that "retailers use store brands to...win the loyalty of their customers" (PLMA 2007). Others, however, tend to be skeptical about the store differentiation and store loyalty-enhancing role of store brands. The argument is that as store brands tend to be lower in quality and price, only the price-sensitive consumers may be drawn to store brands. Such consumers may therefore have little loyalty to a store per se, but they would purchase from stores selling the store brands at the lowest price.

Given this background, we seek to empirically address an open but significant research question: Do store brands serve a store differentiation role that aids store loyalty and ameliorates retail competition, or do they draw price-sensitive, value-conscious customers who have little or no store loyalty, making the investments in store brands counterproductive? As retailers worldwide continue to invest in store brands, insight into this question has become increasingly relevant to both marketing managers and academic scholars.

We address this research question by providing convergent evidence from two complementary sets of analyses. One set of analyses involves an extensive set of descriptive regressions testing the relationship between household store brand loyalty and store loyalty. First, we test whether there is a positive relationship between store loyalty and store brand loyalty and assess whether this qualitative relationship is robust to multiple alternative metrics of store brand loyalty and store loyalty. Second, given the interest of retailers in increasing store brand quality,[1] we evaluate how store brand quality moderates the relationship between store brand loyalty and store loyalty. Specifically, even if loyalty to value-oriented store brands does not relate to store differentiation and store loyalty, would high-quality store brands aid store loyalty? Third, the spatial configuration of the store and household could potentially induce a spurious correlation between store brand loyalty and store loyalty. For example, if a household is price sensitive and therefore wants to buy store brands, but only one store is proximate to the household, the correlation between store brand loyalty and store loyalty might be induced by the spatial configuration. We therefore control for spatial configuration and assess the robustness of the store brand loyalty–store loyalty link. Finally, we test whether the relationship replicates at a second retailer. Across all of these regressions, we find a robust, positive, monotonic relationship between store brand loyalty and store loyalty, supporting the store differentiation role of store brands.

We recognize that the correlational evidence provided in the descriptive regressions leaves open the question of whether there is a causal relationship between store brand loyalty and store loyalty. To address the causality issue, we augment the descriptive analyses with a second set of analyses based on data from a natural experiment involving store closure by a chain. Clearly, store closure will lead to lower chain loyalty for all households that shop at the store. However, if store brands serve to differentiate the store, and greater store brand loyalty leads to greater store loyalty, households with greater store brand loyalty prior to store closure should have a smaller reduction in chain loyalty. We assess the robustness of the result to an alternative explanation based on whether a preference for "value" might drive the smaller change in store loyalty among store brand "loyals." Overall, our results suggest a causal relationship between store brand loyalty and store loyalty and support for the store differentiation role of store brands.

Our study builds on and extends the existing literature on store brand loyalty and store loyalty. Cunningham (1961) first observed that households with high store loyalty are more loyal to store brands than those with low store loyalty. Richardson et al. (1996) discuss a framework for store brand proneness and use a cross-sectional survey to empirically test the role of several factors, such as store brand familiarity, quality uncertainty, risk aversion, and perceived value on store brand proneness. They argue about the role of store brand exclusivity in driving store loyalty but do not test the hypothesis. Corstjens and Lal (2000) refine the argument. Using game-theoretic analysis, they posit that store brands can generate store differentiation and loyalty as long as their quality is high enough to satisfy a significant proportion of consumers, inducing them to purchase again. This store differentiation ability is attributed to the store exclusivity of store brands and/or consumers' inherent brand choice inertia. Sudhir and Talukdar (2004) show empirical support for the store differentiation role of store brands based on an estimated positive linear relationship between store brand loyalty and store loyalty, but they do not allow for nonmonotonicity in the relationship. Ailawadi et al. (2008), González-Benito and Martos-Partal (2012), and Koschate-Fischer et al. (2014) allow for nonmonotonicity in the relationship and find an inverted U-shaped relationship, suggesting that at high levels of store brand loyalty, store loyalty may go down. This implies that investing beyond a threshold on store brands can be counterproductive for retailers. Finally, Hansen and Singh (2008) use data from a natural experiment of Walmart entry on the store-switching behavior of incumbent supermarket shoppers and find that households with high store brand preference are more likely to defect to Walmart when

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[1] In a recent survey, two-thirds of retailers stated that they are increasing their offerings of premium store brands (Deloitte 2010).

it enters. This suggests that store brand loyalty may be driven by the consumers' "value trait" and therefore may not contribute to store differentiation.

In summary, the evidence thus far in the literature for the store differentiation role of store brands has been mixed. We hope the convergent evidence in favor of the store differentiation role of store brands—based on multiple types of analysis and the extensive robustness checks that we provide in this paper—will serve to resolve this important open research question in the literature. The results of our analysis should also be of interest to retailers crafting their store brand strategy and to academics interested in advancing their understanding of the strategic role of store brands.

2. Framework for Empirical Analysis

2.1. The Descriptive Relationship Between Store Brand Loyalty and Store Loyalty

As discussed earlier, store brands can serve to create strategic store differentiation in the market place, whereby greater store brand loyalty can lead to greater store loyalty. On the other hand, store loyalty can also induce greater store brand loyalty. Given search frictions and travel costs between stores, there are benefits to one-stop shopping. Hence consumers who visit the store often will buy more from the store's entire product assortment—including national brands and store brands. To account for this bidirectional nature of the link between store brand loyalty and store loyalty, we estimate a simultaneous equations regression between store loyalty and store brand loyalty. The effect of store brand loyalty on store loyalty captures the store differentiation role of store brands in the market.

2.1.1. Metrics for Store Brand Loyalty and Store Loyalty.
We begin with a discussion of alternative metrics of store brand loyalty and store loyalty to test our hypothesis of interest. Sudhir and Talukdar (2004), Ailawadi et al. (2008), González-Benito and Martos-Partal (2012), and Koschate-Fischer et al. (2014) all use the following definitions of store brand loyalty and store loyalty: $StoreBrandLoyalty = StoreBrandSpend/StoreSpend$ and $StoreLoyalty = StoreSpend/TotalSpendAcrossStores$. One issue with using these metrics to study the link between store brand loyalty and store loyalty is that the numerator of store loyalty is in the denominator of store brand loyalty. This creates a negative mathematical relationship between the two variables by definition. We demonstrate, using a simulation, that even if the fundamental relationship is truly monotonic, the negative mathematical association can induce the recently reported inverted U-shaped relationship between store brand loyalty and store loyalty.

We therefore seek alternative metrics that do not have any built-in association to study the relationship.

Broadly speaking, there are two approaches to operationalize loyalty in the literature: stochastic and deterministic (Bustos-Reyes and González-Benito 2008). Stochastic or behavioral loyalty is based on observed purchase behavior that is assumed to reveal the underlying brand preferences of the customer. Deterministic loyalty, on the other hand, is based on attitudinal constructs and seeks to offer theoretical explanations for loyalty (Fournier and Yao 1997). Bustos-Reyes and González-Benito (2008) discuss the strengths and limitations of different loyalty notions and conclude that behavioral measures are practical, more appropriate, and sufficient in the context of grocery products because consumer loyalty in these markets are driven by factors such as inertia and relative benefits offered by different retailers. They further point out that attitudinal measures have limited discriminatory power in explaining repeat purchase behavior and are only weakly associated with behavioral measures.

We therefore focus on behavioral loyalty metrics in this paper. Behavioral loyalty is typically operationalized as the share of budget allocations, relative volume of purchase, or observed patterns of purchase repetition (Bustos-Reyes and González-Benito 2008). Accordingly, brand loyalty in a category is often defined as the share of spend on a brand relative to total spend in the category. Cunningham (1956) notes that the share of spend in a category is an objective measure that enables comparison across consumers on a continuous scale and is well suited for studying issues such as a relationship between brand loyalty and store loyalty. However, data are often available only for one retailer (and not across competing retailers); therefore researchers have worked with an approximate metric of brand loyalty by using the share of category spend data from the retailer on whom they have data. It is important to note that the within-retailer metric can be a valid approximation of brand loyalty *only if a brand's share of spend at a retailer is roughly equal at all retailers in the household's consideration set*, unless the household's consideration set for the category is limited to the particular store. The assumption may be plausible but is typically not satisfied for national brands. However, for store brands, the assumption will not be met by definition, because a retailer's store brands are exclusive to the particular retailer, and therefore their share at the competing retailers will be zero. To capture the underlying principle of "share of brand purchases among all available alternatives," it is thus important that the store brand loyalty metric captures not merely store brand share within a retailer (as in the existing literature) but also the share of the store brands among all

available alternatives; this should include all the store brand and national brand alternatives available at competing retailers. We therefore propose that *StoreBrandLoyalty* (for a particular retailer's store brand) = *StoreBrandSpend* (at that store)/*TotalSpendAcrossStores*.

Next we move to the metric of store loyalty. Given the discussion of behavioral loyalty above, it is natural to define store loyalty as the ratio of spend at the store relative to spend at *all* stores; i.e., *StoreLoyalty* = *StoreSpend/TotalSpendAcrossStores.* Indeed, this is the metric used in the existing literature. However, there are two concerns with this metric. The first concern is that store brands tend to be priced lower, so their share of spend may be lower than their true impact on the share of consumption of a household. Hence an alternative metric that could be used to define store loyalty is the household's *share of items purchased at the store.* Unfortunately, this metric has the disadvantage that it treats relatively inexpensive categories on par with more expensive categories. The second concern is that the store loyalty metric based on share of store spend has a mathematical positive relationship with store brand spend, because *StoreSpend* = *StoreBrandSpend* + *NonstoreBrandSpend*. To avoid this correlation of store spend with store brand spend by construction, in measuring store loyalty, we consider only the share of store spend in categories that do not have store brands. In our data, 174 of 299 categories do not have store brands; hence this is a broad-based measure of store loyalty.

However, it is possible that the categories with store brands drive much of the store spend and store traffic. To address this concern, we consider another behavioral metric of store loyalty based on the share of trips at the focal store relative to all stores. By construction, the metric based on share of trips does not have the issue of a built-in relationship with the store brand loyalty metric. It, however, has the disadvantage that if a household uses one store for frequent fill-in trips but another for stock-up trips, the store loyalty for the store used for fill-in trips will be inflated. Thus all three store loyalty metrics have their pros and cons; unfortunately, none is flawless. Hence we will assess whether our primary hypothesis is robust using all the three metrics of store loyalty: (1) share of spend in categories without store brands, (2) share of items in categories without store brands, and (3) share of trips to the store.

2.1.2. Operationalizing the Loyalty Metrics. Having laid out the conceptual arguments underlying the choice of our metrics of store brand loyalty and store loyalty, we now discuss practical concerns in operationalizing these metrics. In practice, retailers generally do not have measures of spend at other competing retailers. This is often the challenge in estimating share of wallet for most retailers. To address it, retailers often use proxies for total spend by a household.

We consider three measures for total spend of households in our analysis depending on what data are available in a particular data set. First, we use estimates of household spend used internally by the focal firm from a third-party provider.[2] Second, we use our own survey of households to obtain a self-stated measure of total grocery spend. Third, for one data set from Nielsen we have data on actual spend at all stores by households. We compare the robustness of our results to the use of proxies such as predicted spend and stated spend, relative to the case where we observe actual total spend. Not only does this attest to the robustness of our results, it also helps to reassure retailers and researchers who often have limited data to test their hypotheses and thus can only use a subset of metrics that can be constructed with data available to them.

2.1.3. Robustness to Household–Store Spatial Configuration. The spatial configuration of the store and household could potentially induce a spurious correlation between store brand loyalty and store loyalty. For example, if a household is price sensitive and therefore wants to buy store brands, but only one store is proximate to the household, the correlation between store brand loyalty and store loyalty might be induced by the spatial configuration. We therefore need to control for spatial configuration in assessing the robustness of store brand loyalty–store loyalty link. We draw on the literature on the role of spatial configuration in households' search behaviors and characterize a household's spatial configuration using a three-dimensional vector (D_{12}, D_1, D_2), which captures the distance of the household from its two closest competing stores and the interstore distance between these stores (Gauri et al. 2008). Here, D_{12} refers to the distance between the competing stores; D_1 is the distance of the household from focal store, and D_2 refers to its distance from the competitor.

We classify interstore and household–store distance as large (*L*) or small (*S*), based on thresholds used in Gauri et al. (2008),[3] resulting in five different spatial configurations described in terms of the three-dimensional vector notation as LLL, LSL, LLS, SLL,

and SSS. Thus a household type of LSL implies that the interstore distance is large (*L*) and the household is located close to the focal store (*S*) and far from the competing store (*L*). Among these households, those of types SSS and SLL can easily engage in cross-store shopping because of the smaller interstore distance between the focal retailer and its competitor. Similarly, LLS households, for whom the competitor is closer, are likely to have lower loyalty to the focal retailer. Yet if these households have high store brand loyalty, this reflects relatively strong preference for the focal retailer's store brands. If store brands induce store differentiation, we should see a more positive relationship between store brand loyalty and store loyalty for these households relative to households in other spatial configurations. Conversely, if the positive store brand loyalty–store loyalty relationship is driven by spatial configuration, then we would expect a lower store brand loyalty–store loyalty relationship for these households.

2.1.4. Heterogeneous Relationships for Primary and Secondary Shoppers. It is possible that there is a stronger link between store brand loyalty and store loyalty for primary shoppers but weaker relationships for secondary shoppers and cherry pickers. The monotonic relationship that we report could be simply due to pooling households with such heterogeneous relationships. If store brand loyalty aids store loyalty by serving a store differentiation role, the monotonic positive relationship should be valid for each segment of consumers. We therefore test the relationship for each of these segments.

2.1.5. Controlling for the Effect of Store Brand Quality on Store Loyalty. Corstjens and Lal (2000) argue that store brands can induce store loyalty only if the quality is high enough so that the store brands can satisfy a significant portion of consumers trying the brand, thus serving as a "pull" device for the store. Cheap store brands that do not serve to differentiate the store will reinforce price competition among stores. Practitioners also suggest that greater store brand quality will lead to greater store loyalty, and retailers continue to increase their offering of premium store brands (Deloitte 2010).

An opposing viewpoint is that premium store brands are closer in quality and price to national brands. Hence, unlike store brand loyalty to regular store brands, which may be driven by price sensitivity, premium store brand loyalty is less driven by price. If lower price drives the link between store brand loyalty and store loyalty, we would see a weaker (less positive) link between premium store brand loyalty and store loyalty. Thus, the quality of store brands can accentuate or mitigate the effect of store brand loyalty on store loyalty. To answer this

question, we need to test the moderating effect of store brand quality. Disentangling the role of store brand quality will help assess whether a chain's value brand in itself has sufficiently high quality to serve as a store differentiator—the primary focus of this paper.

2.2. Testing the Causal Relationship Between Store Brand Loyalty and Store Loyalty

We propose a causal test of the link between store brand loyalty and store loyalty, taking advantage of a natural experiment involving a store closure at the focal chain. The basic idea is that if store brands drive store loyalty, when a store closes, the loss in chain loyalty of households that previously shopped at the closed store would be lower among households with greater store brand loyalty prior to store closure.

Our metrics of store brand loyalty and store loyalty are the same as we discussed earlier for the descriptive analysis. We estimate a regression where the change in chain loyalty after closure is the dependent variable, and preclosure store brand loyalty of the household is the independent variable along with other household controls. As store closure is expected to reduce chain loyalty, we anticipate the intercept of the regression to be negative but the preclosure store brand loyalty to be positive.

A possible alternative explanation for the lower reduction in chain loyalty among store brand loyals is the greater price sensitivity of store brand loyals. For instance, if the competing chain does not offer store brands or has store brands that are higher priced, price-sensitive store brand loyals from the closed store are more likely to visit a different store in the focal chain. We therefore compare the effect of the store closure on store loyalty among regular store brand loyals and premium store brand loyals. If price sensitivity is the driver, there should be a greater reduction in loyalty for premium store brand loyals than for regular store brand loyals.

3. Data and Variable Operationalization

We begin with a description of the variables we use for the descriptive analysis. The focal retailer in our study is a large supermarket chain in the northeastern United States that carries store brands in 125 of the total 299 categories it offers. The average store brand share of households at the focal retailer is about 19%, which is in line with the U.S. national average. We employ two different data sources in our study. First, we use scanner data provided by the focal retailer that covers transactions in all the categories for a period of two years (2006 and 2007). In this data set, we focus on 517 households for whom we also have attitudinal variables from household survey. For these data, we only have households' purchase data at the retailer

and not at competing stores. As such, we use two different estimates of households' total grocery spend to derive metrics of loyalty. First, as discussed earlier, we use the estimated grocery spend of households, conditional on observable demographic characteristics and geographic location. Second, we use self-stated weekly grocery spend of households from our survey.

We control for several store and household characteristics that can influence a household's store choice and store brand choice decisions. Nielsen's Spectra data provide us with store characteristics such as sales area and the number of checkout counters. For each sample household, the retail chain provides us with information about the distances of the household from the nearest own and competing stores and their respective interstore distance. We use revealed measures from scanner data for household-specific deal proneness, manufacturer coupon share, and the price differential between national brands and store brands. Further, we also use attitudinal variables such as households' store brand perception, shopping enjoyment, and stated brand loyalty from survey data for our empirical analysis. Besides objective factors such as distance and competition, attractiveness of a store to a household also depends on hedonic attributes such as service quality, in-store environment, etc., which are difficult to quantify even with proxy variables. To capture how attractive a store is to the neighborhood where a household resides, we use average store loyalty of all households in the focal household's census block group as an additional control variable. This variable also accounts for neighborhood influence in a household's store choice decision. Details of operationalization of the variables are provided in Table 1.

Table 1   Variable Operationalization

Variable	Operationalization
StoreLoyalty	Ratio of spend in categories where store brands are not offered at the focal retail chain to total grocery spend of the household across all retail chains.
SBShare	Ratio of store brand spend at the focal retail chain to total grocery spend of the household across all retail chains.
HouseholdShopperType[a]	Each sample household is grouped as a "primary" or "secondary" shopper based on its stated information in the survey as to whether or not its primary grocery store belongs to the focal retail chain. Among secondary shoppers, a subset is classified as "cherry pickers." Cherry-picking secondary shoppers are those engaging in both cross-store and intertemporal price search behaviors, based on five-item spatial and temporal price search propensity scales described in Gauri et al. (2008).
HouseholdSpatialConfiguration (LLL, LSL, LLS, SLL, and SSS)	The household's spatial configuration is characterized using three-dimensional vectors (D_{12}, D_1, D_2), where D_{12} is the distance between the competing stores (small if < 0.3 miles and large if > 2 miles), D_1 is the distance of the household from the focal store, and D_2 is its distance from the competitor (small if less than or equal to 1.8 miles and large if greater than 1.8 miles).
PremiumSBShare	Ratio of premium store brand spend to the total spend of the household in categories having premium store brands.
SalesArea	Sales area of the store of the focal retail chain where the household spends most of its grocery budget (obtained from Nielsen Spectra database).
StoreDistance	Distance of the household from the store of the focal retail chain where it spends most of its grocery budget.
Counters	Number of checkout counters per unit area in the store of the focal retail chain where the household spends most of its grocery budget (obtained from the Nielsen Spectra database).
NB_SBPDiff	Average unit price of national brands minus average unit price of store brands as a percentage of national brand unit price. Price differential for each household is the weighted average across 31 departments with weights equal to share of that department in that household's total spending at the focal retail chain.
DealProneness	Ratio of total price savings to total spending at the focal retail chain.
ManufCpnShr	Ratio of manufacturer coupon savings to the total spending at the focal retail chain.
NBLoyalty[a]	Two-item measure of national brand loyalty on a five-point scale: • "I have my 'favorite' brand in various product categories like detergent, cereal that I regularly buy." • "I usually buy my favorite brand in a product category on a shopping trip even if other competing brands are on price deals."
SBImage[a]	Three-item measures of store brand image on a five-point scale: • "I think the quality of store brands is as good as the national brands for most products." • "I think the grocery store brands provide good value for the price paid." • "I usually buy grocery store brands if they are available."
ShoppingEnjoy[a]	Three-item measures of shopping enjoyment on a five-point scale: • "I enjoy grocery shopping." • "Grocery shopping is boring" (reverse coded). • "I look forward to my grocery shopping trips."
Age	Median household age in the Census Block Group (CBG) where the household resides.
Income	Average income in the CBG where the household resides.
Education	Average number of years spent at school in the CBG where the household resides.
HHSize	Median household size in the CBG where the household resides.
CBGLoyalty	Average store loyalty (to the focal retail chain) of all households in the CBG where the household resides.

Note. The variables are used at either the household (subscripted as h) or household quarter (subscripted as ht) level in the analysis.

[a]Based on our household survey data.

Figure 1   (Color online) Simulated Store Brand Loyalty vs. Store Loyalty
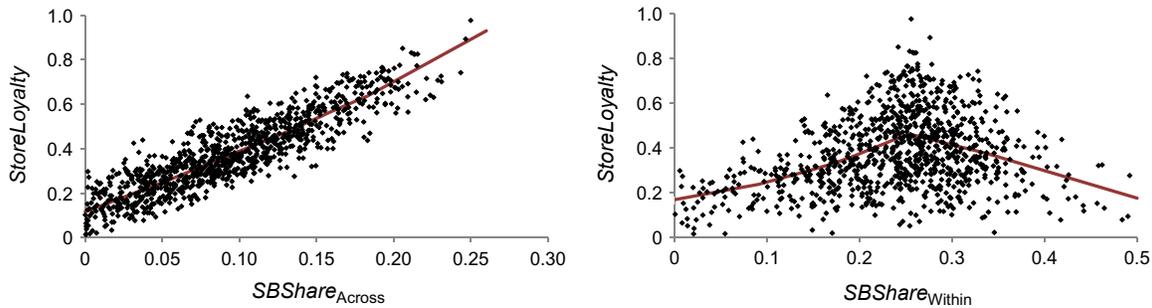
Our second data source is a Nielsen panel data set comprising transactions made by 569 households in food categories across *all stores in the same market* for the year 2006.[4] With these Nielsen panel data, we test the store brand loyalty–store loyalty relationship for the same focal retailer as in the first data set, as well as for another leading retail chain in the same market. Additionally, we use retail competition and store information from the Nielsen Spectra database to control for store characteristics. For the Nielsen panel data set, we have the complete purchase history of households across all retailers; therefore we have the actual spend data of households instead of estimated spend. Further, the complete purchase history of households in the Nielsen data set also allows us to construct the trip- and item-share-based store loyalty measures.

For the second analysis, to test for causality, we take advantage of a permanent store closure by our focal chain in October 2007. We have all of the transactional data at the focal chain for 10,348 households for which the closed store was their primary store for a two-year period from January 2007 to December 2008.

4.   Analyses

4.1.   Relationship Between Store Brand Loyalty and Store Loyalty: Descriptive Analysis

The descriptive analysis is presented as follows: First, we report results of a simulation to validate our conjecture that an inverted U-shaped relationship between store brand loyalty and store loyalty is indeed induced by the built-in negative relationship between the store brand loyalty and store loyalty metrics used in the extant literature. Second, we show both graphical and regression evidence of the monotonic relationship between the store brand loyalty and store loyalty. Finally, we demonstrate that the core result of the monotonic relationship is robust to a range of metrics and alternative explanations and is generalizable to a second retail chain.

4.1.1.   Simulation. We simulate data with a monotone (linear) relationship between across-chain store brand share (our proposed metric of store brand loyalty) and store loyalty using the following linear equation:ht

$$StoreLoyalty = \alpha + \beta \, SBShare_{\text{Across}} + \xi, \quad \xi \sim \text{N}(0, 0.1),$$
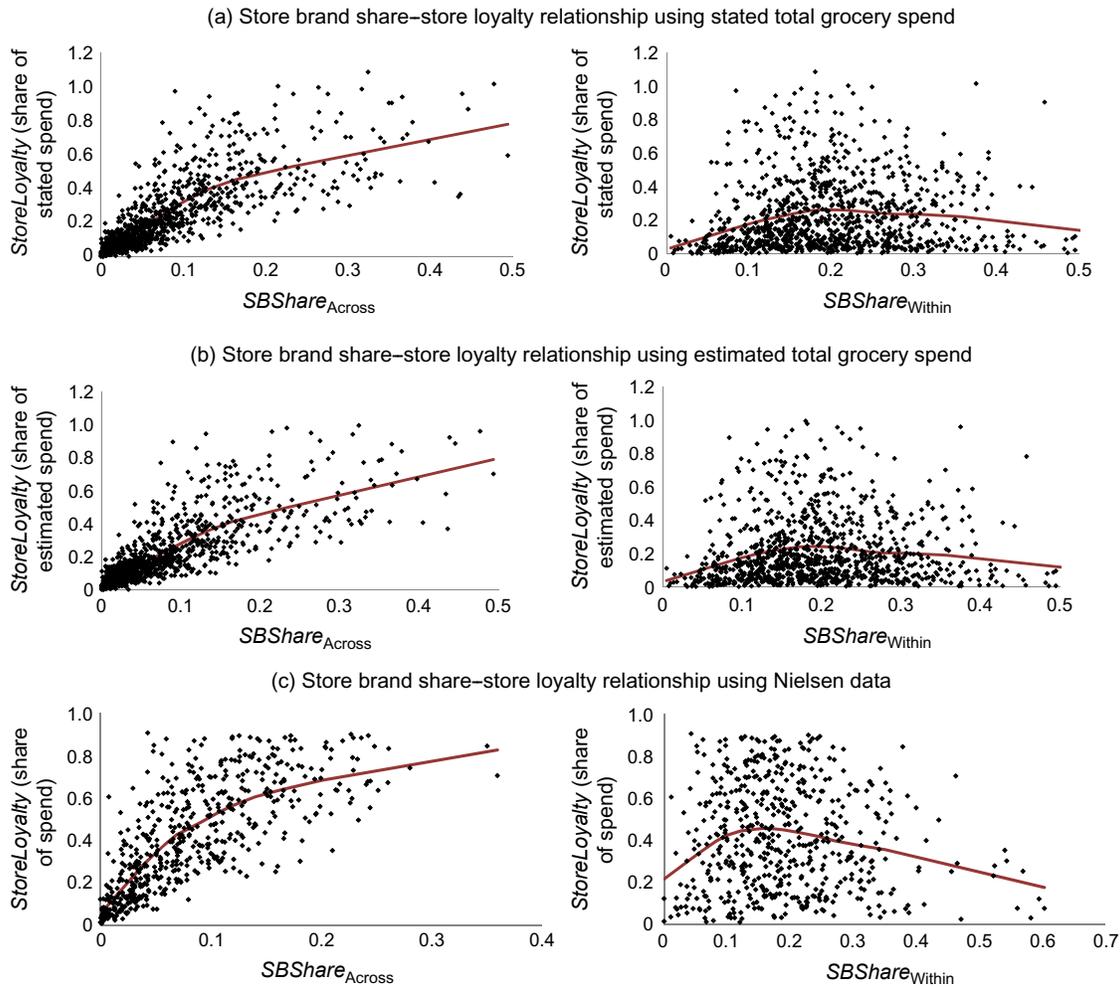
where the intercept is $\alpha = 0.1$ and the slope is $\beta = 2.9$.[5] We generate 1,000 draws of *across-chain* spend normalized store brand share ($SBShare_{\text{Across}}$) from a normal distribution with mean (8.36%) and standard deviation (0.064) of store brand share values in our primary data set. For these store brand share values, we simulate store loyalty values based on the equation above. Next we compute $SBShare_{\text{Within}} = SBSpend_{\text{Within}}/StoreSpend_{\text{Within}} = SBShare_{\text{Across}}/StoreLoyalty$, the metric that has been used in the previous literature. Figure 1 shows scatterplots of store loyalty plotted against $SBShare_{\text{Across}}$ and $SBShare_{\text{Within}}$. Although the Lowess curve in the left panel shows a linear relationship, as would be expected given the simulation, the Lowess curve in the right panel, based on the within-chain store brand loyalty (the metric in the existing literature), shows a clear inverted U-shaped relationship. Results from regression analysis confirm the linear and inverted U-shaped relationships with $SBShare_{\text{Across}}$ and $SBShare_{\text{Within}}$ metrics, respectively.

4.1.2.   Graphical Evidence: The Store Brand Loyalty–Store Loyalty Relationship. Next we empirically demonstrate that within chain metrics of store brand loyalty drive the inverted U-shaped relationship. As with the simulation, we initially present simple scatterplots with a Lowess curve fitting the data. Figure 2 shows the comparative graphs with both $SBShare_{\text{Across}}$ and $SBShare_{\text{Within}}$ based on a variety of metrics we discussed earlier. Panel (a) shows the graphs using stated total spend as the proxy for spend across all stores; panel (b) uses third-party estimates of total spend across stores. Panels (c) and (d)

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[4] For this data set, we do not have the attitudinal variables we collected through our survey in our first data set.

[5] We have tested the simulations for a wide range of parameterizations; the claims from the simulation are robust in all cases.

Figure 2   (Color online) Store Brand Loyalty–Store Loyalty Relationship: Graphical Evidence

(a) Store brand share–store loyalty relationship using stated total grocery spend

(b) Store brand share–store loyalty relationship using estimated total grocery spend

(c) Store brand share–store loyalty relationship using Nielsen data

use actual total spend across stores using the Nielsen data set and show that the results are replicated at our focal retailer and a second retailer. Panels (e) and (f) show the graphs for the Nielsen data with store loyalty based on the share of trips and the share of items, respectively. The pattern across all six panels is remarkably consistent—whereas the graphs on the left with $SBShare_{Across}$ always show a monotonic relationship, the graphs on the right with $SBShare_{Within}$ always show an inverted U-shaped relationship.
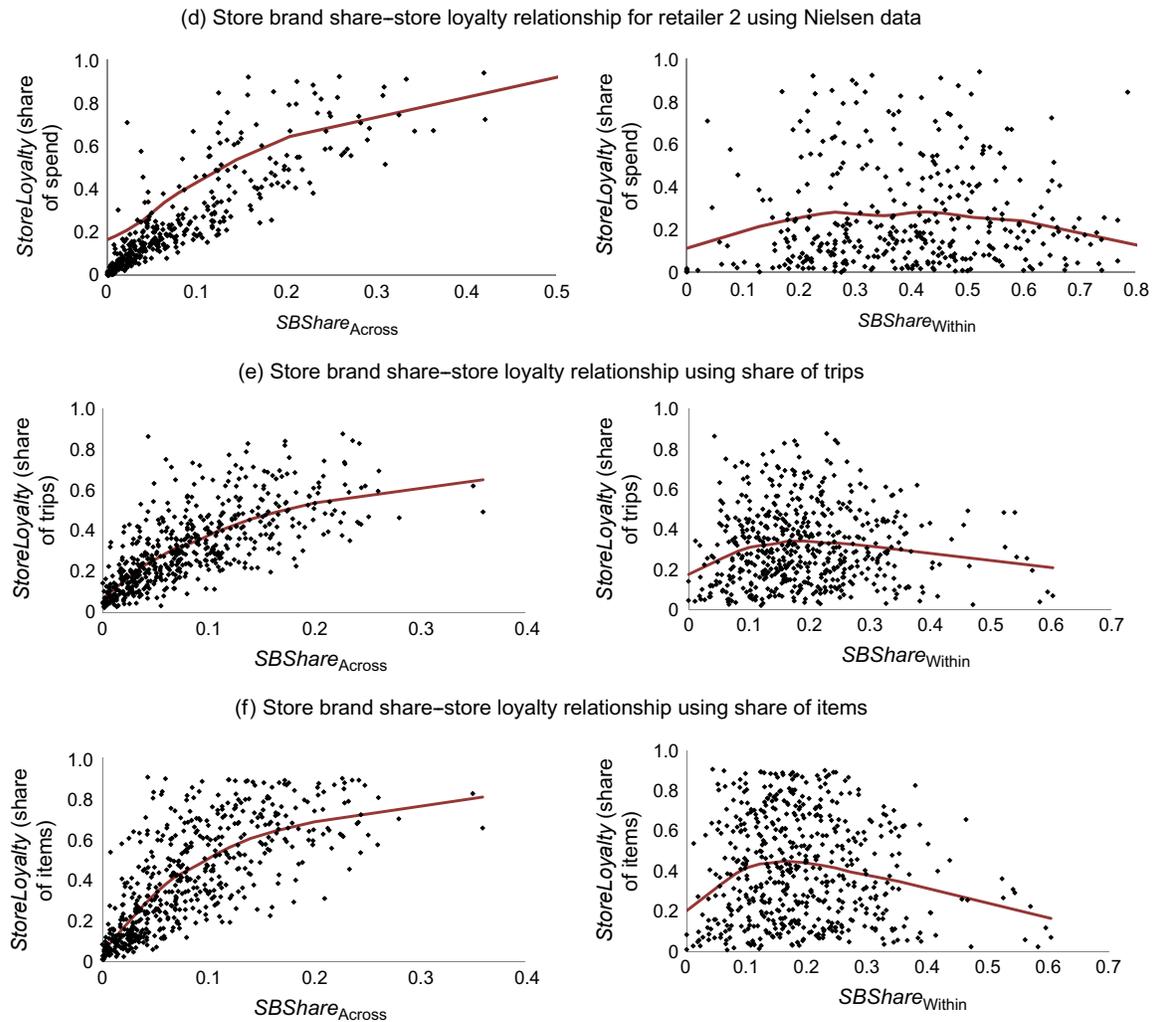
4.1.3.   Regression Analysis. For the regression analysis, as discussed earlier, we recognize the bidirectional nature of the relationship between store brand loyalty and store loyalty. We therefore estimate a system of two simultaneous equations for store brand share and store loyalty. We allow for a nonmonotonic relationship by including the linear as well as quadratic terms of the two focal variables. Taking advantage of our two-year panel data set, we define the focal variables—store brand share and store loyalty—on a finer quarterly frequency, resulting in

eight observations per household, allowing us to control for household-level fixed effects. We use the third-party estimate of total grocery spend in constructing the loyalty metrics. The complete specification of our two equation base model with attitudinal variables is presented as follows:

$$
\begin{aligned}
StoreLoyalty_{ht} \\
&= \alpha_h + \alpha_1\, SBShare_{ht} + \alpha_2\, SBShare_{ht}^2 + \alpha_3\, SalesArea_h \\
&\quad + \alpha_4\, DealProneness_h + \alpha_5\, Counters_h \\
&\quad + \alpha_6\, ShoppingEnjoy_h + \alpha_7\, StoreDistance_h \\
&\quad + \alpha_8\, Education_h + \alpha_9\, Income_h + \alpha_{10}\, HHSize_h \\
&\quad + \alpha_{11}\, Age_h + \alpha_{12}\, CBGLoyalty_h + \varepsilon_{1ht},
\end{aligned}
$$

$$
\begin{aligned}
SBShare_{ht} \\
&= \beta_h + \beta_1\, StoreLoyalty_{ht} + \beta_2\, StoreLoyalty_{ht}^2 \\
&\quad + \beta_3\, NBLoyalty_h + \beta_4\, SBImage_h + \beta_5\, NB\_SBDiff_h \\
&\quad + \beta_6\, DealProneness_h + \beta_7\, ShoppingEnjoy_h \\
&\quad + \beta_8\, Education_h + \beta_9\, Income_h + \beta_{10}\, HHSize_h \\
&\quad + \beta_{11}\, Age_h + \beta_{12}\, ManufCpnShr_h + \varepsilon_{2ht}.
\end{aligned}
$$

Figure 2   (Continued)

(d) Store brand share–store loyalty relationship for retailer 2 using Nielsen data

(e) Store brand share–store loyalty relationship using share of trips

(f) Store brand share–store loyalty relationship using share of items

In this specification, the endogenous variables are household-specific quarterly store loyalty ($StoreLoyalty_{ht}$) and store brand share ($SBShare_{ht}$). The two equations have enough exclusion restrictions for identification. The store loyalty equation has four variables excluded in the store brand share equation—distance to store (*StoreDistance*), sales area (*SalesArea*), number of checkout counters (*Counters*), and census block group (CBG) loyalty (*CBGLoyalty*). These four variables influence a household's store loyalty by affecting the attractiveness of the store overall, without any direct impact on a household's preferences for its store brands. Similarly, the store brand share equation is identified by four variables excluded in the store loyalty equation—national brand–store brand price differential (*NB_SBDiff*), manufacturer coupon share (*ManufCpnShr*), stated national brand loyalty (*NBLoyalty*), and retailer-independent perception of store brand image (*SBImage*). In addition, we also include squares and cross products of exogenous variables as additional instruments (Wooldridge 2002).

We report the results of the two-stage least squares regression using both $SBShare_{Across}$ and $SBShare_{Within}$ in Table 2. Note that only the linear store brand share term is significant in the store loyalty equation when $SBShare_{Across}$ is used as the metric of store brand loyalty, demonstrating a monotonic relationship.[6] By contrast, both the linear and quadratic store brand share terms are significant in the store loyalty equation when $SBShare_{Within}$ is used. The peak of the inverted U in the regression occurs when store brand share is 0.23—similar to the graphical evidence in Figure 2, panel (a) (right side). Thus we replicate the inverted U-shaped relationship in previous

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[6] The scatterplots and Lowess curves in Figure 2 indicate a monotonic nonlinear relationship between store brand loyalty and store loyalty. So we repeated the analysis with a log-transformed store brand loyalty variable. R^2 values were higher for this regression, indicating that the relationship is monotonic but nonlinear. Because our focus is on ascertaining whether the relationship is monotonic or inverted U-shaped, we use quadratic specification for all analyses to allow for nonmonotonic effect.

Table 2   **Store Brand Share–Store Loyalty Relationship**

| | $SBShare_{Across}$ | | | | $SBShare_{Within}$ | | | |
| | StoreLoyalty | | SBShare | | StoreLoyalty | | SBShare | |
Variable	Coeff.	SE	Coeff.	SE	Coeff.	SE	Coeff.	SE
SBShare	1.626***	0.369			2.602***	0.733		
$SBShare^2$	−0.763	0.478			−4.288***	1.265		
StoreLoyalty			0.520***	0.167			0.451*	0.270
$StoreLoyalty^2$			−0.169	0.206			−0.078	0.329
SalesArea	−0.004***	0.002			−0.003***	0.001		
NBLoyalty			−0.016***	0.005			0.012	0.008
SBImage			0.029***	0.005			0.012*	0.007
NB_SBDiff			0.317*	0.173			−0.952***	0.269
DealProneness	−0.143**	0.058	0.043	0.040	−0.277***	0.075	0.204***	0.062
Counters	−0.133	0.128			−0.294	0.206		
ShoppingEnjoy	−0.002	0.008	0.006	0.004	−0.001	0.011	0.001	0.007
StoreDistance	−0.004***	0.002			−0.004*	0.003		
Education	0.045***	0.006	−0.001	0.004	0.041***	0.010	0.006	0.006
Income	−0.040***	0.007	−0.022***	0.004	−0.040***	0.011	−0.020***	0.006
HHSize	0.047*	0.025	0.023	0.014	0.030	0.036	0.074***	0.022
Age	0.001	0.005	−0.005*	0.003	−0.007	0.007	0.001	0.004
CBGLoyalty	0.182***	0.050			0.268***	0.060		
ManufCpnShr			0.019	0.119			−0.822***	0.183
Adjusted R^2	0.789		0.664		0.605		0.698	

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

research when using $SBShare_{Within}$ both in the regression and in the simple graphical evidence reported earlier.[7]

For completeness, we note that the control variables in the regressions have expected signs. The distance from a household to store and the deal proneness of a household have significant negative impacts on its store loyalty, suggesting that households patronize their nearest retailer and deal-prone households are more likely to price search across multiple retailers. As expected, average store loyalty of all households in the neighborhood (CBG) of a household positively impacts its store loyalty. Among the control variables in the store brand share equation, we find that households with positive attitude toward store brands tend to have higher store brand share, whereas national brand-loyal households have lower store brand share.

Finally, a household's income is negatively related to its store brand share.

4.2. Robustness Checks

4.2.1. Alternative Measures of Total Grocery Spend. To address potential concerns about the accuracy of the estimate of total grocery spend from the third-party firm in constructing the loyalty metrics, we repeat our analyses with store loyalty and store brand share values calculated using *stated* total grocery spend of households instead of the third-party *estimated* grocery spend. The results based on the stated grocery spending (reported in Online Appendix B) are consistent with the main results described earlier.

4.2.2. Alternative Data Source with Households' Purchase History Across Stores. We check the robustness of our results using the Nielsen panel data set. The across-store complete purchase history of households in this data set allows us to also use *actual* values of total grocery spend by households to compute the loyalty metrics. The left panel of Table 3 reports the results using the $SBShare_{Across}$ for the same retailer as in the previous analysis; the results replicate the monotonic relationship.[8]

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[7] As shares are bounded between 0 and 1, we also estimated a model using logit transformation of the dependent variables. The results are reported in the Online Appendix A (available as supplemental material at http://dx.doi.org/10.1287/mnsc.2014.2133) and are qualitatively identical. The conclusion that the use of $SBShare_{Within}$ drives the inverted U-shaped relationship is replicated. We report the untransformed results in the main text because it is easier to interpret and replicates the graphical representation. As we discussed in §2, our metric of store loyalty is based on spend only in categories without store brands to prevent the in-built correlation between the metrics. We checked that the monotonic and inverted U-shaped relationships with the $SBShare_{Across}$ and $SBShare_{Within}$ are replicated even if we use store loyalty metrics based on spend in all categories as in the previous literature.

[8] The Nielsen panel data set covers only food categories, unlike our main data that are based on all grocery categories. Also, we do not have attitudinal information for the Nielsen data; so the NB–SB price differential, store brand perception, shopping enjoyment, and CBG loyalty variables are not used for this analysis.

Table 3 Store Brand Share–Store Loyalty Relationship Using Nielsen Panel Data

| | Retailer 1 | | | | Retailer 2 | | | |
| | StoreLoyalty | | SBShare | | StoreLoyalty | | SBShare | |
Variable	Coeff.	SE	Coeff.	SE	Coeff.	SE	Coeff.	SE
Intercept	−0.135	0.127	−0.008	0.065	0.020	0.037	−0.087*	0.050
SBShare	3.288**	1.842			0.538**	0.250		
SBShare^2	−8.241	5.085			−0.781	0.599		
StoreLoyalty			1.295	0.987			1.329	0.462
StoreLoyalty^2			−1.593	3.332			6.051	13.928
SalesArea	0.0002	0.0004			−0.0001	0.0001		
NBLoyalty			0.104**	0.053			0.132*	0.079
DealProneness	−0.048	0.068	0.005	0.035	−0.028**	0.012	0.009	0.394
Counters	−0.055	0.089			−0.022	0.089		
StoreDistance	0.0001	0.0001			−0.0001	0.001		
Education	0.007	0.005	−0.006**	0.003	0.001	0.002	0.001	0.005
Income	0.0001	0.001	−0.0001	0.001	0.0002	0.0003	−0.001	0.001
HHSize	−0.004	0.005	0.007	0.005	−0.004**	0.002	0.013**	0.005
Age	0.003	0.005	−0.001	0.002	0.002	0.001	−0.001	0.004
ManufCpnShr			0.076	0.241			0.009	0.394
Adjusted R^2	0.480		0.141		0.489		0.036	

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

4.2.3. Generalizability of the Relationship to a Competing Retailer. We use the Nielsen data set to check whether the store brand loyalty–store loyalty relationship generalizes at a second major competing retailer in the same market. The right panel of Table 3 shows that only the linear store brand share term is significant in the store loyalty equation, indicating a positive monotonic relationship between store brand share and store loyalty, consistent with the finding for the first retailer. That we find that their respective store brands serve to differentiate the two biggest competing retailers in the same market gives us greater faith in the store differentiation role of store brands.

4.2.4. Alternative Metrics of Store Loyalty. We next check the robustness of our results to two alternative metrics of store loyalty: proportion of store visits and proportion of items purchased. Proportion of store visits is operationalized as the number of trips to the focal retailer divided by the total number of shopping trips made by a household. Proportion of items purchased is calculated as the number of product items purchased by a household from the focal retailer divided by the total number of items purchased by the household across all retailers. The results for the two retailers from the Nielsen data set (reported in Online Appendix C) replicate the positive monotonic store brand loyalty–store loyalty relationship.

4.2.5. Control for Household–Store Spatial Configuration. Next we report results with the controls for household–store spatial configuration in the second column in Table 4. As hypothesized, the relationship between store brand share and store loyalty is stronger for households of types SSS, SLL, and LLS, indicating that those who patronize focal retailers' store brands when other shopping options are geographically close are even more loyal to the retailer for the same level of store brand share. This result further supports the store differentiation role of store brands and rules out the possibility that the positive relationship between store brand share and store loyalty is driven by the household's spatial configuration with respect to stores.

4.2.6. Heterogeneous Relationships for Primary Shoppers, Secondary Shoppers, and Cherry Pickers. To test whether the monotonic relationship that we report is due to pooling of heterogeneous consumer segments, we estimate the relationship separately for each segment. We classify each household in our sample into "primary shopper" and "secondary shopper" based on the household's self-report as to whether the focal chain is its primary grocery store. Among the secondary shoppers, a subset who engage in both cross-store (spatial) and overtime (temporal) intensive price search are classified as cherry pickers following the price search propensity scales described in Gauri et al. (2008). Based on this classification, the 517 households in our sample fall into three distinct customer segments for the focal retailer: (1) primary shoppers (281 households), (2) cherry-picking secondary shoppers (99 households), and (3) other secondary shoppers (137 households). The scatterplots and simultaneous equation regressions show that the relationship is inverted U-shaped with *within-chain* spend-normalized store brand share but monotonic with *across-chain* spend-normalized store brand share

Table 4   Store Brand Share–Store Loyalty Relationship Controlling for Household Spatial Configuration and Store Brand Quality

| Variable | Household spatial configuration | | | | Store brand quality | | | |
| | StoreLoyalty | | SBShare | | StoreLoyalty | | SBShare | |
	Coeff.	SE	Coeff.	SE	Coeff.	SE	Coeff.	SE
SBShare	0.556***	0.212			2.475***	0.531		
SBShare ^{2}	−0.249	0.221			−1.071	0.677		
HouseholdShopperType (SLL, SSS, LLS)	0.018	0.030						
SBShare × HouseholdShopperType (SLL, SSS, LLS)	0.881***	0.276						
SBShare × PremiumSBShare					3.072**	1.346		
StoreLoyalty			0.277***	0.074			0.849***	0.227
StoreLoyalty^2			0.036	0.084			−0.529*	0.277
Adjusted R^2	0.769		0.747		0.703		0.605	

Note. All other variables reported in Table 2 are included in the regressions but suppressed to conserve space.

$^*p < 0.10$; $^{**}p < 0.05$; $^{***}p < 0.01$.

for all three shopper segments.[9] These replications within different segments further reassure us of the store differentiation role of store brands.

4.2.7.   Controlling for the Effect of Store Brand Quality on Store Loyalty. The focal retailer in our study offers premium store brands under four different names in selected categories. We define premium store brand share as the ratio of premium store brand spend to the total spend in categories having premium store brands.[10] To test the moderating role of store brand quality on store loyalty, we include an additional interaction term between store brand share and premium store brand share of households to capture the additional loyalty induced by loyalty to premium store brands. The results are reported in the third column in Table 4. The main effect is monotonic and positive as before; furthermore, the interaction between store brand share and premium store brand patronage is significantly positive. Thus, high-quality store brands engender greater store loyalty, providing additional support for the store differentiation argument of store brands, and the incentives for retailers to invest in store brand quality.

4.3.   Addressing Causality: A Natural Experiment
As noted earlier, we take advantage of a natural experiment to test for a causal relationship between store brand loyalty and store loyalty. In October 2007, one of the stores of the focal supermarket chain in our study closed permanently. The nearest major competitor to this store is only 0.3 miles away, and the nearest store belonging to the same supermarket chain is

3.8 miles away. Hence it is natural that upon closure, a significant number of customers would move to the competing chain. But would the focal chain be able to retain more of the store brand-loyal households after the store closure? By comparing the change in chain loyalty before and after the store closure, as a function of prior-to-closure store brand loyalty, we construct a causal test of the link between store brand loyalty and chain loyalty.

We consider the behavior of 10,348 households for whom the closed store was their regular store (before closure), i.e., where they spent most their total grocery spending at the focal chain. We have data for a two-year period from January 2007 to December 2008, i.e., roughly 9 months of purchase behavior before store closure and 14 months of behavior after store closure. Thus we can construct average chain loyalty before and after the store closed. We use the percentage change in chain loyalty $(ChainLoyalty_{After} - ChainLoyalty_{Before})/ChainLoyalty_{Before}$ as the dependent variable and preclosure store brand loyalty as the focal moderating variable of interest in the regression. As store closure is likely to reduce loyalty, we expect the intercept to be negative. If store brands serve to differentiate the store, households with greater store brand loyalty prior to store closure should have a smaller reduction in chain loyalty, and therefore the coefficient of preclosure store brand loyalty would be positive.

One possible concern here is that consumers' price sensitivity can also result in a positive coefficient for preclosure store brand loyalty if the focal retailer's store brands are priced lower than that of its competitors. In this case, the price-sensitive store brand shoppers may continue to patronize the focal chain for its low-priced store brands even after the closure of their regular store. We assess this plausible explanation in two ways. First, we directly checked whether

[9] Results of the simultaneous equations regressions are reported in Online Appendix D.

[10] Mean store brand share in premium store brand categories (15%) is less than that in regular store brand categories (25.9%). This rules out the possibility that premium store brands are offered only in categories conducive to these brands.

the prices of store brands at the focal chain are systematically lower than that of its major competitor. In June 2014, we collected price data on store brands in 12 randomly selected categories (among categories with high store brand presence) at the focal retail chain and its major competing retail chain. Within each selected category, we identified two to three store brand items at the focal chain for which there were identical (in terms of package size and flavor, if applicable) store brand counterparts at the competing chain. We collected the weekly prices for a total of 34 such pairs of store brand items for three weeks, thereby generating a total of 102 observations on competitive price differentials for the items. The competitive price differential for an item in a given week is computed as *the observed price of the item at the focal chain minus the observed price of the item at the competing chain in that week*, expressed as a percentage of the observed price of the item at the focal chain. Of the 102 price differential values, 12 were found to be zero, 43 were positive, and 47 were negative; the mean was found to be -0.19% (SD = 2.84). A *t*-test of the hypothesis that the price differential value is zero cannot be rejected ($p = 0.487$), indicating no statistically significant price differences in the observed store brand items between the two competing chains, suggesting that the higher store loyalty among store brand loyals is not driven by lower prices of its store brands.

Second, we perform an indirect test. If price sensitivity were a factor driving the higher chain loyalty of prestore closure store brand-loyal customers, then we should find a weaker relationship between preclosure premium store brand loyalty and postclosure chain loyalty. To test this, we include preclosure premium store brand share of the household as an additional moderator in the regression.

One challenge with implementing the test as described above in practice is that for a small number of households with very small preclosure chain loyalty, the percentage change in chain loyalty is artificially inflated and creates large outliers of the dependent variable. To address this outlier issue, we consider two approaches. First, we exclude 155 households out of the 10,348 households that exhibited a preclosure chain loyalty of less than 5% and a percentage increase in postclosure chain loyalty of more than 200%. Second, to assess whether the results are robust to deletion of the outliers, we minimize the impact of outliers without dropping those households from the analysis by estimating a regression using $\log(ChainLoyalty_{After}/ChainLoyalty_{Before})$ as the dependent variable. We also control for a variety of household-specific variables such as deal proneness, CBG loyalty, demographic variables, and a household's distance to the closest store of the focal chain

Table 5   Moderating Effect of Store Brand Loyalty on Store Loyalty After Store Closure

Variable	$(ChainLoyalty_{After-}$ $ChainLoyalty_{Before})/$ $ChainLoyalty_{Before}$		$\log(ChainLoyalty_{After}/$ $ChainLoyalty_{Before})$	
	Estimate	SE	Estimate	SE
Intercept	-0.506^{**}	0.232	-2.470^{***}	0.887
Pre-SBShare	0.497^{***}	0.128	3.996^{***}	0.439
Pre-PremiumSBShare	0.028	0.033	0.122	0.127
DealProneness	0.605^{***}	0.058	2.984^{***}	0.224
DistanceFocalChain	-0.020^{***}	0.003	-0.074^{***}	0.011
DistanceCompetitor	0.020^{***}	0.003	0.073^{***}	0.011
Age	-0.003	0.002	-0.007	0.007
Income	-0.001	0.001	0.001	0.003
HHSize	0.018	0.029	0.331^{***}	0.110
Education	-0.001	0.014	-0.057	0.052
CBGLoyalty	0.195^{***}	0.073	0.639^{**}	0.279
Adjusted R^2	0.020		0.035	

$^{*}p < 0.10$; $^{**}p < 0.05$; $^{***}p < 0.01$.

($DistanceFocalChain$) and that of its major competitor ($DistanceCompetitor$). Table 5 reports the results of the two regressions with the alternative dependent variables.

In both regressions, the intercept is negative, reflecting the reduction in chain loyalty when a store is closed. On average, there is a 50% reduction in chain loyalty as a result of store closure. However, store brand share prior to store closure serves as an important moderator in the reduction of chain loyalty. The positive coefficient on PreSBShare indicates that the higher the store brand loyalty prior to closure, the greater the chain loyalty after store closure. Thus store brands serve to reduce the negative effects of store closure on chain loyalty, providing causal support for the store differentiation role of store brands. We also find that the coefficient of premium store brand share is insignificant, indicating premium store brand share does not have a different (specifically lower) impact than regular store brand share, suggesting that the observed linkage between store brand share and chain loyalty is not driven by price sensitivity.

Our results complement the results in Hansen and Singh (2008), who show that store brand-loyal households shift significantly higher levels of their store spending to Walmart when it enters the market. They argue that store brand purchase behavior is driven by underlying value traits of households and question the ability of store brands to ameliorate competition. However, they also note that their findings can be attributed to the unique value positioning of Walmart supercenters and also because store brands themselves are positioned as providing value vis-à-vis the national brands. Our test based on a natural experiment involving store closure and facing competition with a similarly positioned supermarket avoids

this confound. We show that when a supermarket chain facing conventional competitors closes one of its stores, among the regular shoppers of the closed store, store brand patrons are more likely to patronize other stores of the chain. These results suggest causal support for the claim that store brands can help a retailer in differentiating from a conventional competitor and aid store loyalty.[11]

5. Conclusion

Store brands are widely acknowledged as effective tools for retailers to increase profit margins and gain bargaining power with respect to manufacturers. Another rationale for retailers to invest in store brands is that store brands aid to create a point of differentiation and store loyalty (Richardson et al. 1996, Corstjens and Lal 2000). However, more recent empirical research (Ailawadi et al. 2008, Hansen and Singh 2008, González-Benito and Martos-Partal 2012) has questioned this rationale by suggesting that high levels of store brand share may in fact reduce store loyalty and that store brand buyers are more vulnerable to Walmart.

In this paper, we revisited the "store brand as a loyalty tool" rationale using two distinct and complementary research designs. First, using alternative loyalty measures that are conceptually more appealing for testing the store brand loyalty–store loyalty relationship, we document a robust, monotonic, and positive relationship between store brand loyalty and store loyalty using data from multiple retailers and multiple sources, and we provide controls for a variety of potentially spurious correlations (e.g., spatial configurations that drive both store and store brand loyalty, store brand quality). Second, taking advantage of a natural experiment in the form of a store closure, we introduce a causal test for the link between store brand loyalty and store loyalty.

Our primary contributions are as follows: We argue conceptually and demonstrate using a simulation that the inverted U-shaped relationship between store loyalty and store brand loyalty, reported in the existing literature, is an artifact of the store brand loyalty metric used. We also demonstrate empirically that with our conceptually appropriate metrics, store brand loyalty is indeed monotonically positively related to store loyalty, even after controlling for factors such as household store spatial configurations and heterogeneous consumer segments. The monotonic relationship is strengthened for higher-quality store brands, validating the retailer emphasis not only on gaining store brand share but also on increasing store brand quality. We demonstrate the robustness of our findings to a range of alternative operationalizations of the loyalty metrics and demonstrate that they are generalizable to a second retailer.

Finally, using a natural experiment involving store closure, we show that the chain loyalty is greater after store closure for households with greater store brand loyalty prior to store closure, suggesting a causal link in favor of the link between store brand loyalty and store loyalty. In summary, the totality of the evidence—in terms of (1) the descriptive results across multiple metrics, data from multiple retailers, and the effect of store brand quality and (2) the effect of store closure on store loyalty is moderated by store brand loyalty—supports the store differentiation role of store brands. This paper thus rehabilitates the conventional wisdom that more store brand purchases by customers help retailers in creating higher store loyalty through positive store differentiation—a finding that has been questioned in the recent literature on store brands. From a managerial standpoint, our finding supports the continued investments by retailers in store brands and store brand quality by retailers around the world.

It should be noted that although the inverted U-shaped relationship has been reported in extant literature, the inversion happens beyond a store brand share of 40% in the data used. Therefore, qualitatively, the negative effect will not be seen for most households. However, to the extent that we care about the quantitative impact on store loyalty, we will understate the true impact even for households who are not in the downward slope of the curve. Also, our results show that for any given household (even at higher levels of store loyalty), increased store brand loyalty will not lead to reduced store loyalty.

We should caution that our results should not be interpreted to imply that in terms of overall product assortment, exclusive focus on store brands is good for a retailer. Retailers need to pull in customers to their stores, and since most consumers are interested in national brands, which are available at other competing retailers, reducing national brand assortments is very likely to be counterproductive. However, we believe a good strategy for a retail chain could be promoting its store brands (especially its premium store brands, by increasing their quality) so that they stimulate pull to its stores because of their exclusivity. The issue of optimal mix between national and store brands in product assortment is an important open research question that needs to be addressed in future work.

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[11] We recognize that with a natural experiment, there are potential confounds in making a causality claim. For example, there might be changes in the period before and after the closure of the store that could have led to greater attraction of the store brand-loyal households to the focal chain (e.g., increased support for store brands, such as new store brand introduction, or more displays of store brands at the focal chain after the store closure). We did not find a systematic increase in such store brand support, but it suggests that alternative explanations or controlled experiments may be needed in future research to address the question conclusively.

Supplemental Material

Acknowledgments

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