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Using data from 50 U.S. markets, Bronnenberg, Dhar, and Dubé (2007) observe that geographic variation is the predominant source of variation in national brand market shares. The authors of this comment extend this surprising and previously undocumented result in several respects. First, they replicate this basic finding in France and find that it is robust to time and region aggregation and data duration. Second, because of regional variation in chain locations and the limited research on the relative effect of chains on market shares, they link chain effects to market shares in France. The authors find that (1) chain effects explain more variation in market share than either time or region effects and (2) the addition of chain effects attenuates region-specific effects. Thus, chain structure is both another source of regional variation in demand and an important consideration in its own right. Finally, by coupling brand-time effects with longer data, the authors note that brand-time effects are larger than brand-region effects in France. This result suggests the importance of long-term effects in marketing and the need to collect longer durations of data to explain variation in market shares.

## Consumer Packaged Goods in France: National Brands, Regional Chains, and Local Branding

Bronnenberg, Dhar, and Dubé (2007; hereinafter BDD) document remarkably high variation in national brands' local market shares in the United States. Moreover, this cross-sectional variation is much larger than cross-time variation. This provocative observation is long overdue and indicates that marketing has been too inattentive to this phenomenon.

Our goals in this comment are threefold. First, we attempt to assess whether this result generalizes to other markets—in particular, to France. France is an especially desirable market to contrast with the United States because more than one-third of its retail chains and the bulk of its advertising are nationally oriented. Moreover, France, as are all European countries except for Russia, is smaller than the United States; the area of France is 7.2% of the conterminous

U.S. land area (somewhat larger than a triangle whose vertices are formed by New York, Chicago, and Atlanta), and the population of France is 21% of that in the United States. Therefore, it might be expected that BDD's results do not extend beyond the United States. Surprisingly, we find that BDD's findings are robust in France. Whereas BDD find that brand  $\times$  market interactions explain 92% of the total variation in share in the United States, we find that these effects are also dominant in France, explaining 77% of the total variation in market share. This result is robust to the sampling rate of the data (weekly or four-week), the duration of the data (39 or 66 four-week periods), and the level of aggregation (9, 22, or 96 regions). Consistent with BDD's results, we find that market shares exhibit spatial dependence. However, the spatial dependency in market shares is less in France, presumably because of the greater variation in local culture.

Second, we assess whether variation in market shares is related to chain effects. We consider chain variation for two reasons. The first reason is that many chains operate locally; therefore, they represent another source of spatial variation in sales. The second reason is that the chains are an interesting phenomenon in their own right, and this issue has received scant attention in the literature relative to the regional variation in market shares that BDD describe. In

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contrast to the United States, in which Bronnenberg, Dhar, and Dubé (2006) find that region effects dominate chain effects, we find that chain structure explains more variation in market share in France than either region or time. Moreover, the addition of chains attenuates the combined market and brand-market effects by 27%. This diminution in region-specific effects may arise from (1) regional differences in demand, (2) regional differences in marketing manifested at the chain level, and/or (3) differences in chains' strategies.

Third, we consider BDD's finding of negligible time variation in shares. Using the same duration, frequency, and model as BDD, we replicate their finding that time effects are small (7% of the total variation in France compared with 1% in the United States). However, using a longer time horizon and higher sampling rate coupled with a brand  $\times$  time interaction, we find that the proportion of explained variation in market shares due to brand-time effects in France (20%) is slightly larger than brand-region effects (18%). The weekly brand  $\times$  time interactions can capture market share variation that arises from brand-specific time-varying strategies, such as promotions or advertising. An interesting prescription arising from this finding is that longer-term data are needed to assess time variation in market shares properly.

We organize the remainder of this article as follows: In the next section, we describe the data set used. Then, we summarize the sequence of models used to replicate BDD's results and extend their findings. Finally, we offer conclusions.

#### DATA

We use data provided by Information Resources Inc. (France). These stockkeeping unit-level scanner data are available per store per week, and they cover just over five years (January 1, 1999–January 31, 2004) for 25 product categories sold in a national sample of 443 outlets representing 23 chains. Although BDD use ACNielsen-designated Scan Tracks, there is no equivalent to designated market areas in France (or elsewhere in the European Union, except the United Kingdom). Accordingly, we consider three sets of market definitions using geographic and administrative divisions in France. We first consider the 9 main geographic regions in France (average population = 6,473,172, average area = 22,964 miles<sup>2</sup>). We also study a second market definition with 22 regions (average population = 2,659,943, average area = 9547 miles<sup>2</sup>). These

regions are also the main administrative units of the French government (somewhat like states in the United States, but with less independence). The regional characteristics are pronounced in this breakdown because people promote and preserve valued traditions, from clothing to local types of food. We then subdivide these 22 regions into 96 departments (counties), which form the third market definition (average population = 609,570, average area = 2188 miles<sup>2</sup>).<sup>1</sup> Note that the 9-region breakdown is closest to BDD's U.S. sample with regard to the number of stores sampled per region, whereas the 22-region breakdown is closest in terms of population per region. To make our sample most comparable to BDD and to decrease the covariation between chain location and region, we use the most aggregated market definition for our analysis (9 regions), though we consider the other two market definitions to explore the effect of regional aggregation.

To make our data further comparable to BDD in terms of duration, sampling rate, and level of aggregation, in each category, we aggregated data from the stockkeeping unit per store per week level to the brand per region per four-week level. As do BDD, we consider the variation over time in the volume share of the two largest national brands in each category. To make the data duration comparable, we initially focus only on the last 39 four-week periods. Subsequently, we relax the duration, sampling rate, and level of aggregation restrictions to explore their effects.

Table 1 contains descriptive statistics for the market shares of the selected 50 brands (2 brands in 25 categories) based on the last 39 four-week periods. We report descriptive statistics for the market shares, which we calculated using data from all chains, local chains only, or national chains only. We define a chain as national if it is present in all nine regions and local if otherwise. The local chain-only row mimics U.S. data, in which national chains, such as Target and Wal-Mart, are often excluded.

Table 1 indicates that average national market share for the two leading share brands in the United States (BDD) and French samples is similar at approximately 20%. However, the standard deviation of national market shares across regions is lower in the French sample (.10 versus .15 in the United States), and the dispersion is considerably smaller (.13 versus .72 in the United States). This smaller disper-

<sup>1</sup>To be precise, we use 21 markets in the 22-region breakdown because we do not include the island of Corsica in the analysis. Furthermore, we observe stores located in 79 departments in the 96-region breakdown.

Table 1  
DESCRIPTION OF THE TOP SELLING TWO BRANDS ACROSS 25 CATEGORIES

	<i>National Share</i>	<i>Dispersion</i>	<i>Range</i>	<i>Minimum</i>	<i>Maximum</i>
<i>All Chains</i>					
M	.203	.132	.073	.162	.235
SD	.099	.087	.052	.086	.112
<i>Local Chains Only</i>					
M	.199	.158	.091	.157	.249
SD	.098	.100	.061	.086	.121
<i>National Chains Only</i>					
M	.194	.118	.064	.162	.226
SD	.097	.078	.043	.088	.109

sion may reflect the smaller size of the French market. It may also be due, in part, to the presence of retail chains that operate nationally in the French data and brands that operate locally in the U.S. data. When we consider only local chains and nationally distributed brands in both data, the difference in dispersion between France and the United States becomes smaller (.16 versus .43 in the United States). The increase in dispersion when we omit national chains suggests that national distribution plays a role in the relatively low dispersion in France. In addition, advertising expenditure data provided by TNS Media (France) reveal that the bulk of brands in our sample do not spend money on regional advertising, which is also consistent with BDD's speculation that local advertising may play a role in the creation of regional variation in market shares.

#### APPROACH

To assess whether regional differences dominate market share variation in France and how robust this finding may be to factors such as data aggregation and duration, we estimate a sequence of generalized linear models, as outlined in Figure 1. Using this approach, we explore the robustness of the dominance of regional effects to (1) data duration, (2) time aggregation, (3) regional aggregation, (4) chain aggregation, (5) the addition of brand  $\times$  chain interactions, and (6) the addition of brand  $\times$  time interactions.

We consider brand  $\times$  chain interactions because chains differ in their locations across regions and because chain-specific effects are an interesting consideration in their own right. Chain variation in shares can arise from differences in a clientele's preferences or differences in retailer and manufacturer marketing support for a given brand across chains. To exemplify the role of chains in explaining variation in market shares, we consider Kellogg's cereal shares in two French chains, Chain 1 and Chain 2. Most of Chain 1's outlets are in the northeast of France, and Chain 2's outlets are present in almost all regions. Kellogg's has low share in Chain 1 across its entire territory and tends to have a high share in Chain 2 across its territory. This has a couple of key implications. First, when we consider the northernmost part of France (e.g., Nord Pas-de-Calais, Paris), the overlap of Chain 1 and Chain 2 in the same region leads to considerable within-region variation in market shares. This suggests that chain variation is an important component of market shares. Second, in regions where Chains 1 and 2 do not overlap, such as Bordeaux in the southwest of France (where only Chain 2 operates), it is unclear whether the high share for Kellogg's can be ascribed to a chain effect or a region effect. Therefore, it is desirable to control for chain effects when measuring region effects, and the overlap of chains within at least some of the regions makes it possible to disentangle these effects (e.g., in our 9- and 22-region data).

We consider brand  $\times$  time interactions because time effects may be brand specific as a result of brand-specific promotions or advertising. Time main effects (as BDD include) may not explain much variation in share because share gains for one brand often come at the expense of another brand. This implies that the combined share of the top two brands might not vary much over time (if all brands are included, constraints on the sum of market shares mitigate any over-time variation).

#### RESULTS

##### *Market Share Analysis of Variance*

Table 2 reports the results of each model. M0, which is reflective of the approach that BDD use, indicates that (1) market main effects explain much more market share variation than time main effects (14.2% versus 6.5%) and (2) brand  $\times$  market interactions explain more variation than the sum of their main effects (76.5% > 51.3% + 14.2%). These results reaffirm BDD's finding that there is a large, brand-specific geographic dispersion in market shares that dominates time main effects.

M1 replaces BDD's "one-at-a-time" analysis of variance (ANOVA) in which each factor is considered separately with a simultaneous ANOVA and all factors are simultaneously present. This controls for nonorthogonality in the design variable because a small number of brand-region-time combinations are not present in our data. M1 indicates that the combined brand, market, and brand  $\times$  market effect constitutes 50.9% + 14.1% + 11.1% = 76.1% of the total variation (similar to M0's 76.5%).

In M2, we assess the robustness of the findings to a 69% increase in the data duration (from 39 to 66 four-week periods). As BDD indicate, more observations over time accommodate the possibility of an increase in time variation. In confirmation of their conjecture, the total variation accounted for by time effects increases from 6.4% to 9.9%, and the sum of brand, market, and brand  $\times$  market effects drops somewhat to 71.3%. Note that the time variation increases in proportion to the data length, suggesting that it is important for firms to collect long periods of data to assess the long-term effects of their strategies on market share (Ataman, Van Heerde, and Mela 2006).

Next, we consider the sensitivity of our results to time and regional aggregation. Regional differences as a percentage of total variation become slightly less pronounced as we disaggregate markets: 71.3% for 9 regions (M2) versus 69.5% for 22 regions (M3b) and 64.7% for 96 regions (M3c). Similarly, time effects become slightly less pronounced as a percentage of total variation as time aggregation increases: 10.5% for weekly periods (M3a) versus 9.9% for four-week periods (M2). Overall, the regional effects are largely robust to aggregation across time and region. Our subsequent analyses proceed using the most disaggregated time (i.e., 264 weeks) and the most aggregated region (i.e., 9 regions) levels because the larger regions offer the most orthogonal design to disentangle region and chain effects and because the 264 weeks provide more information about time effects.

M4 considers chain aggregation by disaggregating the data from the brand per region per time level to the brand per region per time per chain level. The percentage of total variation explained (39.8%) by the same four factors (market, brand, time, and brand  $\times$  market) is much lower than M3a (77.4%) because of added variation in the data that arises from unobserved chain per time per region per brand factors. In other words, adding observations but not regressors to the ANOVA decreases the explained variation in the model. This makes it difficult to compare the regional effects across the different data sets because, in general, the explained variation falls with more observations. To address this issue, we introduce another metric: percentage of

Figure 1  
ANALYSIS STEPS

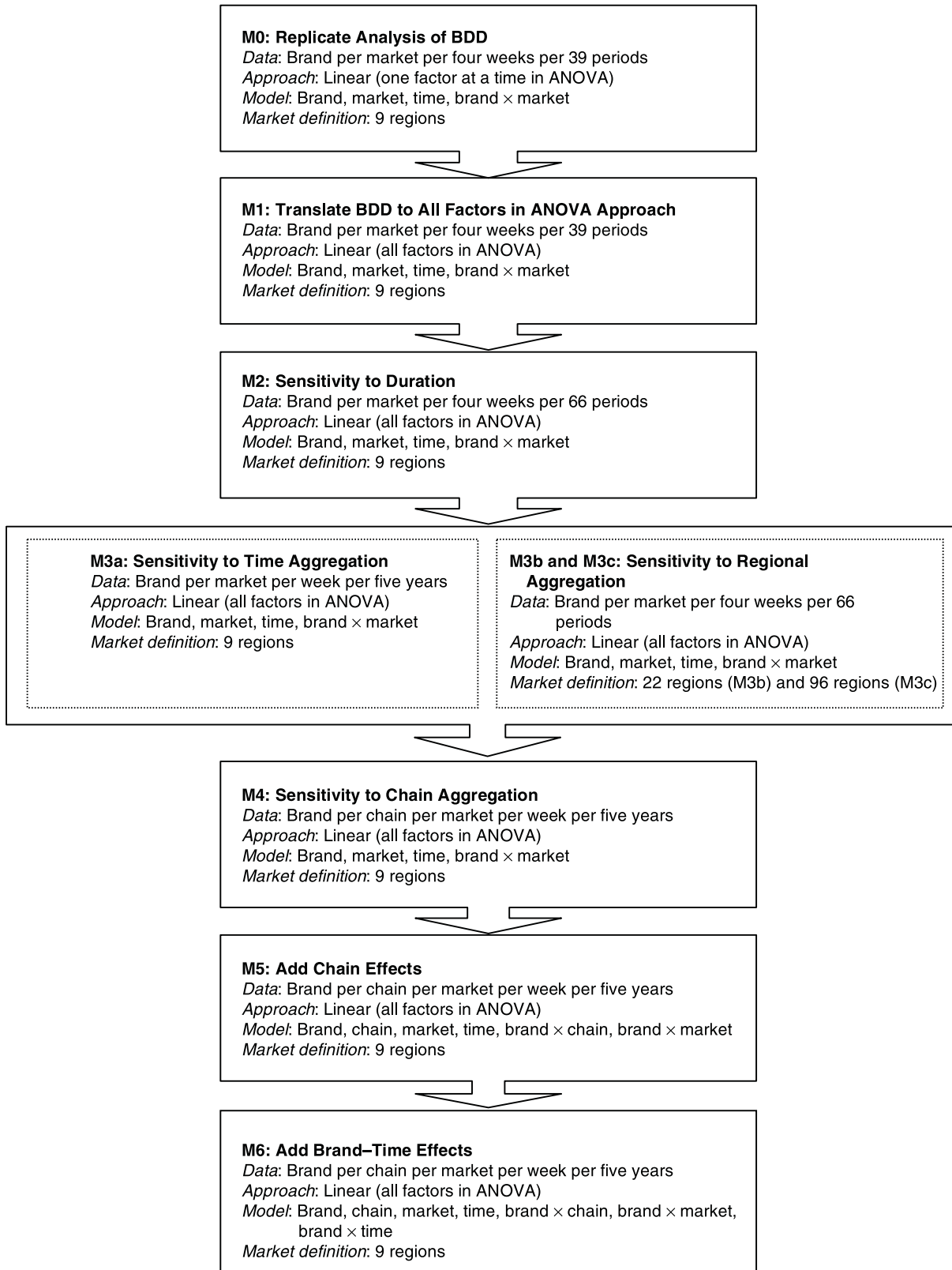


Table 2  
 PERCENTAGE OF VARIANCE EXPLAINED (AVERAGE ACROSS 25 CATEGORIES)

Model	Data	Duration/Market Definition	Market (%)	Chain (%)	Brand (%)	Time (%)	Brand × Market (%)	Brand × Chain (%)	Brand × Time (%)
M0	Brand per market per four weeks	39 periods/9 regions	14.2	—	51.3	6.5	76.5	—	—
M1	Brand per market per four weeks	39 periods/9 regions	14.1	—	50.9	6.4	11.1	—	—
M2	Brand per market per four weeks	66 periods/9 regions	12.5	—	48.5	9.9	10.3	—	—
M3a	Brand per market per week	265 periods/9 regions	11.3	—	46.2	10.5	9.4	—	—
M3b	Brand per market per four weeks	66 periods/22 regions	12.2	—	43.4	8.2	13.9	—	—
M3c	Brand per market per four weeks	66 periods/96 regions	13.8	—	35.3	5.3	15.6	—	—
M4	Brand per chain per market per week	265 periods/9 regions	4.5	—	27.6	3.4	4.3	—	—
M5	Brand per chain per market per week	265 periods/9 regions	3.3	8.8	11.9	3.3	3.1	8.2	—
M6	Brand per chain per market per week	265 periods/9 regions	3.3	8.8	11.9	3.1	3.1	8.1	5.2

Notes: We report the average eta-square for all models. Note that the results of M0 are comparable to those of BDD because eta-square and R-square statistics are identical in models with a single fixed effect.

explained variation (as opposed to percentage of total variation). The brand and market factors in M4 constitute  $(4.5\% + 27.6\% + 4.3\%)/(4.5\% + 27.6\% + 4.3\% + 3.4\%) = 91.5\%$  of the explained variation, compared with 86.4% in M3a, 89.4% in M3b, 92.4% in M3c, 87.8% in M2, and 92.2% in M1. Because these percentages are all roughly comparable, we conclude that regional effects are robust to aggregation across chains, markets, and time in terms of their relative importance in explaining variation in market share.

M5 adds chain and brand  $\times$  chain effects to M4. We add chain effects because there is considerable regional variation in the location of chains, as we discussed previously, and because we conjecture that these effects may explain considerable variation in market shares. The results of M5 indicate that chain effects (8.8%) explain more share variation than market (3.3%) or time (3.3%) main effects in France. In addition, when we add chain and brand  $\times$  chain effects, we observe that the explained variation that arises from the combined chain, brand, and brand  $\times$  chain effect is larger than the combined brand, market, and brand  $\times$  market effect (28.9% versus 18.3%). Both factors appear to dominate time effects. Furthermore, the percentage of explained variation that arises from brand, market, and brand  $\times$  market effects decreases from 91.5% in M4 to 47.4% in M5 because the variation explained by chain effects is considerable and because some of the regional variation in shares can be ascribed to chains. Reflective of this latter point, the percentage of total variation explained by the combined region and brand  $\times$  region effects decreases from 8.8% to 6.4% (a decrease of 27%) when we add chain effects, suggesting that it is desirable to control for chain effects when estimating region effects. From M5, we conclude that not only does spatial variation in market shares merit additional attention but so too does variation in shares across chains.

M6 adds brand  $\times$  time effects. In this model, the combined brand, market, and brand  $\times$  market effect accounts for 18.3% of the total variation; the combined brand, chain, and brand  $\times$  chain effect accounts for 28.8% of the total variation; and the combined brand, time, and brand  $\times$  time effect accounts for 20.2% of the total variation in market shares.<sup>2</sup> Therefore, brand–time effects are somewhat larger than brand–region effects in France and constitute a key source of variation in market shares.<sup>3</sup>

<sup>2</sup>When adding a brand  $\times$  time interaction to M0 (denoted M0a), we find that the percentages of total variance explained by market, brand, time, brand  $\times$  market, and brand  $\times$  time are 14.0%, 50.9%, 6.9%, 11.1%, and 12.5%, respectively. This indicates that brand and time effects as a percentage of total variance (70.3%) are smaller than combined brand and region effects (76.0%) in France, but they are still sizable. The increasing relative importance of time effects at the chain per week level may reflect chain-level differences in promotional strategy.

<sup>3</sup>We also estimated a multivariate analysis of variance of the two brand shares on brand, chain, region, and time. This analysis controls for within-chain covariation of brand shares for a given chain per region per period. In the between-subjects block, market, chain, and time explain 12.3%, 27.2%, and 11.1% of the total variation, whereas in the within-subjects block, the market, chain, and time effects explain 7.6%, 15.8%, and 11.1% of the total variation. The brand effect is 23.4%; thus, brand effects are dominant on within-chain differences in brand shares, and chain effects are dominant on mean share differences across markets. Furthermore, time effects exceed region effects within chains, whereas the region effect exceeds the time effect across chains. This implies that between-subjects variation in market shares is the predominant source of regional variation in shares.

### *Spatial Dependence*

Following BDD, we estimate each brand's spatial autocorrelation using Conley and Topa's (2002) approach.<sup>4</sup> We find significant spatial autocorrelation primarily in the lowest level of regional aggregation (the spatial autocorrelation is significantly different from zero for 78%, 48%, and 10% of brands in the 96-, 22-, and 9-region levels, respectively). We find that brand shares are correlated in regions separated, on average, by 96, 58, and 9 miles in the 96-, 22-, and 9-region levels, respectively (inclusive of zero distances). The finding of lower levels of spatial autocorrelation in France may reflect greater regional heterogeneity in customs and culture (as is the case in many countries) than in the United States. For example, the easternmost regions of Alsace-Lorraine and Moselle are influenced by German-speaking cultures, Flemish culture is prevalent in the far north, Italian influences are present in the far southeast, Celtic influences are common in Bretagne in the northwest, and Catalan and Basque cultures are common along the Spanish border. This suggests that spatial covariation is most likely to manifest at the most local level. Consistent with this conjecture, much of this spatial covariation is attenuated when we aggregate across regions.

### *CONCLUSION*

First, we replicate in France BDD's findings pertaining to the central role of regional variation in market shares. In short, the important source of market share variation that BDD document, which has been previously underattended in marketing research, is robust across different levels of time and region aggregation and time duration. Moreover, spatial dependence in market shares appears to be a common phenomenon in France and the United States. Second, we find that a large portion of the explained market share variance in France is due to chain effects. Importantly, these chain effects exceed region and time effects, suggesting that there is another important component to market shares that has been largely underattended by the field. An interesting avenue for further research would be to assess whether these chain differences are another manifestation of regional variation in shares that arises from manufacturer policy or local consumer preferences or whether they are related to other chain-specific factors. Third, by extending BDD's analysis to the chain per week level over five years and adding brand  $\times$  time interactions, we find that brand–time effects are larger than brand–region effects in France. We also find the time variation in share increases with the duration of the data, and therefore we recommend that firms work to collect data over increasingly long durations to understand better how brands garner enduring share advantage. Given the plethora of research pertaining to explaining brand–time variation, the relative dearth of research on spatial and chain effects is surprising, and we commend BDD for their pioneering research in this area.

<sup>4</sup>We estimate spatial autocorrelation using each brand's mean market shares across 50 markets and a uniform kernel with a bandwidth of 50 miles, which is approximately 25% of distance distribution's interquartile range for each level of regional aggregation. We obtain the acceptance regions using a bootstrap procedure, in which data are resampled from the empirical marginal distribution with replacement and locations fixed.

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