \lambda \left[\frac{1}{2} + \frac{\left(v_{G^+}^{(2)} - v_R^{(2)}\right) - (p_{G^+} - p_R)}{2\tau}\right] + p_G(1-\lambda) \left[\frac{1}{2} + \frac{\left(v_G^{(2)} - v_R^{(2)}\right) - (p_G - p_R)}{2\tau}\right], \text{ and}$$

$$\pi_R = p_R \left\{\frac{1}{2} - \lambda \left[\frac{\left(v_{G^+}^{(2)} - v_R^{(2)}\right) - (p_{G^+} - p_R)}{2\tau}\right] - (1-\lambda) \left[\frac{\left(v_G^{(2)} - v_R^{(2)}\right) - (p_G - p_R)}{2\tau}\right]\right\}.$$

By taking derivatives with respect to prices and solving for the first-order conditions, we obtain the optimal prices

$$\text{(A6)} \quad p_{G^+}^{*(2)} = \frac{6\tau + (3-\lambda)\left(v_{G^+}^{(2)} - v_R^{(2)}\right) + r(1-\lambda)\left(v_R^{(2)} - v_G^{(2)}\right)}{6},$$

$$\text{(A7)} \quad p_G^{*(2)} = \frac{6\tau - \lambda\left(v_{G^+}^{(2)} - v_R^{(2)}\right) - r(2+\lambda)\left(v_R^{(2)} - v_G^{(2)}\right)}{6}, \text{ and}$$

$$\text{(A8)} \quad p_R^{*(2)} = \frac{6\tau - 2\lambda\left(v_{G^+}^{(2)} - v_R^{(2)}\right) + 2r(1-\lambda)\left(v_R^{(2)} - v_G^{(2)}\right)}{6}.$$

In the remainder of the proof, we consider that parameters are such that undistorted optimal prices allow separation (i.e., high-type consumers select the high-value product while low-type consumers select the low-value product). If parameters are such that undistorted prices would allow pooling (both segments of consumers would prefer to buy the same product from firm G), the firm would need to distort its prices to implement separation. If that is the case, the Separation Conditions to be satisfied are as follows.

For consumer type $\overline{\theta}$,

(A9)

$$\begin{aligned} & v_{G^+}^{(2)} - \tau|x_G - x_h| + u(T - p_{G^+}) \geq v_G^{(2)} - \tau|x_G - x_h| + u(T - p_G) \\ & \Leftrightarrow \left(v_{G^+}^{(2)} - v_G^{(2)}\right) - (p_{G^+} - p_G) \geq 0. \\ & \Leftrightarrow [(\overline{s}\gamma - 1 - \underline{s})\Delta_A - (\gamma + 1 - \underline{s})\Delta_B] - (p_{G^+} - p_G) \geq 0 \end{aligned}$$

Similarly, for consumer type $\underline{\theta}$,

$$\text{(A10)} \quad \begin{aligned} & r\ \left(v_{G^+}^{(2)} - v_G^{(2)}\right) - (p_{G^+} - p_G) \leq 0. \\ & \Leftrightarrow r[(\overline{s}\gamma - 1 - \underline{s})\Delta_A - (\gamma + 1 - \underline{s})\Delta_B] - (p_{G^+} - p_G) \leq 0 \end{aligned}$$

We proceed considering that parameters are such that undistorted prices satisfy these conditions. The reason is that the research question in the article is not about finding optimal price discrimination policies but rather addresses the drawbacks of launching a premium line extension with overlapping product attributes. As such, we want to consider situations in which it could be optimal for the leading firm (firm G) to have both the legacy and the new product in the market in the postlaunch scenario—thus the focus on separating outcomes. In addition, the first-best postlaunch scenario for firm G occurs when it achieves price discrimination with undistorted prices. If, even in this first-best case, the firm is worse off by launching the new product, it would do worse in situations in which distorted prices are implemented.

With this perspective on prices, we compute the equilibrium total demand by substituting in the equilibrium prices in the demand functions. The resulting expressions are

(A11)

$$q_{G^+}^{*(2)} = \lambda\left[\frac{6\tau + (3-\lambda)\left(v_{G^+}^{(2)} - v_R^{(2)}\right) + r(1-\lambda)\left(v_R^{(2)} - v_G^{(2)}\right)}{12\tau}\right],$$

(A12)

$$q_G^{*(2)} = (1-\lambda)\left[\frac{6\tau - \lambda\left(v_{G^+}^{(2)} - v_R^{(2)}\right) - r(2+\lambda)\left(v_R^{(2)} - v_G^{(2)}\right)}{12\tau}\right], \text{and}$$

$$\text{(A13)} \quad q_R^{*(2)} = \frac{3\tau - \lambda\left(v_{G^+}^{(2)} - v_R^{(2)}\right) + r(1-\lambda)\left(v_R^{(2)} - v_G^{(2)}\right)}{6\tau}.$$

Finally, equilibrium profit for the firms can be left implicit as

$$\text{(A14)} \quad \pi_G^{*(2)} = p_{G^+}^{*(2)} q_{G^+}^{*(2)} + p_G^{*(2)} q_G^{*(2)}, \text{ and } \pi_R^{*(2)} = p_R^{*(2)} q_R^{*(2)}. \blacksquare$$

Proof of P_3

In the proof of P_3, we are considering that Condition 11 is true, which implies that $v_{G^+}^{(2)} > v_G^{(2)}$.

Impact on the Firm's Overall Demand. The difference $q_G^{(2)-(1)}$ is

$$\begin{aligned} q_G^{(2)-(1)} &= \left(q_{G^+}^{*(2)} + q_G^{*(2)}\right) - q_G^{*(1)} \\ &= \frac{\lambda\left(v_{G^+}^{(2)} - v_G^{(1)} - v_R^{(2)} + v_R^{(1)}\right) + r(1-\lambda)\left(v_G^{(2)} - v_G^{(1)} - v_R^{(2)} + v_R^{(1)}\right)}{6\tau}. \end{aligned}$$

Expanding this expression, we obtain

$$q_G^{(2)-(1)} = \frac{\lambda\{-\Delta_A + [\gamma(1-\overline{s}) - 1]\Delta_B\} + r(1-\lambda)(\underline{s} - \gamma\overline{s})(\Delta_A + \Delta_B)}{6\tau}.$$

By solving $q_G^{(2)-(1)} = 0$ for $\underline{s}$, we find the cutoff point

$$\underline{s}^{cut} = \frac{[\lambda + r(1-\lambda)\gamma\overline{s}](\Delta_A + \Delta_B) + \lambda[\gamma(\overline{s} - 1)]\Delta_B}{r(1-\lambda)(\Delta_A + \Delta_B)}.$$

This equation represents a separating line (hyperplane) with a positive slope. The cutoff point is a negative value when $\overline{s} = -1$ because

$$\underline{s}^{cut} = \frac{[\lambda - r(1-\lambda)\gamma](\Delta_A + \Delta_B) - 2\lambda\gamma\Delta_B}{r(1-\lambda)(\Delta_A + \Delta_B)}$$

is negative, and a positive value when $\overline{s} = 1$ because

$$\underline{s}^{cut} = \frac{[\lambda + r(1-\lambda)\gamma](\Delta_A + \Delta_B)}{r(1-\lambda)(\Delta_A + \Delta_B)}$$

is positive.

Impact on the Firm's Overall Market Share. It is direct to conclude that the overall market share for firm G increases when the overall demand increases (the values of $\underline{s}$ and $\overline{s}$ are located to the left of the hyperplane $\underline{s}^{cut}$). Conversely, the overall market share decreases when the values of the values of $\underline{s}$ and $\overline{s}$ are located to the right of the hyperplane $\underline{s}^{cut}$.

Impact on the Firm's Overall Profit. Let $\pi_G^{*(2)-(1)} \equiv \pi_G^{*(2)} - \pi_G^{*(1)}$ from Equations A14 and A5.

By expanding $\pi_G^{*(2)-(1)}$ and substituting in $\underline{s}^{cut}$, we obtain:

$$\pi_G^{*(2)-(1)} = \frac{\lambda([\lambda + r(1-\lambda)]\Delta_A + \{[\lambda(1-\gamma)(1-\overline{s})] + (1-\lambda)[r - \gamma(1-\overline{s})]\}\Delta_B)^2}{8(1-\lambda)\tau}.$$

This expression is unambiguously positive. However, if we decrease γ to its minimum value (the minimum value that still satisfies Condition 11) and either make $\underline{s}$ assume its minimum value ($\underline{s} = -1$) or make $\overline{s}$ assume its maximum value ($\overline{s} = 1$), we obtain the following expression:

$$\pi_G^{*(2)-(1)} = -\frac{[\lambda + r(1-\lambda)]\{6\tau + [\lambda + r(1-\lambda)](\Delta_A + \Delta_B)\}(\Delta_A + \Delta_B)}{18\tau},$$

which is unambiguously negative.

Because $\underline{s}$, $\overline{s}$, and γ are all continuous variables, we can ascertain that a cutoff point in the profit expressions difference exists and that the slope of the separating line (hyperplane) is positive. As a direct consequence, continuity enables us to conclude that when $\underline{s}$ is large or $\overline{s}$ is small, firm G does better by launching the premium subbrand. Conversely, when $\underline{s}$ is small or $\bar{s}$ is large, firm G does better by not launching the premium subbrand.

Note that although extremely large values of γ could push the cutoff points to a corner solution in which it is always better to launch the premium subbrand. In practice, the case of extremely large values of γ means that if such a positioning of product G^+ were achievable, the firm would prefer to replace its current product line with a much better version of the current product.■

Appendix B: Downward Line Extension Analysis

In Appendix B, we analyze the outcomes when Condition 11 does not hold and consumers perceive that $v_{G^+}^{(2)} < v_G^{(2)}$. In this situation, the leading firm will target product G^+ to low-type consumers and product G to high-type consumers. As in the Proof of P_2, we begin analysis by first determining the indifference point x^{indif}. To keep expressions simple, we only expand the expressions for $v_{G^+}^{(2)}$, $v_G^{(2)}$, and $v_R^{(2)}$ when necessary.

The indifference points for the high- and low-type consumers are, respectively,

$$\bar{x}^{indif*} = \frac{1}{2} + \frac{\left(v_G^{(2)} - v_R^{(2)}\right) - (p_G - p_R)}{2\tau}, \text{ and}$$

$$\underline{x}^{indif*} = \frac{1}{2} + \frac{\left(v_{G^+}^{(2)} - v_R^{(2)}\right) - (p_{G^+} - p_R)}{2\tau}.$$

The demand for firm G's products is

$$\bar{q}_G = \int_0^{\bar{x}^{indif*}} \lambda\, dx = \lambda\left[\frac{1}{2} + \frac{\left(v_G^{(2)} - v_R^{(2)}\right) - (p_G - p_R)}{2\tau}\right], \text{ and}$$

$$\underline{q}_G = \int_0^{\underline{x}^{indif*}} (1-\lambda)\, dx = (1-\lambda)\left[\frac{1}{2} + \frac{\left(v_{G^+}^{(2)} - v_R^{(2)}\right) - (p_{G^+} - p_R)}{2\tau}\right].$$

Similarly, firm R's demand from each segment is

$$\bar{q}_R = \int_{\bar{x}^{indif*}}^1 \lambda\, dx = \lambda\left[\frac{1}{2} - \frac{\left(v_G^{(2)} - v_R^{(2)}\right) - (p_G - p_R)}{2\tau}\right], \text{ and}$$

$$\underline{q}_R = \int_{\underline{x}^{indif*}}^1 (1-\lambda)\, dx = (1-\lambda)\left[\frac{1}{2} - \frac{\left(v_{G^+}^{(2)} - v_R^{(2)}\right) - (p_{G^+} - p_R)}{2\tau}\right].$$

Therefore, the profit functions for the firms can be written as

$$\pi_G = p_{G^+}\lambda\left[\frac{1}{2} + \frac{\left(v_G^{(2)} - v_R^{(2)}\right) - (p_G - p_R)}{2\tau}\right] + p_G(1-\lambda)\left[\frac{1}{2} + \frac{\left(v_{G^+}^{(2)} - v_R^{(2)}\right) - (p_{G^+} - p_R)}{2\tau}\right], \text{ and}$$

$$\pi_R = p_R\left\{\frac{1}{2} - \lambda\left[\frac{\left(v_G^{(2)} - v_R^{(2)}\right) - (p_G - p_R)}{2\tau}\right] - (1-\lambda)\left[\frac{\left(v_{G^+}^{(2)} - v_R^{(2)}\right) - (p_{G^+} - p_R)}{2\tau}\right]\right\}.$$

By taking derivatives with respect to prices and solving for the first-order conditions, we obtain the optimal prices

(B1) $$p_G^{*(2)} = \frac{6\tau + (3-\lambda)\left(v_G^{(2)} - v_R^{(2)}\right) + r(1-\lambda)\left(v_R^{(2)} - v_{G^+}^{(2)}\right)}{6},$$

(B2) $$p_{G^+}^{*(2)} = \frac{6\tau - \lambda\left(v_G^{(2)} - v_R^{(2)}\right) - r(2+\lambda)\left(v_R^{(2)} - v_{G+}^{(2)}\right)}{6}, \text{ and}$$

(B3) $$p_R^{*(2)} = \frac{6\tau - 2\lambda\left(v_G^{(2)} - v_R^{(2)}\right) + 2r(1-\lambda)\left(v_R^{(2)} - v_{G^+}^{(2)}\right)}{6}.$$

In this scenario, the conditions that implement separation are as follows:

For consumer type $\bar{\theta}$,

(B4)
$$\begin{aligned}
&v_G^{(2)} - \tau|x_G - x_h| + u(T - p_G) \geq v_{G^+}^{(2)} - \tau|x_G - x_h| + u(T - p_{G^+})\\
&\Leftrightarrow \left(v_G^{(2)} - v_{G^+}^{(2)}\right) - (p_G - p_{G^+}) \geq 0.\\
&\Leftrightarrow [(\gamma + 1 - \underline{s})\Delta_B - (\bar{s}\gamma - 1 - \underline{s})\Delta_A] - (p_G - p_{G^+}) \geq 0
\end{aligned}$$

Similarly, for consumer type $\underline{\theta}$,

(B5)
$$\begin{aligned}
&r\left(v_G^{(2)} - v_{G^+}^{(2)}\right) - (p_G - p_{G^+}) \leq 0.\\
&\Leftrightarrow r[(\gamma + 1 - \underline{s})\Delta_B - (\bar{s}\gamma - 1 - \underline{s})\Delta_A] - (p_G - p_{G^+}) \leq 0
\end{aligned}$$

For the same reasons discussed in the Proof of P_2 in Appendix A, we proceed by considering that parameters are such that undistorted prices satisfy these conditions.

With this perspective on prices, we compute the equilibrium total demand. This is done by substituting in the equilibrium prices in the demand functions. The resulting expressions are

(B6)
$$q_G^{*(2)} = \lambda\left[\frac{6\tau + (3-\lambda)\left(v_G^{(2)} - v_R^{(2)}\right) + r(1-\lambda)\left(v_R^{(2)} - v_{G^+}^{(2)}\right)}{12\tau}\right],$$

(B7)
$$q_{G^+}^{*(2)} = (1-\lambda)\left[\frac{6\tau - \lambda\left(v_G^{(2)} - v_R^{(2)}\right) - r(2+\lambda)\left(v_R^{(2)} - v_{G^+}^{(2)}\right)}{12\tau}\right], \text{ and}$$

(B8) $$q_R^{*(2)} = \frac{3\tau - \lambda\left(v_G^{(2)} - v_R^{(2)}\right) - r(1-\lambda)\left(v_R^{(2)} - v_{G^+}^{(2)}\right)}{6\tau}.$$

Finally, equilibrium profit for the firms can be left implicit as

(B9) $$\pi_G^{*(2)} = p_G^{*(2)}q_G^{*(2)} + p_{G^+}^{*(2)}q_{G^+}^{*(2)}, \text{ and } \pi_R^{*(2)} = p_R^{*(2)}q_R^{*(2)}.$$

With these results, we can investigate the impact of launching the new subbrand on ensuing outcomes for firm G.

Impact on the Firm's Overall Demand

The difference $q_G^{(2)-(1)}$ is

$$q_G^{(2)-(1)} = \left(q_{G^+}^{*(2)} + q_G^{*(2)}\right) - q_G^{*(1)}$$
$$= \frac{\lambda\left(v_G^{(2)} - v_G^{(1)} - v_R^{(2)} + v_R^{(1)}\right) + r(1-\lambda)\left(v_{G^+}^{(2)} - v_G^{(1)} - v_R^{(2)} + v_R^{(1)}\right)}{6\tau}.$$

Expanding this expression, we get

$$q_G^{(2)-(1)} = \frac{\lambda(\underline{s} - \gamma\bar{s})(\Delta_A + \Delta_B) + r(1-\lambda)\{-\Delta_A + [\gamma(1-\bar{s}) - 1]\Delta_B\}}{6\tau}.$$

By solving $q_G^{(2)-(1)} = 0$ for $\underline{s}$, we find the cutoff point

$$\underline{s}^{cut} = \frac{[r(1-\lambda) + \lambda\gamma\bar{s}](\Delta_A + \Delta_B) + r(1-\lambda)[\gamma(\bar{s} - 1)]\Delta_B}{\lambda(\Delta_A + \Delta_B)}.$$

From here, it follows that $\underline{s}^{cut}$ is a direct function of $\bar{s}$ with a positive slope. It constitutes the separating line (hyperplane). When $\bar{s} = 0$ and no spillover affects brand R and the overlapping attribute, the cutoff point is

$$\underline{s}^{cut} = \frac{r(1-\lambda)(\Delta_A + \Delta_B) - r(1-\lambda)\gamma\Delta_B}{\lambda(\Delta_A + \Delta_B)}.$$

Note that there are multiple values of γ, such that $\bar{s} = 0$ implies that the cutoff point $\underline{s}^{cut} > 0$ (e.g., any $\gamma < 1$ yields this result). This further implies that, absent spillover effects, there are multiple values of γ such that the extending firm will lose (instead of win) demand and market share. This is already a manifestation of the negative outcomes of launching an inferior subbrand.

Impact on the Firm's Overall Market Share

It is direct to conclude that the overall market share for firm G increases when the overall demand increases (the values of $\underline{s}$ and $\bar{s}$ are located to the left of the hyperplane $\underline{s}^{cut}$). Conversely, the overall market share decreases when the values of the values of $\underline{s}$ and $\bar{s}$ are located to the right of the hyperplane $\underline{s}^{cut}$.

Impact on the Firm's Overall Profit

Let $\pi_G^{*(2)-(1)} \equiv \pi_G^{*(2)} - \pi_G^{*(1)}$ from Equations B9 and A5.

By expanding $\pi_G^{*(2)-(1)}$ and substituting in $\underline{s}^{cut}$, we obtain

$$\pi_G^{*(2)-(1)} = \frac{\lambda([\lambda + r(1-\lambda)]\Delta_A + \{[\lambda(1-\gamma)(1-\bar{s})] + (1-\lambda)[r - \gamma(1-\bar{s})]\}\Delta_B)^2}{8(1-\lambda)\tau}.$$

This expression is unambiguously positive. However, if we decrease γ to its minimum value (i.e., zero) and either make $\underline{s}$ assume its minimum value ($\underline{s} = -1$) or make $\bar{s}$ assume its maximum value ($\bar{s} = 1$), we obtain the following expression:

$$\pi_G^{*(2)-(1)} = -\frac{[\lambda + r(1-\lambda)]\{6\tau + [\lambda + r(1-\lambda)](\Delta_A + \Delta_B)\}(\Delta_A + \Delta_B)}{18\tau},$$

which is unambiguously negative.

Because $\underline{s}$, $\bar{s}$, and γ are all continuous variables, we can ascertain that a cutoff point in the profit expressions exists. Furthermore, continuity enables us to conclude that when $\underline{s}$ is large or $\bar{s}$ is small, firm G does better by launching the premium subbrand. Conversely, when $\underline{s}$ is small or $\bar{s}$ is large, firm G does better by not launching the premium subbrand.

Finally, we investigate the firm profitability outcomes if there were no spillover effects. The answer depends on the magnitude of the parameter γ. To illustrate, we nullify the spillover effects by setting $\underline{s}$ and $\bar{s}$ to zero and setting γ to its maximum possible value. In this case, we obtain

$$\pi_G^{*(2)-(1)} = \frac{\lambda(1-\lambda)(r-1)^2(\Delta_A + \Delta_B)^2}{8\tau},$$

which is positive.

In contrast, when we set γ to its minimum value, we obtain

$$\pi_G^{*(2)-(1)} = -\frac{(1-\lambda)(\Delta_A + \Delta_B)\{24r\tau + [4r(1-\lambda) - \lambda(9-8r)](\Delta_A + \Delta_B)\}}{72\tau},$$

which is generally negative unless the parameter r is very small. This latter negative profit outcome is given by the cannibalization effect, as low-type consumers trade from the high-value product of the legacy brand G to the inferior product provided by subbrand G^+.

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