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Wedded Bliss or Tainted Love? Stock Market Reactions to the Introduction of Cobranded Products

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We examine whether cobranding—the practice of using two established brand names on the same product—increases the market value of parent firms. Using data from the consumer packaged goods industry, we document that the average stock market reaction to the announcement of cobranded new products is approximately +1.0%. We hypothesize that this reaction is significantly higher than it would have been if these same products were single branded, and we find evidence consistent with this hypothesis. We also examine the determinants of this stock market reaction. We find that the consistency between the two brand images, the innovativeness of the product, and the exclusivity of the cobranding relationship significantly increase the market reaction to cobranding announcements. Our findings provide important managerial guidelines for enhancing firm value through cobranding partnerships.

Key words: cobranding; new products; stock market reaction; marketing alliances; propensity score matching

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Introduction

Cobranding is the practice of using the established brand names of two different companies for the same physical product (e.g., Aaker 2004, Blackett and Boad 1999). From Dell Computers with Intel Processors, to Kellogg's Star Wars cereal, to Philips shavers dispensing Nivea shaving cream, cobranded products take many forms across industries, at times connecting seemingly unlikely alliance partners. Industries such as the credit card industry have significantly increased product offerings through the practice of cobranding (Spethmann and Benezra 1994), and a recent Nielsen study reports that "co-branded credit cards comprise approximately 50% of all credit card spending."¹ The business press has touted cobranding as a source of competitive advantage, calling it "a holy grail in ... differentiating your brand, establishing consumer trust, gaining new channels of distribution or launching a new product successfully" (Thompson 1998, p. 22). Cobranding success stories are regularly featured on the news. A recent example is Taco Bell's popular Doritos Locos Tacos, a 2012 introduction leveraging Yum! Brands' Doritos brand, which now sells about one million units every day and is credited with having helped create 15,000 jobs for the Yum! Brands subsidiary (Schriffen et al. 2013).

However, despite practitioners' apparent enthusiasm toward cobranding, its effect on shareholder value is not well understood. Most academic research on cobranding is conducted in a lab setting.² Although this research shows that cobranded products are generally viewed favorably by consumers, such preferences do not necessarily translate into corporate profits. Profits are also dependent on contextual variables that are typically not included in experimental research (e.g., size of the market, competition, marketing support). Cobranded products could be costlier to develop and riskier to market compared with single-branded products. For example, the parent firm may incur significant coordination costs for the development of infrastructure, research and development (R&D), and manufacturing knowledge required to properly combine the two brands into a new product. In addition, negative associations could transfer from partner brands to the cobranded product, hindering its market success. Alternatively, negative associations could also transfer from the cobranded product to one of the partner brands. In an experiment intended to assess preferences for brownies made from a cobranded mix, Levin et al. (1996) found that if one partner brand is thought to be inferior (in their case, the brand of chocolate chips used

¹ See <http://www.mastercard.us/merchants/cobrand-cards.html>, accessed April 20, 2013.

² For an exception, see Venkatesh and Mahajan (1997), who analytically modeled the optimal price of cobranded products.

in the brownie mix), it brings down not only the perception of the cobranded product but also that of the other partner brand.

We are the first, to our knowledge, to provide market-based evidence on the relation between cobranding and shareholder value. We do so by examining abnormal stock returns around the introduction of new cobranded products. We seek to understand the determinants of these abnormal returns and whether cobranding adds value to these products. Specifically, we investigate the following two questions:

1. What is the sign and magnitude of the stock market reaction to the introduction of cobranded products that can be attributed to the cobranding decision?
2. Among cobranded products, which attributes are most valued by stock market investors?

We rely on two streams of research to build our theoretical framework. First, we draw on studies in consumer research that examine consumer attitudes toward branding, brand extensions, and cobranded products. These studies suggest that attitudes toward partner brands affect attitudes toward cobranded products, and vice versa (e.g., Park et al. 1996, Simonin and Ruth 1998, Walchli 2007). Second, we draw on studies that examine the stock market reaction to corporate announcements about branding, new products, and alliances. Although these studies find that new product announcements usually affect stock prices, contingencies typically affect the magnitude and direction of the stock price reaction. For instance, the market reacts positively to brand extension announcements, but only in the case of brands that enjoy positive consumer attitudes and high familiarity (Lane and Jacobson 1995).

The empirical context for our research is the consumer packaged goods industry. We assemble a sample of 316 announcements of cobranded new products made during the 2000–2010 period. These announcements correspond to 61 primary brand firms that are publicly traded. We use product-level data obtained from Datamonitor's Product Launch Analytics database, archival data on firm announcements obtained from LexisNexis and Factiva, firm-level data obtained from COMPUSTAT and the Center for Research in Security Prices (CRSP), and survey data obtained from Amazon's Mechanical Turk.

We document positive and significant abnormal stock returns around cobranded product announcements. We also measure the *average treatment effect of the treated* (ATET), which is the average value that the cobranding aspect alone adds to the cobranded products. We find that ATET is significantly positive, which suggests that abnormal returns observed around cobranded product announcements are higher than they would have been if these same products were single branded.

Our analysis also shows which products are more likely to be cobranded. At the product level, firms are more likely to cobrand products targeted to children and products with multiple stock-keeping units (SKUs). At the firm level, having a house of brands increases the likelihood of cobranding, as does firm size and prior experience with cobranding partnerships. Firms are also more likely to use one of their bigger brands in cobranding partnerships, rather than a smaller niche brand. At the category level, firms are more likely to introduce cobranded products in relatively smaller categories but ones in which cobranding has been frequently used in the past.

We also find that among products that are cobranded, abnormal returns measured around announcement dates are higher when consumers perceive the two cobrands to be consistent with each other, when the product itself is innovative, and when the cobranding relationship is exclusive.

Data from Product Launch Analytics can shed light on the prevalence of cobranding in the consumer packaged goods industry over the past decade. Specifically, this database lists 4,659 cobranded products that have been introduced in the United States by all firms in that industry (public and private) from 2000 through 2010. The annual number of cobranded introductions has steadily increased in the early 2000s, has declined from 2007 to 2009, and has resumed an upward trend in 2010 with 461 cobranded products introduced that year. Overall, an average 420 cobranded products per year were introduced during our sample period.

Although our results have been derived within the consumer packaged goods context, they nonetheless provide a guiding principle for product managers in other industries—not all products benefit from cobranding, but for some products, cobranding can significantly enhance shareholder value. The positive ATET documented in this paper indicates that managers can use cobranding as a tool to earn economic rents from products that are suitable for this strategy.

The rest of the paper is structured as follows. The next section outlines the conceptual foundation of our theoretical framework and proposes hypotheses about the stock market reaction to cobranding announcements. This is followed by a methods section where we test our hypotheses and provide additional analyses of returns to cobranded new products. The paper concludes with a discussion of managerial implications and suggestions for future research.

Theoretical Framework

Cobranding as a Type of Brand Alliance

Brand alliances can take many forms, from product bundling, to dual branding, to cobranding. Product

bundling is a strategy in which two or more different products are sold together for one price (Gaeth et al. 1990, Yadav 1994). In many instances the components of the bundle carry the same brand, but there are cases in which different brands are sold together in one package (e.g., the fragrance or skincare multi-brand packs sold by Sephora). Product bundling is also encountered in promotions, where typically one branded product is offered for free with the purchase of another branded product (e.g., Varadarajan 1986). Dual branding is the concept of hybridized retailers using a single location site, such as Sears and Jiffy Lube or Arby's and John Long Silver's sharing the same retail space (Levin et al. 1996).

In this paper we focus on a specific type of brand alliance: cobranding. Cobranding involves two brands that are typically independent before, during, and after the commercialization of the cobranded product but lend both their names to a single physical product for the duration of the alliance. Cobranding alliances differ from typical marketing alliances in that they also involve fixed costs in R&D and manufacturing related to the development and production of the new product. Thus, they require a higher level of firm commitment since it might be easier and less costly to discontinue an advertising or promotional campaign involving two partners than to discontinue a cobranded product for which the manufacturer has committed production infrastructure and retail space.

Multiple terms have been used in the literature to label the two brands involved in a cobranding alliance: modifier and modified brand, primary and secondary brand, leader and partner brand, base and supplemental product, for example (e.g., Levin et al. 1996, Ugglä and Asberg 2010). In our paper we adopt the primary and secondary brand terminology. The term *primary brand* denotes the brand of the firm that manufactures the cobranded product, and the *secondary brand* refers to the other brand involved in the partnership (Helmig et al. 2008). For instance, Edy's/Dreyer's Grand Ice Cream introduced its Galactic Chocolate and Vanilla Treasure flavors through a cobranding partnership with Disney's *Treasure Planet* movie in 2002. In this case, Edy's/Dreyer's is the primary brand and Disney's *Treasure Planet* is the secondary brand.

We also note that not all cobranding partnerships are structured in the same manner. Across cobranded products, the two partners bring different levels of contribution. We investigate and control for these differences in our empirical analysis. Our emphasis, however, is on the stock returns to the primary brand parent. We do not examine the parents of secondary brand products. Our sample contains only product manufacturers—the parents of primary brand products.

Financial Returns to Cobranding

Prior research shows that financial returns to new products accrue mostly to radical innovations: products that are significantly new on some dimension of relevance to consumers (Sorescu and Spanjol 2008, Srinivasan et al. 2009). Cobranded products are typically incremental (as opposed to radical) innovations, suggesting that—at least from an innovation perspective—they might not elicit large stock market reactions to their announcements. However, new cobranded products also share two unique features that are likely to be viewed more favorably by investors when compared with single-branded products.

First, cobranding could signal quality to consumers (Rao et al. 1999) and can improve consumer attitudes toward individual partner brands. Positive brand association spillovers have been documented from the individual brands to the cobranded product, and vice versa (Simonin and Ruth 1998). Cobranded products can command a price premium, possibly because they are viewed as unique and different by consumers. For instance, Venkatesh and Mahajan (1997) found that including an Intel 486 instead of a baseline chip into a Compaq computer would yield a price premium of \$140. Cobranded products have also been found to elicit more positive perceptions than single-brand extensions, arguably because cobranded products might benefit from the secondary brand's equity (Desai and Keller 2002, Park et al. 1996).

Second, cobranding alliances could offer opportunities for improved operational efficiencies. Cobranding partners can gain access to new markets and share each other's resources in terms of manufacturing, managerial knowledge, and advertising. Cobranding alliances involve both a marketing aspect and a technological aspect, because they involve the creation and commercialization of a new product.

The effect of the marketing aspect is uncertain because marketing alliances do not always increase shareholder value—the stock market reaction is positive in some studies (e.g., Swaminathan and Moorman 2009) and insignificant in others (e.g., Das et al. 1998, Koh and Venkatraman 1991), potentially reflecting differences between investors' perceptions of such alliances. Moreover, the volatility of stock returns seems to increase following announcements of marketing alliances, perhaps because of additional risks such as opportunistic partner behavior (Das et al. 1998). In contrast, the effect of the technological aspect is likely positive, consistent with the market reaction to new product and technological alliances (e.g., Kalaignanam et al. 2007).

These prior studies suggest that cobranding can increase shareholder value for some but not necessarily all products. The extent to which a product stands to benefit from cobranding depends on

product-, firm-, and industry-specific factors. A cost-benefit analysis should be performed before each cobranding decision. Assuming that managers are rational, on average, they will choose to cobrand products for which the benefits of cobranding are expected to exceed the costs. Thus, we should observe that, on average, the increase in shareholder value associated with cobranded products will be larger than it would have been had these same products been single branded.

HYPOTHESIS 1 (H1). *Average abnormal returns to the announcement of cobranded product introductions are larger than they would have been if these same products were single branded.*

Determinants of Abnormal Returns to the Introduction of Cobranded Products

Once a decision to launch a new cobranded product is made, managers might want to understand which product attributes can determine the success of the new product in the marketplace. We identify the consistency between the two brands, the exclusivity of the cobranding agreement, and the innovativeness of the cobranded product as attributes that are likely to be valued by stock market investors.

Consistency. The literature highlights one characteristic that can elicit positive brand associations for cobranded products: the consistency between the images of the two partner brands. Brand consistency, defined as the congruence or fit between two (or more) brand images (Keller 1993), is positively related to attitudes toward brand extensions (Aaker and Keller 1990, Batra et al. 2010) and to attitudes toward brand alliances (Simonin and Ruth 1998).

The fit between two brands can override the associations that consumers might have with individual brands. Park et al. (1996) found that cobranded products enjoy better recognition when they carry two complementary brands rather than two brands that are viewed as highly favorable but not complementary. Their findings support the predictions of cognitive consistency theory, which suggests that individuals are more likely to view an object favorably (and by extension, choose that object among alternatives) if it does not involve dissonant elements.

In sum, when brands have a consistent image, spillovers of positive attitudes and perceptions of quality are more likely to transfer between the two brand partners or between the respective brands and their cobranded products. For the primary brand manufacturer, these positive attitudes should translate into higher and less volatile cash flows for the cobranded product. If investors recognize the value of consistency, the increase in shareholder value should be higher for cobranding announcements that involve consistent brand partners.

HYPOTHESIS 2 (H2). *Abnormal returns associated with the announcement of cobranded product introductions are positively related to the consistency between the two partner brands' images.*

Exclusivity. An important dimension in cobranding agreements is the exclusivity of the partnership. In line with industry practice, we focus only on cases of exclusivity from the perspective of the secondary brand partner. These are cases where the secondary brand agrees to participate in a cobranding agreement with a single primary brand firm and does not participate in similar agreements with the primary brand's competitors (e.g., Bucklin and Sengupta 1993). For instance, Kellogg's partnership with Disney specifies that only Kellogg's can use select Disney characters on the packages of its breakfast cereal, but it does not prevent Kellogg's from entering into future cobranding partnerships with other firms (Verrier 2001).

Exclusivity in cobranding can function as a commitment mechanism that limits the secondary brand partner's ex post options and protects the primary brand partner from opportunistic behavior (Williamson 1983). In an exclusive partnership, the secondary brand partner has stronger incentives to help the cobranded products turn into enduring assets, which can further enhance the value of the partnership. In addition, the primary brand partner can more freely contribute its capabilities since the exclusivity provision makes it less likely that critical technology and skills would transfer to rival firms (Aghion and Bolton 1987). Thus, from a strategic and operational standpoint, an exclusive agreement should be beneficial to the brand partnership. Likewise, from the standpoint of consumer perceptions, exclusivity could strengthen brand image for the primary partner, although the lack of exclusivity could dilute it (e.g., Park et al. 1986). In sum, exclusivity increases the uniqueness of cobranded products and should be a source of competitive advantage for the parent firm (Krattenmaker and Salop 1986).

HYPOTHESIS 3 (H3). *Abnormal returns associated with the announcement of cobranded product introductions are higher for exclusive cobranding partnerships than for nonexclusive partnerships.*

Innovativeness. In a meta-analysis, Henard and Szymanski (2001) found that there is no systematic relationship between product innovativeness and new product performance, on average. However, Sorescu (2012) observed that, in many studies, innovativeness is significantly related to performance (in particular, stock performance), but most of these studies are based on samples of highly salient or radical innovations in the high-tech industries.

This calls into question whether product innovation in non-high-tech industries would elicit a positive stock market reaction, especially since innovative products are known to increase the risk of their parent firms as a result of uncertainty about adoption by the marketplace (Sorescu and Spanjol 2008). We argue, however, that this uncertainty is reduced by branding these products with not one but two established brands. A transfer of positive associations from either partner brand should increase the credibility of the product's new features and its overall perceptions of quality, which should translate into higher shareholder value.

Innovativeness might also minimize losses from launching an unsuccessful product. When a product brand extension fails, the parent brand is diluted mostly if the product is similar to other firm products that carry the same brand (Keller and Aaker 1992, Loken and Roedder John 1993). An innovative product, particularly a cobranded product, is more likely to be dissimilar from the parent's portfolio of single-branded products, which should limit negative associations and brand damages in the case of market failures. Overall, we expect that the increase in shareholder value will be higher for cobranded products that are innovative.

HYPOTHESIS 4 (H4). *Abnormal returns associated with the announcement of cobranded product introductions are positively related to product innovativeness.*

Taken together, our four hypotheses predict that the stock market reaction to cobranded product announcements is stronger than it would be if these same products were single branded. Once the cobranding decision is made, we predict a higher increase in shareholder value for products that are innovative, for products with consistent cobrands, and for products with exclusive cobranding agreements.

Method

Empirical Context

We test our hypotheses using data from the consumer packaged goods industry. We select this industry for two reasons. First, consumer packaged goods account for a sizeable portion of the U.S. economy. According to the Grocery Manufacturers Association (2013), the food, beverage, and consumer packaged goods industry employs 14 million U.S. workers and contributes more than \$1 trillion to the nation's economy. Second, cobranding is a prevalent practice in this industry. As mentioned previously, a total of 4,659 cobranded products were introduced in the United States over the last decade, as reported by Datamonitor's Product Launch Analytics database.

Data and Sample

To test our hypotheses, we use Product Launch Analytics to build a sample of cobranded products for which we can identify both the primary and secondary brand parent firms. A comprehensive and detailed source of product information that includes consumer packaged goods launched around the world since the early 1980s, this database provides, among other things, the date of product introduction, the manufacturer, an assessment of the product's innovativeness, and a tag identifying products that are cobranded or that carry a double trademark. Moreover, products are added to this database at the time they are launched, eliminating potential memory biases related to new product selection and to classification along relevant dimensions (such as innovativeness).

We obtain from Product Launch Analytics all consumer packaged goods introduced in the United States between 2000 and 2010 that carry the "cobranded" or "double trademark" tag. Of the products listed, 4,659 meet this initial screening criterion. We identify manufacturers for all products and retain only those that are publicly traded. For cobranded products introduced by publicly traded firms, we identify the primary and secondary brands. The primary brand is usually the manufacturer's corporate brand or one of the brands under its umbrella. The secondary brand is the other brand that appears on the product's package and is identified by Product Launch Analytics as being the cobranded partner.

Product Launch Analytics reports the date on which each product is added to the database. This is also the date when it publicizes the new product thorough their internal Product Alert news release service. In some cases an earlier announcement in other publications could precede the Product Alert news release date. To identify these cases, we conduct, for each cobranded product launched by publicly traded firms, searches in Factiva and LexisNexis to identify the earliest date when public information about that product became available. To ensure accuracy, two researchers independently conducted searches to identify cobranded products announcements and subsequently reconciled their differences. When no formal announcement was found and the first publicly available mention of that product was in Product Alert, we used the Product Alert date as the announcement date.

In most cases, a single cobranding announcement includes several cobranded products to be introduced over a period of time. For example, on February 19, 2001, Coca-Cola announced a cobranding partnership with the *Harry Potter and the Sorcerer's Stone* movie

that would yield multiple products carrying the Coca-Cola brand. In such cases we treat the announcement as a single event because all relevant information regarding the variables of interest is conveyed on the announcement date. Subsequent product introductions that result from the cobranding partnership are no longer a surprise to investors.³

After eliminating products introduced by privately held firms and foreign firms, and after eliminating multiple products covered by a single announcement, we narrowed our sample to 403 announcements of cobranding partnerships. We used the RavenPack News Analytics (a Dow Jones database that consolidates corporate news for 28,000 publicly traded companies in 86 countries) to determine whether there were confounding events on the day of these cobranding announcements. A total of 87 announcements had confounding events and were eliminated from our sample, because the stock market reaction to the cobranding announcement cannot be disentangled from the reaction to the confounding event. Eliminating announcements with confounding events is in line with other event studies in marketing (e.g., Boyd et al. 2010, Chen et al. 2012).

The final sample contains 316 announcements of cobranded partnerships during the period from 2000 to 2010. These announcements correspond to 61 publicly traded primary brand firms. Of these 316 announcements, 195 involve secondary brands belonging to 42 publicly traded companies, with the remaining secondary brands belonging to private or foreign firms. During our sample period, the 61 primary brand firms introduced a total 21,130 single-branded products and 1,543 cobranded products.

Testing H1 requires that we account for selection bias because the decision to cobrand is likely endogenous. We do so by estimating a switching regression model that accounts for selection based on unobservable characteristics and, alternatively, by estimating a propensity score model. The latter requires that we match each cobranded product with a similar single-branded control product introduced by the same firm. To this end, we collected additional data on all products introduced by the 61 primary brand firms in our sample from 1990 to 2000: the total count of all products introduced by these 61 firms from 1990 to 2000 is 14,539. These single-branded products introduced prior to 2000 are used exclusively as candidates for control products in the propensity score model. We collected these additional products back to 1990 to

reduce data censoring in the process of selecting control products for the propensity score model. Had we selected control products from among new products introduced during our sample period (2000–2010), cobranded products introduced at the beginning of the sample would have likely matched with single-branded products launched at a subsequent date.

After constructing our product sample, we perform archival searches in Factiva and LexisNexis to obtain data on the exclusivity of the cobranding agreements; the exact process is described later in the next section. The next section also describes the survey-based method we used to collect data on cobranding consistency. Data on firm-level control variables (such as firm size) are obtained from COMPUSTAT and Merger, and stock returns are obtained from CRSP.

Measures

We now develop empirical measures for our dependent and independent variables. These measures are discussed below and summarized in Table 1.

Dependent Variables: Short-Term Abnormal Returns. Short-term event studies have frequently been used to measure the stock market reaction to corporate announcements such as new product introductions (Chaney et al. 1991), brand extensions (Lane and Jacobson 1995), alliances (Swaminathan and Moorman 2009), and additions of Internet channels (Geyskens et al. 2002). The methodology is well established and well specified over short-term horizons (Brown and Warner 1985).

We use the market model to estimate the short-term market reaction to the introduction of cobranded products (Brown and Warner 1985). Specifically, we estimate abnormal returns (ARs) for each firm that introduces a cobranded product as follows:

$$AR_{it} = R_{it} - (\hat{\alpha}_i + \hat{\beta}_i R_{mt}), \quad (1)$$

where R_{it} is the rate of return of stock i on day t , R_{mt} is the rate of return on the stock market index on day t , and α and β are the parameters of the market model estimated from an ordinary least squares regression of R_{it} on R_{mt} over a period ranging from 200 to 30 trading days prior to the announcement date. The daily abnormal returns are then cumulated over a time window (t_1, t_2) , which includes the announcement day:

$$CAR(t_1, t_2) = \sum_{t=t_1}^{t_2} AR_{it}. \quad (2)$$

For robustness, we also compute abnormal returns using the Fama-French-Carhart four-factor model, which augments the market model with three additional risk factors that have been shown to explain the

³ We manually ascribed each cobranded product retrieved from Product Launch Analytics to its relevant announcement. Whenever the partnership included an innovative product, this was introduced first. Thus, the information contained in the innovativeness rating is also available at the time of the original announcement.

Table 1 Variables and Data Sources

Conceptual variable	Equation (4)	Equation (7)	Description	Data source
Dependent variables				
<i>Cobranded product</i>	✓		Dummy (1 if the product is cobranded and 0 otherwise)	Product Launch Analytics
<i>CAR</i>		✓	Cumulative abnormal return (over a five-day window) computed using the market model and the Fama-French-Carhart four-factor model	CRSP
Independent variables				
<i>Exclusivity</i>		✓	The manufacturer of the secondary brand has not been involved in other cobranding agreements over the previous 10 years (1, 0)	Factiva and Product Launch Analytics
<i>Consistency</i>		✓	Three-item scale of brand fit (Helmig et al. 2007)	Amazon Mechanical Turk surveys
<i>Innovativeness</i>		✓	Extent to which the first introduced product is new to the industry (1, 0)	Product Launch Analytics
Cobranging equation-independent variables/Control variables				
<i>Type of cobranding agreement</i>		✓	Dummy variables for (a) endorsement cobranding (b) ingredient cobranding (c) composite cobranding	Factiva and Product Launch Analytics
<i>Preannouncement</i>		✓	Dummy variable (1 if the product is ready for introduction and 0 otherwise)	Factiva
<i>News outreach</i>		✓	Categorical variable on a scale of 1 to 5, where 1 = low reach and 5 = high reach	Factiva
<i>Category cobranding</i>	✓		Number of cobranded products introduced over the past year into the category in which the focal product is introduced	Product Launch Analytics
<i>Experience</i>	✓	✓	Number of cobranding products introduced by the primary brand in past five years before the introduction of the focal product	Product Launch Analytics
<i>Firm size</i>	✓	✓	Total assets (log)	COMPUSTAT
<i>Corporate brand</i>	✓	✓	Dummy (1 for corporate brand and 0 for house of brands)	Mergent
<i>Brand strength</i>	✓	✓	Percentage of the primary brand's products that carry the focal brand name introduced five years before the introduction of each cobranded product	Product Launch Analytics
<i>Market size</i>	✓	✓	Number of products introduced in the same category as the cobranded product during the five years preceding its introduction	Product Launch Analytics
<i>Targeted to children</i>	✓	✓	Dummy (1 if the product has the "kids" tag, 0 otherwise)	Product Launch Analytics
<i>Number of SKUs</i>	✓	✓	Number of SKUs associated with each product introduced	Product Launch Analytics

cross section of stock returns (see Carhart 1997, Fama and French 1993):

$$AR_{it} = R_{it} - (\hat{\alpha} + \hat{\beta}R_{mt} + \hat{\gamma}SMB_t + \hat{\delta}HML_t + \hat{\lambda}UMD_t), \quad (3)$$

where R_{it} and R_{mt} are as previously defined, SMB_t is the return differential between portfolios of small and large market capitalization stocks, HML_t is the return differential between portfolios of high (value) and low (growth) book-to-market ratio stocks, and UMD_t is the momentum factor computed as the return differential between portfolios of high and low prior-return stocks.

To choose the appropriate length of the event window, we computed cumulative abnormal returns (CARs) for various event windows, beginning two days before the announcement and ending two days after the announcement. We tested the significance

of the CARs in each event window and selected the event window with the most significant t -statistic (Geyskens et al. 2002, Swaminathan and Moorman 2009). Our event window begins two days before the announcement and ends two days after the announcement [$t - 2, t + 2$].

Independent Variables. Independent variables include the focal variables required for testing H2–H4 (*consistency*, *exclusivity*, and *innovativeness*), as well as additional control variables and variables that are used to estimate the selection equation.

Consistency. Consistency in brand images can be construed as consistency on one or more dimensions: quality perceptions, brand associations, or specific facets of the two brands' personalities. Assessing consistency along multiple dimensions of brand image is beyond the scope of this paper (see, alternatively,

Batra et al. 2010). Instead, we follow prior research in branding and treat consistency as a one-dimensional construct (e.g., Park et al. 1991, Simonin and Ruth 1998).

To evaluate the consistency between each pair of primary and secondary brands, we use the three-item scale of brand fit developed by Helmig et al. (2007). Specifically, using a seven-point scale (1 = strongly disagree, 7 = strongly agree), we measure consumer agreements with the following statements:

- The following primary and secondary brands are complementary and fit well together.
- The brand images of the primary and secondary brands are endorsing each other.
- The combination of brand images of the primary and secondary brands leads to a consistent new brand image for the cobranded product.

We included these scales in a survey that was launched on the Amazon Mechanical Turk. To ensure that survey participants would not have an overly lengthy task, we split the sample in eight parts and included no more than 40 primary–secondary brand pairs to be evaluated within each survey. Each survey contained a block of three questions (based on the Helmig et al. 2007 scale) for each pair of brands and concluded with a few demographic questions. Each survey instrument was completed by 40 Mechanical Turk respondents. We requested that respondents be U.S.-based and have a previous task approval rate of greater than equal 95%. The average age of the respondents is 36, with respondents ranging from 18 to 83 years old. Of the respondents, 42% were male and 58% female.

We measured the reliability of this three-item scale and found that Cronbach's α across all surveys is 0.75 or higher. We thus averaged, for each respondent, the responses to the three consistency questions, and then we averaged the responses across each set of 40 survey participants to obtain one consistency measure for each pair of primary–secondary brands.⁴

Exclusivity. We use two different methods to identify cases where the secondary brand has an exclusive partnership with the primary brand. The first method is implicit: we search for evidence of previous partnerships in Product Launch Analytics, Factiva, and LexisNexis, beginning with 10 years prior to the introduction of the cobranded product. To illustrate, a cobranding partnership with NutraSweet is not exclusive, since this brand has partnered with many food manufacturers. Alternatively, the fitness brand Curves' partnership with General Mills, which

led to Curves' branded cereals and cereal bars, is exclusive because General Mills is the only consumer packaged goods manufacturer that has established a partnership with Curves. Exclusivity is coded as a dummy variable that takes value equal to 1 if the cobranding agreement is exclusive and is 0 otherwise.

The second measure of exclusivity is explicit: we read the cobranded product announcements to determine whether the agreement contains an exclusivity provision. We found, however, that cobranding announcements rarely include information on exclusivity. Thus, our explicit measure of exclusivity may incorrectly classify some of the exclusive partnerships as nonexclusive if the information provided in the published announcement is incomplete. Results obtained with this explicit measure are reported in the robustness section.

Innovativeness. To identify innovative products, we use the "innovative" rating available in Product Launch Analytics. This rating is assigned by the database's staff experts at the time of product introduction and identifies products that are new to the market in terms of formulation, packaging, or merchandising. An example of a cobranded product that is innovative on a formulation dimension is Budweiser & Clamato Chelada, a flavored malt beverage that combined Budweiser beer and Clamato tomato juice. Proctor & Gamble's IntelliClean Toothbrush System (a rechargeable toothbrush with a liquid toothpaste container that carries both the Sonicare and Crest brands) is innovative in terms of both formulation (the liquid toothpaste) and technological innovation. If the cobranding agreement provides for a series of products to be introduced through time, we use the innovativeness rating of the product (or products) launched at the time of the initial announcement. Innovativeness is coded as a dummy variable that is equal to 1 in the case of innovative products and 0 otherwise.

Type of Cobranding Agreement. Cobranding agreements can be classified into three categories, depending on the relative contribution of the two partners to the cobranding relationship: *ingredient*, *composite*, and *endorsement*. We use dummy variables to control for the type of cobranding agreement. To classify our cobranding announcements into one of these three categories, we used the following heuristics:

i. **Endorsement cobranding** occurs when the secondary brand makes no contribution to product formulation but only appears on the package of the cobranded product for promotional purposes. In this arrangement the two brands are "endorsing" each other as they look to leverage the other brand's positive associations. For instance, Crest Barbie toothpaste offers additional visibility to Hasbro's Barbie; in turn, Barbie should presumably increase the appeal of

⁴ We note that the consistency measure is not contemporaneous to the introduction of the product and could have been potentially influenced by past branding strategies of the parent firm. This is a limitation of our study.

the toothpaste among children in the target market. In most of these cases, the secondary brand belongs to the entertainment industry, and thus classification along this dimension is straightforward.

ii. *Ingredient cobranding* is an agreement whereby the secondary brand is an identifiable ingredient that contributes to product formulation, for products that were previously available in similar forms when they were single branded. The secondary brand is featured on the package; however, the primary brand's characteristics remain clearly dominant.

iii. *Composite cobranding* occurs when both brands have a significant contribution to the formulation and positioning of the cobranded product, and when no similar version of this product was available in the marketplace prior to the cobranding agreement. Both primary and secondary brands are prominently featured on the package and are an integral part of the cobranded product. The secondary brand appears to be a partner in product design, rather than a supplier. For example, Kraft's Handi-Snacks Baskin-Robbins ready-to-eat pudding, a type of Handi-Snacks pudding with flavors inspired by Baskin-Robbins' ice cream, is a composite cobranded product that prominently leverages the characteristics of both brands and is quite different from the original Kraft product. By contrast, Coke with Splenda is an example of ingredient cobranding because it is essentially a diet soda with a new ingredient.

Two experts independently classified all cobranded products into one of these three categories. The initial agreement was 96%, and remaining differences were resolved through discussion. Examples of cobranded products in each category are presented in Table 2.

Experience (Prior Cobranding Experience of the Primary Brand Partner). The prior cobranding experience of the primary brand partner can affect how stock prices react to the introduction of cobranded products. A long history of cobranding helps reduce investors' information asymmetry when estimating future cash flows, and it may also suggest that the firm has successfully managed past cobranding partnerships.

Thus, investors might be more optimistic about the prospects of cobranded products introduced by firms with prior cobranding experience. On the other hand, cobranding announcements made by firms with prior cobranding experience may no longer contain a surprise element and could already be incorporated into stock prices. We measure prior cobranding experience using the number of cobranded products introduced by the primary brand during the five-year period preceding the announcement of the cobranded product. We collect this information from Product Launch Analytics and through archival searches in Factiva and LexisNexis.

Firm Size. We use the book value of firm assets to control for the effect of firm size on abnormal returns. This is standard practice in event studies, since larger firms typically have smaller percentage changes in their stock prices in response to corporate announcements. As in prior studies, we use the log of firm assets as a proxy for firm size (e.g., Boyd et al. 2010).

Corporate Brand vs. House of Brands. We control for the position of the primary brand in its parent brand portfolio. A partnership where the primary brand is a corporate brand is likely to be more salient than a partnership where the primary brand is from a house-of-brands portfolio. On average, corporate brands have better established brand associations, and more resources are available to support the brand and the partnership. Thus, we expect a stronger market reaction when the primary brand is corporate as opposed to belonging to a house of brands. We use a dummy variable that equals 1 for corporate primary brands and 0 otherwise.

News Outreach. The reach of the news outlet where the cobranding agreement is announced could affect the magnitude of the stock market reaction. The announcement is likely to have a larger audience if it is publicized through a wide-reaching wire service (such as the Associated Press) as opposed to a trade publication. We classified news outlets into five categories, listed below in decreasing order of probable outreach in the investment community: newswire,

Table 2 Examples of Cobranded Products

Type of cobranded product	Name of product	Primary brand (parent firm)	Secondary brand (parent firm)	Introduction date
Endorsement branding	Crest Barbie toothpaste	Crest (Procter & Gamble)	Barbie (Mattel)	9/15/2006
	Bertie Bott's Every Flavour Beans	Cap Candy (Hasbro)	Harry Potter (Warner Bros. Consumer Products)	2/11/2000
Ingredient branding	Tuna Helper Complete with Starkist Tuna	Betty Crocker (General Mills)	Starkist (Heinz)	2/11/2002
	Diet Coke with Splenda	Coke (Coca-Cola)	Splenda (Johnson & Johnson)	2/7/2005
Composite branding	Duncan Hines Fun Frosters with Nestlé Crunch Candy	Duncan Hines (Aurora Foods)	Nestlé Crunch (Nestlé)	5/2/2001
	Sonicare Crest IntelliClean toothbrush system	Crest (Procter & Gamble)	Sonicare (Royal Philips Electronics)	10/1/2004

marketing publications (e.g., *Brandweek*), trade publications (e.g., *Dairy Field*), newspapers (e.g., the *Star Tribune*, a Minneapolis newspaper that frequently reports on General Mills' product introductions), and Product Alert (Product Launch Analytics' own information releasing service). We explored two specifications of news outreach in our empirical analysis: (1) separate dummies for four out of the five outreach categories and (2) a categorical variable capturing the reach of the news outlet.

Market Size. The variable *market size* refers the size of the category in which the cobranded product is introduced. A product introduced in a large market could elicit a stronger stock market reaction compared with one introduced in a niche market. Product Launch Analytics provides a categorization of products by market. We measure the market size by computing the number of products introduced in that market during the five years preceding the introduction of the cobranded product.

Brand Strength. The variable *brand strength* refers to the economic significance of the cobranded product brand to the primary brand parent firm. Stock prices may have a stronger reaction to a cobranding announcement if the firm cobrands a product that carries its flagship brand rather than a less important brand from its portfolio. To control for this possibility, we compute the strength of the primary brand used on each cobranded product as the percentage of the primary brand parent firm's new products that carry that particular brand name (as opposed to a different brand name that belongs to the same firm), calculated over a five-year period prior to the introduction of each cobranded product.

Preannouncement vs. Introduction. Some cobranding announcements refer to products that are being launched at the time of the announcement. Others are preannouncements that mention a future introduction date. The stock market reaction to preannouncements could be more subdued as a result of residual uncertainties about the product's ultimate prospects (Sood and Tellis 2009). We control for preannouncements using a dummy variable.

Targeted to Children. Among cobranded products in the consumer packaged goods industry, many are targeted to children. This is especially prevalent among endorsement-type cobranding (see also Gallagher 2007). We use a dummy variable for products targeted to children, constructed using the "kids" tag available in Product Launch Analytics.

Number of SKUs. Cobranded products might carry more SKUs, on average, than single-branded products because the parent firm might seek to Also, a large number of SKUs might signal that the manufacturer believes that there is sufficient demand for multiple variants of the product. Thus, products with higher

numbers of SKUs could be perceived more favorably by investors.

Category Cobranding. A cobranded product is more likely to be introduced in a category where cobranding activity is high than in one where it is rare. The prevalence of cobranding in each product category—a concept we call *category cobranding*—can be used as an instrument for the decision to cobrand. We expect *category cobranding* to be a determinant of the cobranding decision—the higher the cobranding activity in a given product category, the more likely it is that products in that category will be cobranded. This is because cobranding is a more salient marketing tool among managers in product categories with high cobranding prevalence. Yet, at the same time, *category cobranding* should have no effect on abnormal returns because it is not directly related to the cobranded product. A higher percentage of cobranded products in a given category does not necessarily imply that new products in that category can extract higher rents, particularly after accounting for other product-, firm-, and category-specific variables. We measure *category cobranding* as the count of cobranded products introduced in a product category during the year preceding the introduction of the focal cobranded product.

Models

Testing H1

Testing H1 requires that we estimate the counterfactual CARs that cobranded products would generate if they were single branded. The metric of interest in this hypothesis is the difference between the measured CARs and the counterfactual CARs, the ATET. This difference accounts for selection bias—the fact that the decision to cobrand is more likely strategic than random, reflecting systematic differences between cobranded and single-branded products.⁵

A selection bias could arise if firms use cobranding to further leverage an advantage that the new product may already hold, such as high brand awareness or extensive distribution network. Another case of a selection bias is one where managers use cobranding to mitigate potential shortcomings that products would face if they were single branded. For instance, a firm might enter into an ingredient cobranding agreement with a secondary brand firm if it lacks the expertise or credibility that the secondary brand has in producing that particular ingredient (e.g., using Splenda may be more appealing to certain firms than trying to develop a proprietary artificial sweetener). We address the selection bias problem through a propensity score

⁵ We thank a reviewer for this insight.

model as well as through a switching regression model that controls for selection based on unobservables.

Basic Propensity Score Model. The propensity score model produces an explicit measure of the counterfactual CARs required for testing H1. These are the CARs earned by control products that are, in the ideal case, similar to cobranded products in all aspects except branding. To identify these control products, we estimate a probit model of the decision to cobrand. The dependent variable takes a value of 1 if the product is cobranded and 0 otherwise. In line with previous research, we use a stepwise estimation to ensure that only relevant covariates are included in the final model (Rosenbaum and Rubin 1984):

$$\begin{aligned} \Pr(C_{ij} = 1 \mid \text{Covariates}_{ij}, \gamma_j) \\ = \Phi(\beta_0 + \beta_1 \text{Experience}_{ij} + \beta_2 \text{Corporate brand}_j \\ + \beta_3 \text{Firm size}_{ij} + \beta_4 \text{Brand strength}_{ij} \\ + \beta_5 \text{Market size}_{ij} + \beta_6 \text{Targeted to children}_{ij} \\ + \beta_7 \text{Number of SKUs}_{ij} \\ + \beta_8 \text{Category cobranding}_{ij} + \gamma_j), \end{aligned} \quad (4)$$

where j denotes the firm, i denotes the announcement, C_{ij} equals 1 if product i by firm j is cobranded and 0 otherwise, γ_j is a random, firm-specific effect, Φ is the standard normal cumulative distribution function, and other variables are as previously defined.

From this model we extract the propensity score as the predicted probability that a product would be cobranded given its characteristics (Bronnenberg et al. 2010, Huang et al. 2012, Rosenbaum and Rubin 1983). We then match each cobranded product with a single-branded product using, respectively, each of the following six matching methods:

1. the single-branded product having the highest propensity score from among all single-branded products introduced by the same firm within a five-year window,
2. the single-branded products having the closest propensity scores to that of the cobranded product from among all single-branded products introduced by the same firm within a five-year window,
3. a matching method similar to method 1 but with the matching window extended to the entire sample,
4. a matching method similar to method 2 but with the matching window is extended to the entire sample,
5. a matching method similar to method 2 except that the matching is done across firms rather than within each firm, and
6. a matching method similar to method 4 except that the matching is done across firms rather than within each firm.

In sum, matching methods 1–4 perform matches within the same firms, whereas matching methods 1, 2, and 5 further restrict the matching period to be within five years of the cobranded product introduction.

Once the control products are obtained, we estimate the counterfactual CARs as the actual CARs earned by the control products. We then subtract the counterfactual CARs from the cobranded CARs and test whether the mean and median differences are significantly positive. This is our first formal test of H1.

Pairwise-Difference Propensity Score Model. If the matching process in the propensity score model is not perfect, control products might still differ from cobranded products along the dimension of interest. To account for this possibility, we perform a second formal test of H1: we regress the difference in CARs (between cobranded and control products) on pairwise differences in the independent variables of interest:

$$\begin{aligned} \text{DIFF_CAR}_{ij} \\ = \gamma_0 + \gamma_1 \text{DIFF_Innovativeness}_{ij} \\ + \gamma_2 \text{DIFF_Brand strength}_{ij} + \gamma_3 \text{DIFF_Experience}_{ij} \\ + \gamma_4 \text{DIFF_Firm size}_{ij} + \gamma_5 \text{DIFF_Corporate brand}_j \\ + \gamma_6 \text{DIFF_Market size}_{ij} \\ + \gamma_7 \text{DIFF_Targeted to Children}_{ij} \\ + \gamma_8 \text{DIFF_Number of SKUs}_{ij} + \xi_{ij}, \end{aligned} \quad (5)$$

where j denotes the firm, i denotes the announcement, and DIFF_CAR is the difference between the abnormal returns of cobranded and control products. The independent variables are pairwise differences in the previously defined variables.

We estimate this model for each of the six control samples that correspond to the six matching methods described in the previous subsection. A significantly positive intercept supports H1 because it indicates that cobranded CARs are significantly higher than counterfactual, single-branded CARs, even after accounting for known differences between cobranded and control products.

Switching Regression Model. The propensity score model implicitly assumes that there are no unobserved determinants of the decision to cobrand. It is, however, quite plausible that unobserved factors (such as a lack of experience with a key product feature) might influence both CARs and the cobranding decision. To account for this possibility, we use a switching regression model (e.g., Verbeek 2008).⁶

⁶ We thank the associate editor for suggesting this methodology.

Unlike the propensity score model, the switching regression model does not produce a specific estimate of the counterfactual CARs (an intermediate step in the propensity score model). Instead, the switching regression model produces a direct estimate of the ATET, the metric of interest for H1.

In this model, the equation governing CARs depends on the branding regime. For each product, the value added of cobranding (ATET) is the sum of three separate components: a constant, a component that captures the effect of observable determinants of cobranding, and an idiosyncratic component that captures the effect of unobservable determinants (Verbeek 2008, p. 254). In simple terms, the switching regression model can be described as follows:

$$CAR_{ij} = \vartheta_0 + \sum \vartheta_k X_{ijk} + \delta C_{ij} + \sum \varphi_k C_{ij} X_{ijk} + \varepsilon_{ij}, \quad (6a)$$

$$Cobrand_{ij} = v_0 + \sum v_k X_{ijk} + v \text{Category cobranding}_{ij} + \mu_{ij}, \quad (6b)$$

$$C_{ij} = 1 \quad \text{if} \quad Cobrand_{ij} > 0, \quad (6c)$$

where j denotes the firm, i denotes the announcement, and X_{ij} are the determinants of the CARs and of the decision to cobrand ($X_{ijk} \in \{\text{Targeted to children}_{ij}, \text{Number of SKUs}_{ij}, \text{Brand strength}_{ij}, \text{Market size}_{ij}, \text{Experience}_{ij}, \text{Corporate brand}_j, \text{Firm size}_{ij}\}$). $Cobrand_{ij}$ is a latent variable that captures the true value of cobranding, and C_{ij} is the previously defined cobranding dummy of the actual cobranding decision. *Category cobranding* in Equation (6b) is the instrumental variable defined previously.

From this model we derive ATET and test for its statistical significance. This is the third formal test of H1. Support for H1 is obtained if ATET is significantly positive. The appendix presents complete details of the switching regression model, its derivation, and its estimation.

Comparing the Models. There are strengths and weaknesses in both the propensity score models and the switching regression model. The two propensity score models do not control for selection upon unobservables. The advantage is that they do not require an instrument for identification. In contrast, the switching regression model controls for unobservables but ideally requires an instrument for identification. Ultimately, it is the weight of the evidence across these three models that will determine whether H1 is supported in our study.

Testing H2–H4

These three hypotheses are conditional on the cobranding decision having already being made and

thus do not require that we account for selection or endogeneity. To test H2–H4, we estimate a random effects model of the determinants of CARs. The model is estimated on the subsample of cobranding announcements only:

$$\begin{aligned} CAR_{ij} = & \alpha_0 + \alpha_1 \text{Ingredient cobranding}_{ij} \\ & + \alpha_2 \text{Composite cobranding}_{ij} + \alpha_3 \text{Consistency}_{ij} \\ & + \alpha_4 \text{Exclusivity}_{ij} + \alpha_5 \text{Innovativeness}_{ij} \\ & + \alpha_6 \text{Experience}_{ij} + \alpha_7 \text{Firm size}_{ij} \\ & + \alpha_8 \text{Corporate brand}_j + \alpha_9 \text{Brand strength}_{ij} \\ & + \alpha_{10} \text{Market size}_{ij} + \alpha_{11} \text{News outreach}_{ij} \\ & + \alpha_{12} \text{Preannouncement}_{ij} + \mu_j + \xi_{ij}, \end{aligned} \quad (7)$$

where j represents the firm and i represents the announcement. CARs are the short-term abnormal returns earned by the primary brand's parent. The remaining variables are as previously defined. We control for firm-specific unobserved heterogeneity (μ_j), and we also correct standard errors for heteroscedasticity. We run a Hausman test to determine the appropriateness of random effects.

Results

We begin by examining the descriptive statistics of cobranded products and their parent firms. The results are presented in Tables 3(a)–3(d). Table 3(a) compares cobranded products to single-branded products introduced by the same 61 primary brand parent firms. During the 11 years covered by our sample, these firms introduced 1,543 cobranded products and 21,130 single-branded products. The proportion of cobranded to total products is 6.8%. In contrast, these same firms introduced only 1,043 innovative products (as rated by Product Launch Analytics), or 4.6% of the total new products. These results suggest that, at least in this sample, cobranded products are more prevalent than innovative products. This is an important finding on its own, given the disproportionate amount of academic research dedicated to innovation in relation to cobranding. Other univariate statistics presented in Table 3(a) show little difference between cobranded and single-branded products in terms of innovativeness, importance of their parent brand in the firm's portfolio, and average number of SKUs per product. The major difference is the percentage of products targeted to children: 31.95% for cobranded products versus only 6.45% for single-branded products. Cobranded products are also more likely to be introduced in product categories with smaller market sizes and, as expected, in categories where cobranding is more prevalent.

Table 3(b) summarizes key characteristics of cobranding partnership announcements. Exclusivity is implicitly implied in 23% of cobranding agreements (first row) and is mentioned explicitly in only 3% of announcements (second row). The average consistency between the primary and secondary brands is fairly high, 4.80 on a scale of 1 to 7 (where a higher number indicates higher consistency), in line with our expectations that firms are more likely to pursue cobranding partnerships with brands that provide a good fit with their own. Finally, 6% of cobranding announcements include at least one innovative product, consistent with the overall level of innovativeness

in the sample. For Table 3(b) we also note the breakdown of the various types of cobranded products. the most common type is endorsement cobranding: there are 210 cases of endorsement cobranding in our sample, compared with 77 cases of ingredient cobranding and 29 cases of composite cobranding. This breakdown is not surprising because endorsement cobranding requires minimal commitment from the primary brand parent, as it typically affects only the package of a product it already sells in the marketplace.

Table 3(c) presents descriptive statistics of firm-level variables included in the analysis. Cobranding is used by firms across the size spectrum. Further, firms'

Table 3(a) Descriptive Product-Level Statistics

	Cobranded	Single branded
Count	1,543	21,130
Innovative (%)	4.80	4.59
Targeted to children (%)	31.95	6.45
Average brand strength (%)	21.95	26.97
Average size of the product category in which they are introduced	546.09	713.24
Average number of SKUs per product	2.55	2.72
Average number of products introduced over the past year into the category in which the focal product is introduced	12.44	6.23

Note. Between 2000 and 2010, 22,673 total new products were introduced.

Table 3(b) Descriptive Announcement-Level Statistics

	Mean	SD	Min	Max
Exclusivity (implicit)	0.23	0.42	0	1
Exclusivity (explicit)	0.03	0.17	0	1
Consistency	4.80	0.65	2.76	6.24
Innovativeness	0.06	0.24	0	1

Note. There are 316 announcements in total: 210 were classified as endorsement cobranding, 77 as ingredient cobranding, and 29 as composite cobranding.

Table 3(c) Descriptive Parent Firm-Level Statistics, Characteristics, and Associated Variables

Variable	Parent firm-level variable							
	Primary brand (61 publicly traded firms)				Secondary brand (42 publicly traded firms)			
	Mean	SD	Min	Max	Mean	SD	Min	Max
Firm size (\$ million)	21,123	29,928	7.03	180,663	21,251	41,945	4.69	392,647
Experience	22.2785	29.38394	0	147				

Table 3(d) Average CARs Around Cobranding Announcements

Model	Coefficient	SE
Market (%)	0.89***	0.14
Fama–French (%)	0.79***	0.15

* $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$.

cobranding experience ranges from using a cobranding strategy for the first time to having used it on close to 150 products over a period of five years.

Table 3(d) presents descriptive statistics of the (unadjusted) CARs computed around announcements of cobranded products. These CARs are positive and significant both in the case of the market model (0.89%, $p < 0.01$) and in the case of the Fama–French model (0.79%, $p < 0.01$). These results suggest that, on average, cobranded products create value for the shareholder. The tests associated with H1, described below, will determine whether this value enhancement comes from the cobranding aspect per se or from the underlying new product announcement.

Test of Hypotheses

Results for H1—Basic Propensity Score Model.

We begin with the basic propensity score model and extract propensity scores from Equation (4). These scores are used to form control samples of single-branded products announcements. The CARs of these control product announcements provide estimates of the counterfactual CARs required for testing H1.

Table 4 presents the estimated coefficients of Equation (4). A stepwise probit model was used in the estimation process, and thus only the significant determinants of cobranding ($p < 0.01$) are retained in the final version.

After computing propensity scores for all products, we use the six matching methods described in the previous section to obtain six control samples of 316 single-branded products each. These control samples are drawn from the population of 37,212 new products introduced by the 61 firms in our sample during 1990–2010. Table 5(a) provides a formal definition of the six matching methods.

Table 5(b) presents descriptive statistics of the cobranded sample and of the six control samples in terms of the eight determinants of the cobranding decision from Equation (4). An important question is whether control samples are sufficiently similar to

the cobranded sample along these eight dimensions. We conduct a Hotelling test to determine whether the vector of means in the cobranded sample is equal to the vector of means in each of the six control samples. The results are presented at the bottom of Table 5(b). In the case of control samples 1, 3, and 4, the Hotelling test does not reject the null hypothesis of equal vector means. These three matching methods are likely to produce adequate matches that account for all observable characteristics of the selection process. For the remaining matching procedures (2, 5, and 6), the Hotelling test rejects the null, suggesting that these methods are likely to produce imperfect matches. However, the problem of imperfect matches problem is mitigated by using the pairwise-difference regression from Equation (5).

We next check and update, through archival searches, the announcement dates for all single-branded control products. As we did with cobranded products, we use the Product Alert date as the announcement date if there are no other announcements or if that date precedes other announcements. We also check for confounding events on announcement dates. When a confounding event is identified, we select the next single-branded product announcement indicated by that particular matching method.

Having identified six control samples, we measure the CARs corresponding to all control product announcements. These are estimates of the counterfactual CARs required for testing H1. These CARs are then subtracted from the cobranded product CARs, and the mean pairwise difference provides an estimate of ATET that accounts (only) for observable selection factors. The mean and median of these pairwise differences are presented in Table 6(a). All means are significantly positive ($p < 0.01$) for all matching subsamples, for both the market model and the Fama–French model. Only 1 of the 12 medians is not significantly positive ($p = 0.43$). These results provide strong support for H1.

Pairwise-Difference Propensity Score Model. In Table 5(b) we show that in three of the six matching methods, cobranded products appear to be different from their respective control products. To account for these possible differences, we regress the pairwise differences in CARs on pairwise differences on determinants of CARs from Equation (5). For completeness, we estimate this model for all six control samples. The intercepts from these regressions provide estimates of ATET that account for observable selection factors, as well as for the possibility of imperfect matches. These intercepts are presented in Table 6(b). All values are significantly positive ($p < 0.01$), supporting H1.

Switching Regression Model. We estimate next the switching regression model of Equations (6a)–(6c) to

Table 4 Determinants of the Decision to Cobrand

Independent variable	Coefficient	SE
<i>Experience</i>	0.005***	0.000
<i>Brand strength</i>	0.333***	0.059
<i>Market size</i>	−0.001***	0.000
<i>Corporate brand</i>	−0.265***	0.075
<i>Targeted to children</i>	0.751***	0.033
<i>Firm size</i>	0.051***	0.014
<i>Number of SKUs</i>	0.011***	0.003
<i>Category cobranding</i>	0.041***	0.002
<i>Constant</i>	−2.27***	0.134
Wald χ^2	1,843.96	

Note. The dependent variable is the cobranding dummy ($n = 37,212$).

* $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$.

Table 5(a) Description of Matching Procedures

Matching method	Description
1	Announcement with the highest propensity score made by the same firm within five years of the cobranding announcement
2	Announcement with the closest propensity score made by the same firm within five years of the cobranding announcement
3	Announcement with the highest propensity score made by the same firm
4	Announcement with the closest propensity score made by the same firm (smallest difference between the two propensity scores)
5	Announcement with the closest propensity score made by any firm in the sample within five years of the cobranding announcement
6	Announcement with the closest propensity score made by any firm in the sample (smallest difference between the two propensity scores)

Table 5(b) Means of the Determinants of the Decision to Cobrand

Variable	Cobranded sample	Control sample (matching method)					
		1	2	3	4	5	6
<i>Experience</i>	38.11	49.24	50.00	37.70	37.43	60.12	45.44
<i>Brand strength</i>	0.307	0.287	0.269	0.321	0.269	0.221	0.226
<i>Market size</i>	537.57	343.25	481.29	330.38	489.47	509.46	464.97
<i>Corporate brand</i>	0.094	0.084	0.084	0.094	0.094	0.051	0.028
<i>Targeted to children</i>	0.478	0.470	0.386	0.472	0.383	0.304	0.361
<i>Log of firm size</i>	9.23	9.49	9.53	9.03	9.17	9.76	9.51
<i>Number of SKUs</i>	2.35	5.69	3.05	2.83	2.87	3.03	2.46
<i>Category cobranding</i>	13.12	9.39	8.46	12.52	11.27	8.97	11.81
Hotelling <i>F</i> -statistic ^a		1.37	6.24***	0.756	1.49	14.23***	3.14***

^aThe Hotelling *F*-statistic tests the null hypothesis that the vector of means are equal for the two groups, the cobranded sample and the sample of matched single-branded products.

* $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$.

Table 6(a) Tests of Differences in CARs Between Cobranded and Single-Branded Announcements Matched by Propensity Scores

	Matching method											
	1		2		3		4		5		6	
	Market	FF	Market	FF	Market	FF	Market	FF	Market	FF	Market	FF
Mean ^a (%)	0.70** (0.27)	0.53** (0.26)	0.84*** (0.23)	0.74*** (0.22)	1.62*** (0.26)	1.35*** (0.25)	0.80*** (0.22)	0.66*** (0.22)	1.10*** (0.23)	1.02*** (0.23)	0.89*** (0.24)	0.87*** (0.25)
Median ^b	0.40* (0.08)	0.31 (0.22)	0.58%*** (0.00)	0.61%*** (0.00)	1.12%*** (0.00)	0.92%*** (0.00)	0.34%*** (0.00)	0.12%*** (0.00)	0.86%*** (0.00)	0.42%*** (0.00)	0.54%*** (0.00)	0.30%*** (0.00)

Notes. We used the market and Fama–French (FF) models to compare the CARs to the announcement. Pairwise difference in CARs between cobranded and single-branded products were matched by propensity scores. Standard errors are shown in parentheses.

^aWe used *t*-tests to determine the significance for means.

^bWe used the Wilcoxon sign-rank test to determine the significance for medians.

* $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$.

Table 6(b) Intercept of a Model Run on the Pairwise Difference in CARs Between Cobranded and Single-Branded Products Matched by Propensity Scores (Equation (5))

	Matching method											
	1		2		3		4		5		6	
	Market	FF	Market	FF	Market	FF	Market	FF	Market	FF	Market	FF
Intercept (%)	0.83** (0.34)	0.69** (0.32)	0.76*** (0.26)	0.72*** (0.25)	1.93*** (0.29)	1.64*** (0.29)	0.84*** (0.23)	0.65*** (0.23)	1.38*** (0.27)	1.34*** (0.27)	0.92*** (0.26)	0.89*** (0.27)

Notes. We used the market and Fama–French (FF) models to compare the CARs to the announcement. Standard errors are shown in parentheses.

* $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$.

Table 6(c) Average Effect of the Cobranding Decision on the CARs to Cobranded Product Announcements (ATET)

Model	Coefficient	SE
Market	1.08***	0.03
Fama–French	0.94***	0.03

* $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$.

account for the possibility that the selection decision might be based, at least in part, on characteristics that are unobservable. We note that Equation (6b) is identical to selection Equation (4), but it is presented here in a different format to highlight that *Category cobranding* is used as an instrument in (6b) and is not used in the CAR equation (6a).⁷ Table 6(c) provides estimates of ATET obtained from the switching regression model. ATET is 1.08% for market-model CARs and 0.94% for Fama–French CARs. Both values are significantly positive ($p < 0.01$), providing support for H1.

Taken together, the results in Tables 6(a)–6(c) provide support for H1 across three different econometric models, each of which is based on different sets of assumptions. The ATET associated with the cobranding decision varies from 0.53% to 1.93%, depending on the method. Averaging these ATET values within the method and then across methods, we conclude that the typical ATET associated with the cobranding decision is approximately 1.0%.

Results for H2–H4. We test H2–H4 using the random effect model of CARs described in Equation (7). The results are presented in Table 7. The top three rows show the coefficients of the focal independent variables that are directly linked to H2–H4. For the *exclusivity* variable, we use the implicit measure; results obtained with the explicit measure are discussed in the robustness section. The subsequent rows in Table 7 present the coefficients of the control variables, and the last row presents the Wald χ^2 statistic for model significance. Both models are significant at the 1% level, and they include firm effects. Hausman tests were performed for both models; p -values of more than 0.10 indicate the appropriateness of firm-specific random effects.

We find support for all three hypotheses (H2–H4). Consistency is a positive and significant determinant of CARs ($p < 0.01$), as are exclusivity ($p < 0.01$) and innovativeness ($p < 0.05$).⁸ Examining the control variables, we find CARs are lower

for preannouncements (as opposed to actual product launch announcements) ($p < 0.05$). Marginally positive effects on CARs are observed for the size of the cobranded product category ($p < 0.10$ for the market model), and a positive effect of brand strength on CARs ($p < 0.05$) is obtained in the Fama–French model. The other variables do not significantly affect CARs, with the exception of the ingredient brand dummy, which has a marginally significant and negative coefficient in the Fama–French model only. A large sample is needed to draw robust conclusions about differences between the types of cobranding products.

Robustness Tests

We perform two additional tests to assess the robustness of our results. First, we retest all hypotheses using market-adjusted CARs. The results are similar to those reported in Tables 6 and 7. Second, we retest H2–H4 using an explicit measure of exclusivity. Since only 9 of the 316 announcements make explicit reference to the exclusivity provision, explicit exclusivity is a highly skewed and potentially noisy variable; its effect on CARs is no longer significant, although the coefficient remains positive.

Additional Analysis

New Markets or Product Categories. We seek to understand whether CARs are higher for cobranded products that open a new market or a new product category. Using the product category codes provided by Product Launch Analytics, we identify cobranded products introduced in categories where the primary

already been made, we do not need to control for selection or endogeneity in testing these hypotheses. However, an alternate way of restating H2–H4 would be in terms of attributes that maximize the value-added of *only* the cobranding aspect (which is the pairwise difference between the CARs of the cobranded product and the CARs of a counterfactual single-branded product). It would be interesting to determine whether the same three attributes that maximize CARs in H2–H4 are also attributes that maximize the value-added of (only) the cobranding aspect of these new products. To this end, we estimate Equation (7) with a different dependent variable: the ATET obtained from the propensity score model (with CARs computed from the Fama–French and market models). Among the six matching methods described in Table 5(a), we select Method 4 to run this test. This method selects as control products the single-branded products introduced by the same firm and with the closest propensity score as the cobranded products. The method produces a high-quality match, as indicated by the nonsignificant Hotelling F -statistic in Table 5(b). The results (not shown) are consistent with those obtained in Table 7. Using pairwise differences in CARs computed from the Fama–French and market models, the coefficients on all three variables of interest (*consistency*, *exclusivity*, and *innovativeness*) are positive and significant at the 5% level. Overall, we conclude that the three attributes that maximize shareholder wealth conditional on the cobranding decision are also attributes that maximize the value-added of the cobranding aspect of these new products.

⁷ The validity of *Category cobranding* as an instrument can be assessed using a test suggested by Sargan (see Verbeek 2008, p. 156). The test is used to reject the validity of a variable as an instrument. We performed this test and were unable to reject the validity of *Category cobranding* as an instrument ($p = 0.52$ for the market model and $p = 0.81$ for the Fama–French model).

⁸ We also examine an alternate formulation of hypotheses H2–H4. Because H2–H4 are conditional on the cobranding decision having

Table 7 Determinants of Cumulative Abnormal Returns

Variable	CAR			
	Market		Fama–French	
	Coefficient	SE	Coefficient	SE
<i>Consistency</i>	0.009***	0.002	0.010***	0.002
<i>Exclusivity</i>	0.008***	0.003	0.009***	0.003
<i>Innovativeness</i>	0.009**	0.005	0.011***	0.004
<i>Ingredient cobranding</i>	−0.005	0.004	−0.006	0.003
<i>Composite cobranding</i>	0.007	0.006	0.004	0.005
<i>Preannouncement</i>	−0.006**	0.004	−0.007**	0.004
<i>News outreach</i>	0.001	0.001	0.001	0.001
<i>Experience</i>	-8.02×10^{-6}	9.19×10^{-5}	5.38×10^{-5}	7.45×10^{-5}
<i>Brand strength</i>	0.0004	0.002	0.004**	0.002
<i>Market size</i>	5.59×10^{-6}	3.96×10^{-6}	3.86×10^{-6}	3.40×10^{-6}
<i>Corporate brand</i>	0.0001	0.01	−0.002	0.005
<i>Firm size</i>	−0.001	0.001	−0.001	0.001
<i>Constant</i>	−0.029	0.012	−0.034	0.012
Wald χ^2	74.33		73.10	

Note. The dependent variable is CAR ($n = 316$).

* $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$.

brand firm was already present. We ran an alternate model where we added a corresponding dummy variable to Equation (7), but its effect on CARs is insignificant.

Labeling vs. Innovation Effects. Cobranding partnerships could affect consumer perceptions though either a labeling effect or an innovation effect. The *labeling* effect occurs when consumer perceptions are affected only by the presence of the secondary brand on the product's label, even in the absence of a change to that product's formulation. Endorsement-type cobranded products fall into this category. The *innovation* effect occurs when consumer perceptions are influenced by the product's new features. We expect the innovation effect to be prevalent for ingredient and composite cobranding agreements.

We also seek to understand whether the labeling effect is sufficient to generate a positive ATET or whether an innovation effect is also necessary. We repeat the analysis in Table 6 for three separate subsamples: endorsement, ingredient, and composite cobranding. The average ATET values are significantly positive in each subsample, suggesting that each type of cobranding agreement adds value to the underlying product. The positive ATET values for endorsement cobranding indicate that the labeling effect is valuable even in the absence of changes to product formulation. We did not find any significant differences between the three types of cobranding strategies. Composite cobranding appears to yield marginally higher ATET values, but the sample is too small to conclusively determine that this is indeed a superior strategy.

We next turn to H2–H4 to see whether they continue to hold when only the labeling effect of cobranding is present. We reestimate Equation (7) for two separate subsamples: (i) endorsement cobranding and (ii) combined ingredient and composite cobranding. The results in each subsample are substantively similar to those obtained with the full sample. This indicates that the effects of consistency, exclusivity, and innovativeness documented in Table 7 are not related to the labeling effect of cobranding.

Summary and Discussion

The reader interested in learning about cobranding can rely on a substantial stream of research that documents how consumers react to brand partnerships. This literature has identified a set of circumstances when cobranding can strengthen perceptions of the partner brands, but it also warns of potential brand equity damage to one or both partners if the brand alliance is not successful. We extend this literature by focusing on the relation between cobranding and shareholder value.

We find evidence consistent with the hypothesis that the stock price increase surrounding cobranded product announcements is attributed to the cobranding feature of the product, rather than to the product itself. In the consumer packaged goods industry, where new product introductions are mostly incremental, cobranding appears to be a valuable differentiating strategy. However, not all products benefit from cobranding, and we offer empirical evidence on a set of characteristics shared by cobranded products in this industry over the past decade. We also find that consistency between the two cobrands has a positive and significant effect on the market reaction to the introduction of cobranded products. Likewise, investors appear to place more value on partnerships where the secondary brand has agreed to an exclusive cobranding agreement with the primary brand.

Our results have several implications for both theory and practice. We discuss them below.

1. *Cobranding can substantively contribute to firm value.* Prior research has found that incremental innovations in consumer packaged goods contribute to normal profits but are not a source of economic rents (Sorescu and Spanjol 2008). In such a mature and competitive industry, one where incremental, rather than radical, innovations are prevalent, it is difficult to elicit strong investor enthusiasm with new product introductions. Yet our results show that by cobranding an appropriate subset of new products, managers can earn significant economic rents. We find the cobranding aspect alone could increase firm value by approximately 1.0% for products that benefit from cobranding. We also identify a set of characteristics

shared by cobranded products in this industry. Taken together, our results provide managerial guidelines on the determinants and possible financial gains of cobranding.

2. *New products need not be technological innovations to create shareholder wealth; cobranding can be effectively leveraged to significantly increase the value-added of new products.* The value-added of cobranding (approximately 1.0%) is a remarkable finding given that most of the products in our sample are not technologically innovative. Even endorsement-type agreements that leverage the labeling effect of cobranding appear to add value. Given how difficult it is to achieve innovation through product formulation in a mature industry such as consumer packaged goods, cobranding provides managers with an alternative path to create shareholder value through brand-driven product differentiation.

3. *Exclusivity is valued.* The value of cobranded products is higher in cases where the secondary brand partner has not previously engaged in cobranding agreements with other primary brand firms. We acknowledge, however, that this could be a simple manifestation of pioneering advantage. For instance, Cadbury Schweppes's Diet Rite, the first beverage to incorporate Splenda sweetener, saw a significant boost in sales after its reformulation with the Splenda brand, but the same was not true for other entrants that subsequently partnered with Splenda (Esfahani 2005).

4. *Consistent brand associations might provide an easier path to successful new product introductions when compared to exclusivity or innovativeness.* The set of suitable secondary brand partners willing to engage in exclusive cobranding partnerships could be too small, and such partners could require significant profit sharing. Likewise, creating highly innovative products could be too elusive a goal. In contrast, selecting a partner with a consistent brand image might well be the easiest way to design new products that excite investors and consumers alike.

5. *Not all products benefit from cobranding.* Although the average cobranding announcement is associated with an increase in firm value of approximately 1.0%, we expect that only a relatively small proportion of products benefit from cobranding. The results in Table 4 show that companies operating under house-of-brand strategies are more likely to introduce cobranded products. However, only 12 of the 61 publicly traded firms in our sample fall into this category. In addition, cobranded products tend to use one of the parent's more prominent brands, and cobranding is more prevalent among products targeted to children. Firms are more likely to cobrand products with multiple SKUs and products that carry one of their flagship brands. And firms are also more likely

to cobrand in categories where cobranding has been more prevalent in the past. Because only a small fraction of new products are likely to fulfill these conditions, we expect cobranding to be a relatively rare strategy.

Limitations and Future Research. Our study is, to our knowledge, the first attempt to investigate the stock market reaction to the introduction of new cobranded products. Similar to many papers that open a new research area, ours has some limitations that could serve as topics for future research. First, our data set contains limited information about the revenue model behind cobranding agreements. In cases where a licensing fee is paid, the fee is typically not reported in the cobranding announcement. Yet the market reaction to cobranding announcements could be affected by the magnitude of this licensing fee. Second, we used a backward-looking measure of consistency between the two partner brand images, because, to our knowledge, data on contemporaneous brand consistency are not available for our sample. Third, additional factors (e.g., competitor reactions) could moderate the relation between stock returns and cobranded product introductions. Finally, our stock return metrics limit the cobranding sample to publicly traded firms. The sample could be extended to privately held corporations by using accounting measures of performance such as sales or return on investment when such measures are available at the product level.

Future research could also examine the length and success of cobranding relationships and investigate the extent to which the initial market reaction can anticipate the longevity and success of cobranded products. Finally, cobranding research from other industries, particularly services where cobranding is increasingly frequent, could explore additional important dimensions of cobranding that are unique to each industry.

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Appendix

We show how to estimate the ATET when measuring returns to announcements of cobranded products and when the cobranding decision is based, in part, on unobservable factors. We closely follow Verbeek's (2008, pp. 253–256) switching regression model that accounts for selection upon unobservables. In our context ATET represents how much a cobranded product gains from the cobranding feature.

Let CAR_0 be the cumulative abnormal return to the announcement of a single-branded product. Let R^* be the incremental CAR that can be attributed to the cobranding

feature of a product, i.e., the added value of cobranding to the CAR of the announcement. Then, the CAR to the announcement of a cobranded product i is

$$CAR_{1i} = CAR_{0i} + R_i^*, \quad (8)$$

where i denotes the announcement. For simplicity of exposition, we omit j , the firm subscript. By construction, CAR_{1i} and CAR_{0i} pertain to the same product under two different scenarios: one in which the product is cobranded and another in which it is single branded. In reality, only one of these scenarios is observed. The other is the counterfactual scenario that will be estimated by our model.

The magnitude of the CARs to a new product announcement is determined by industry-, firm-, and product-level factors. For simplicity of exposition, in our models below we only include one observable determinant of the CARs, denoted X , and one unobservable determinant of the CARs, denoted U ; however, the derivation of the ATET is easily generalizable to multiple dimensions of X and U . Thus, the CARs to single-branded products, and the incremental CARs attributable to cobranding, R^* , can be written as

$$CAR_{0i} = \alpha_0 + \beta_0 X_i + k_0 U_i + \mu_{0i}, \quad (9)$$

$$R_i^* = \alpha + \beta X_i + k U_i + \mu_i. \quad (10)$$

From (8), (9), and (10), we derive CAR_{1i} to be

$$CAR_{1i} = \alpha_0 + \alpha + (\beta_0 + \beta) X_i + (k_0 + k) U_i + \mu_{0i} + \mu_i. \quad (11)$$

When considering cobranding a product i , managers need to estimate R_i^* , the added value of cobranding for that particular product. If they could perfectly assess R_i^* without error (i.e., with $\mu_i = 0$), they would always make the correct branding decision; in that case, ATET could not be estimated. Perfect knowledge of R_i^* is, however, an unrealistic assumption. More realistically, managers will make cobranding decisions using heuristics derived from their experience, which determine what they perceive to be the value of cobranding a specific product. The error term, μ_i , captures these heuristics.

It follows that C_i , the decision to cobrand product i , is $C_i = 1$ if $R^* > 0$ and $C_i = 0$ if $R^* \leq 0$. We note that R^* is a latent variable and U is unobservable. Therefore, the observable part of the decision to cobrand can be modeled as

$$C_i = v_0 + v_1 X_i + \varepsilon'_i. \quad (12)$$

The ATET is defined as

$$ATET \equiv E\{CAR_{1i} - CAR_{0i} \mid X_i, U_i, C_i = 1\}.$$

More specifically, ATET is the difference between the observed CARs of cobranded products (CAR_{1i}) and the counterfactual, single-branded CARs of these same products (CAR_{0i}), contingent on these products being cobranded ($C_i = 1$). If variable U were observable, ATET could be estimated from Equations (9) and (11). However, because U is unobservable, we can only estimate reduced forms of (9) and (11) as follows:

$$CAR_{0i} = \alpha_0 + \beta_0 X_i + \varepsilon_{0i}. \quad (13)$$

The reduced form of (11), $CAR_{1i} = \alpha_0 + \alpha + (\beta_0 + \beta) X_i + \varepsilon_{1i}$, can then be rewritten as

$$CAR_{1i} = \alpha_1 + \beta_1 X_i + \varepsilon_{1i}, \quad (14)$$

where $\varepsilon_{0i} = k_0 U_i + \mu_{0i}$ and $\varepsilon_{1i} = (k_0 + k) U_i + \mu_{0i} + \mu_i$.

Following Verbeek (2008, p. 254), the average treatment effect in this case is given by

$$ATE \equiv E\{CAR_{1i} - CAR_{0i} \mid X_i, C_i\}. \quad (15)$$

To obtain the ATET, we simply condition Equation (15) on $C_i = 1$:

$$ATET \equiv E\{CAR_{1i} - CAR_{0i} \mid X_i, C_i = 1\}. \quad (16)$$

We obtain estimates of $E\{CAR_{1i} \mid X_i, C_i\}$ and $E\{CAR_{0i} \mid X_i, C_i\}$ from (13) and (14):

$$E\{CAR_{0i} \mid X_i, C_i\} = \hat{\alpha}_0 + \hat{\beta}_0 X + E\{\varepsilon_{0i} \mid X_i, C_i\}, \quad (17)$$

$$E\{CAR_{1i} \mid X_i, C_i\} = \hat{\alpha}_1 + \hat{\beta}_1 X + E\{\varepsilon_{1i} \mid X_i, C_i\}. \quad (18)$$

Verbeek (2008, p. 256), citing Vella and Verbeek (1999), provided formulas for the conditional expectations of the error terms ε_{0i} and ε_{1i} :

$$E\{\varepsilon_{0i} \mid X_i, C_i\} = \sigma_{02} \lambda_i(\hat{C}_i), \quad (19)$$

$$E\{\varepsilon_{1i} \mid X_i, C_i\} = \sigma_{12} \lambda_i(\hat{C}_i), \quad (20)$$

where

- \hat{C}_i are the fitted values from the probit model in (12), and

- $\lambda_i(\hat{C}_i) = \frac{C_i - \Phi(\hat{C}_i)}{\Phi(\hat{C}_i)(1 - \Phi(\hat{C}_i))} \phi(\hat{C}_i).$ (21)

The term $\lambda_i(\hat{C}_i)$ is the generalized residual from the probit model. For $C_i = 1$, it also corresponds to Heckman's lambda.

- Finally, σ_{02} and σ_{12} are the covariances of ε_{0i} and ε_{1i} , respectively, with ε'_i from Equation (12). If the unobservable quantity U is a determinant of both the CARs and the decision to cobrand, these covariances are different from zero, and we must account for them in the estimation of ATET to correct the endogeneity caused by U .

Verbeek explains that for Equations (13) and (14) to be identified, it is desirable to find an instrumental variable, Z , which affects the decision to cobrand but does not affect the benefits of cobranding.⁹ Thus, we estimate Equation (12) by adding an instrument, Z , to the right-hand side as follows:

$$C_i = v_0 + v_1 X_i + v Z_i + \varepsilon'_i. \quad (22)$$

To compute the ATET, we substitute (17)–(21) into (16), conditioned upon $C_i = 1$, and obtain

$$ATET \equiv E\{CAR_{1i} \mid X_i, C_i = 1\} - E\{CAR_{0i} \mid X_i, C_i = 1\},$$

$$ATET = [\hat{\alpha}_1 + \hat{\beta}_1 X_i + \sigma_{12} \lambda(\hat{C}_i) - \hat{\alpha}_0 - \hat{\beta}_0 X_i - \sigma_{02} \lambda(\hat{C}_i) \mid C_i = 1]. \quad (23)$$

⁹ In the absence of an instrumental variable, identification rests on the nonlinearity of $\lambda_i(\hat{C}_i)$; the model can only be identified if this term is sufficiently nonlinear to prevent multicollinearity.

If we define $\hat{\delta} = \hat{\alpha}_1 - \hat{\alpha}_0$ and $\hat{\gamma} = \hat{\beta}_1 - \hat{\beta}_0$, then we can write (23) as

$$ATET = [\hat{\delta} + \hat{\gamma}X_i + (\hat{\sigma}_{12} - \hat{\sigma}_{02})\lambda(\hat{C}_i) | C_i = 1]. \quad (24)$$

To compute ATET from (24), we need estimates of $\hat{\delta}$, $\hat{\gamma}$, $\hat{\sigma}_{12}$, $\hat{\sigma}_{02}$, and $\lambda_i(\hat{C}_i)$. Estimates of \hat{C}_i are obtained from (12), and estimates of $\lambda_i(\hat{C}_i)$ are obtained from (21).

To obtain estimates of $\hat{\delta}$, $\hat{\gamma}$, $\hat{\sigma}_{12}$, and $\hat{\sigma}_{02}$, we return to the determinants of the CARs and combine Equations (13) and (14) into a single equation for all products (single-branded and cobranded) as follows:

$$CAR_i = \alpha_0 + \beta_0 X_i + \varepsilon_{0i} + C_i[(\alpha_1 - \alpha_0) + (\beta_1 - \beta_0)X_i + \varepsilon_{1i} - \varepsilon_{0i}]. \quad (25)$$

Taking expectations in (25), we obtain

$$E(CAR_i | X, C_i) = \hat{\alpha}_0 + \hat{\beta}_0 X + \hat{\delta} C_i + \hat{\gamma} C_i X_i + \hat{\sigma}_{02} \lambda(\hat{C}_i) + C_i \hat{\sigma}_{12} \lambda(\hat{C}_i) - C_i \hat{\sigma}_{02} \lambda(\hat{C}_i).$$

Rearranging the terms, we obtain

$$E(CAR_i | X, C_i) = \hat{\alpha}_0 + \hat{\beta}_0 X + \hat{\delta} C_i + \hat{\gamma} C_i X_i + \hat{\sigma}_{12} C_i \lambda(\hat{C}_i) + \hat{\sigma}_{02} (1 - C_i) \lambda(\hat{C}_i). \quad (26)$$

From (26), it follows that the estimates of coefficients $\hat{\delta}$, $\hat{\gamma}$, $\hat{\sigma}_{12}$, and $\hat{\sigma}_{02}$ needed to compute (24) can be obtained from the following regression ran over the sample of single-branded and cobranded products:

$$CAR_i = \vartheta_0 + \vartheta_1 X_i + \vartheta_2 C_i + \vartheta_3 C_i X_i + \vartheta_4 C_i \lambda_i(\hat{C}_i) + \vartheta_5 (1 - C_i) \lambda_i(\hat{C}_i) + \varepsilon_i''. \quad (27)$$

Comparing (26) with (27), we see that the coefficients of interest for estimating ATET ($\hat{\delta}$, $\hat{\gamma}$, $\hat{\sigma}_{12}$, $\hat{\sigma}_{02}$) are identical to coefficients ϑ_2 , ϑ_3 , ϑ_4 , and ϑ_5 in Equation (27). These coefficients can then be used in Equation (24) to complete the estimation process of ATET.

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