

Analysing proprietary, private label and non-brands in fresh produce purchases

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Abstract

When purchasing packaged products within a supermarket, consumers choose between proprietary or private label brands. However, when purchasing fresh fruits and vegetables, non-branded produce is the dominant option – with proprietary and private label brands only recently becoming available. Previous FMCG research finds that proprietary and private label brands affect consumer loyalty - however, no research exists for fresh categories. This research is the first to determine the effect of emerging brands in fresh categories on consumer buying behaviour. Our research examines consumers' loyalty towards proprietary, private label, or non-branded fresh fruits and vegetables and the level of customer sharing between these options, using analytical approaches applicable to FMCG categories. The panel data contains nearly 46,000 households making over eight million purchases in the United States during 2015. Results show that proprietary, private label, and now non-branded fresh produce have expected loyalty levels, for their size, and consumers share their purchases across the three options (i.e., consumers are not loyal to just one option). The study analyses and interprets purchase data in fresh categories offering marketing academics and practitioners actionable advice for working with fresh produce purchase data.

Keywords: Double jeopardy; duplication of purchase; consumer behaviour; non-branded; fresh fruit and vegetable categories

Introduction

For several decades marketing researchers became accustomed to working with consumer purchase data in fast moving consumer goods (FMCG), developing approaches to guide their analyses (Graham *et al.* 2017). When documenting brand loyalty relative to size - use double jeopardy (DJ) (Ehrenberg *et al.* 1990). When outlining brands sharing customers - use duplication of purchase (DoP) (Goodhardt 1966). These useful patterns measure loyalty towards, and competition between FMCG brands, product variants (Singh *et al.* 2008), and prices (Dawes *et al.* 2017). The recent expansion of these analytical tools includes the context of private label brands (Dawes & Nenycz-Thiel 2013), an unusual condition given the lower branding investments. However, other products are receiving even less marketing and branding investment – commodities. To the best of our knowledge, few studies cover these products, giving academics and practitioner’s limited guidance on what to expect in data analysis.

The lack of non-branded products examination is surprising, given their traditional domination in fresh fruit and vegetable categories – a market in the United States (US) worth \$992 billion, accounting for 5.5% of Gross Domestic Product (GDP), and employing 21.6 million people (USDA 2018). A recent trend is emerging with the development of proprietary and private label brands. Fresh proprietary brands are focusing on the grower/manufacturer (e.g., Sunny farms, Zespri or Dole) or production region (e.g., New Zealand gold or Tasmanian apples). For consumers, proprietary fresh brands, like FMCG brands, are decision-making short-cuts, allowing consumers to identify products that satisfy their needs. Similarly, fresh proprietary brand advertisements could encourage first-time trial (Bogomolova *et al.* 2017), with recognition influencing consumer repeat purchase rates, and increasing loyalty to a proprietary brand, over non-branded produce.

Fresh category private label brands are another recent trend. Retailers who are already providing good quality fresh produce at a reasonable price (Hutcheson & Moutinho 1998) are now offering private label alternatives. These private label brands serve the same function as the proprietary brands,

allowing consumers to identify and form loyalty quickly. Despite the unique nature of the fresh fruit and vegetable category, its significant economic contribution to all members of the supply chain, and the novel developments in its branding structure, no contextual research exist. Our research fills this gap by guiding marketing academics and practitioners towards analytical approaches and models for measuring buying behaviour of proprietary, private label and non-branded products in fresh categories.

The article begins by exploring proprietary, private label, and non-branded produce before outlining patterns of consumer buying behaviour. Specifically, the relationship between how many people and how often they choose a brand. It continues by examining how brands share consumers within a category. This study contributes original empirical research into how consumers purchase non-branded products within the context of fresh categories using observational data. The manuscript outlines several key concepts to marketing research practitioners including, how to approach consumer purchase data in fresh categories, which analytical approaches to use, and what benchmarks they should expect.

Background

Development of brands in fresh categories

Decades of research demonstrates that within FMCG categories, brands affect consumer choices. Brands distinguish products (Laaksonen 1994), signal consistent quality (Zeithaml 1988; Keller & Lehmann 2006), are easier to find (Shocker *et al.* 1991), and therefore encourage repeat purchases (Kotler 1967). Brands are built by understanding and serving customers' wants and needs. The concept of customer-based brand equity (CBBE) holds all of the knowledge that consumers have about a brand (Keller 2001). CBBE builds on five components: perceived quality, brand awareness, brand associations, other proprietary brand assets, and brand loyalty (Aaker 1991; Keller 1993; Zeithaml 1988). This study focuses on brand loyalty (Aaker 1991), specifically, modelling the behavioural

loyalty towards individual brands (DJ) or groups of brands (DoP) (Bryła 2018; Ehrenberg & Goodhardt 2002; Sharp *et al.* 2012; Winchester *et al.* 2015).

Brands aid consumer's decision making. Proprietary brands have existed in grocery stores for decades, and are often available throughout different retailers and store formats. For example, within the US, Pepsi Cola is available in various retailers (e.g., Walmart and Safeway) and different store formats (e.g., hypermarkets, supermarkets, convenience stores) throughout the country (Kumar & Steenkamp 2007). These proprietary brands enhance repeat purchase rates and brand loyalty within FMCGs (Ehrenberg *et al.* 2004; Goodhardt *et al.* 1984). Now, fresh category growers are starting to develop and promote proprietary (e.g., Chiquita bananas) or private label (e.g., Walmart stickered bananas) branded produce.

Private label brands first appeared in the US in the early 1970s, initially accounting for 1% market share (Kumar & Steenkamp 2007). Often, the price was lower, the packaging was plain, and they received less attention or advertising support (Kumar & Steenkamp 2007; McEnally & Hawes 1984). In the following decade, private label's market share grew to 10% (Hoch & Banerji 1993). After which, retailers, realising that private labels with improved quality, increased promotion, and long-term strategies, enabled higher profit margins, and thus, increased production, which resulted in ~18% of category sales (Nielsen 2018). A review of the literature finds that private labels benefit retailers in seven key ways - increasing category profits, heightening gross margins, increasing bargaining power with manufactures, decreasing the risk of carrying proprietary brands on promotion, differentiating competing chain stores, boosting store loyalty, and attracting price-sensitive and deal-prone consumers (Hyman *et al.* 2010).

Overall, proprietary and private label brands simplify consumers' choice. Private labels share memory cues (Nenycz-Thiel *et al.* 2009), which are offset by how consumers see each store (e.g., premium

retailers as having premium private labels and discount retailers as having discount private labels (Nenycz-Thiel & Romaniuk 2012)). Studies comparing proprietary brands with private labels examined the competition between them, finding that they retrieve the same attributes (e.g., costs a little less, or gives great clean for less) in the evoked set and brands compete with those associated with the same memory cue (Nenycz-Thiel *et al.* 2009). Prior knowledge of non-users is higher for proprietary brands than private labels (Nenycz-Thiel & Romaniuk 2014).

Double jeopardy – a behavioural loyalty pattern

Double jeopardy, the commonly repeating pattern closely described by simple mathematical models with underlying theoretical assumptions, was first described by Sociologist William McPhee (1963). For almost sixty years, the pattern consistently shows that small brands have fewer buyers, who purchase slightly less frequently, and bigger brands have more buyers who buy slightly more frequently (Ehrenberg & Goodhardt 2002; Sharp *et al.* 2012). The difference between big brands and small brands is the percentage of category buyers purchasing in the period, and not their loyalty (often measured as purchase frequency, or share of category) (Graham *et al.* 2017; Greenacre *et al.* 2015; Uncles & Kwok 2009). The pattern occurs in FMCGs including instant coffee (Greenacre *et al.* 2015), toothpaste, carbonated soft drinks, yoghurt, instant noodle, soy sauce (Uncles & Kwok 2009), and many other categories such as washing detergent (Scriven *et al.* 2017). Earlier research analysing fresh category loyalty was not at a brand level, and the behavioural data were not observational (i.e., claimed) (Anesbury *et al.* 2018a).

DJ is a generalisable outcome of the NBD-Dirichlet model (hereafter Dirichlet) (Goodhardt *et al.* 1984; Sharp & Ehrenberg 2000). Dirichlet provides theoretical DJ values of brand penetration and average purchase frequencies (Kearns 2010), allowing for deviation identification (i.e., niche and Change-of-Pace (CoP)). When the difference between the observed behaviour and theoretical behaviour is greater than 10%, there is a deviation (e.g., if fewer consumers are buying a brand more often than

theoretically expected, a niche classification). To be considered niche, the observed penetration is less than 10%, and the average purchase frequency is greater than 10% of that expected (Anesbury *et al.* 2018b; Kahn *et al.* 1988; Scriven *et al.* 2017). Niche brands have a low market share because of their positioning to a small loyal customer base. Often small companies or a small division of large enterprises follow this strategy to avoid confrontation with the market leader (Kahn *et al.* 1988).

Alternatively, if consumers are buying a brand less frequently than expected, the brand is classified as a CoP. Therefore, the observed penetration is greater than 10%, and the average purchase frequency is less than 10% of that expected (Anesbury *et al.* 2018b; Kahn *et al.* 1988; Scriven *et al.* 2017). There are three common causes of CoP deviations - seasonality, buying for others (Scriven *et al.* 2017), and variety seeking (Kahn *et al.* 1988). Seasonality restricts the period the brand is available, and therefore, an inability to repeat purchase. Seasonality is a larger factor in the fresh categories compared to highly processed FMCGs with long shelf-lives, as the availability of fresh produce is dependent on growing seasons and harvest times. Seasonality influences price, origin, availability, and quality of fresh fruit and vegetables (Rekhy & McConchie 2014). Therefore, seasonality plays a role in the consumer choices and the resulting fit of the DJ pattern. Buying for others, say as a gift, means people buy brands, with no intention of buying again.

Similarly, restricted distributions or functional differences cause niche brands. Private labels, are only available in specific chains (Scriven *et al.* 2017), restricting their penetration to shoppers of these chains. Another example is Hispanic television networks being watched by Hispanic speakers, who are limited to those few channels (Goodhardt & Ehrenberg 1969). When observed brand performance differs from the Dirichlet theoretical, marketers often notice something interesting about consumers loyalty towards those brands (Ehrenberg *et al.* 2004).

While traditional reasons for DJ deviations (e.g., seasonality) equally affect proprietary, private label and non-branded products, this situation has additional reasons. First, proprietary brands receive far more marketing support, both instore and outside. The consistency, higher quality, larger advertising and media budgets all increase consumer's propensity to purchase these brands. Therefore, proprietary brands are more likely to exhibit niche like behaviour from consumers.

Second, the restricted distribution and lack of advertising (limiting the potential customer base), and the historical position of private label brands (i.e., lower quality, restricting trial, limiting potential customer base) (Romaniuk *et al.* 2014) are all potential causes for a small, but loyal customer base. The lack of advertising reduces knowledge amongst current non-brand buyers (Nenycz-Thiel & Romaniuk 2014), decreasing the probability of growing the brand's penetration, and maintaining this small, but loyal customer base. Empirical evidence shows that private labels, compared to proprietary brands, grow more in purchase frequency than share of category requirements (Romaniuk *et al.* 2014), which is the most prominent DJ loyalty measure. Further, if consumers see private label brands as entailing lower price and lower quality, and they maintain restricted advertising and distribution, then they may have small but loyal customer bases. However, consumers shop at multiple supermarkets (Wrigley & Dunn 1984), and therefore when analysing within supermarket buying behaviour, the occurrence of consumer buying at multiple supermarkets results in private labels being much more likely to be CoP.

Last, non-branded products may be CoP, as previous research shows that their greatest impact occurs for penetration (not loyalty) if consumers see them as commodities, where quality is of less importance (Harris & Strang 1985). Therefore, the first research question is:

RQ1: Are proprietary, private label, and non-branded fresh produce bought as expected, given the double jeopardy pattern?

However, the 10% deviation proposed by Kahn et al., (1988) and widely adopted (Anesbury *et al.* 2018b; Scriven *et al.* 2017) is arbitrary (why not 5%, or 20%, or 50%?), so we use a secondary approach. Driesener *et al.* (2017) propose using eight goodness-of-fit tests to determine if Dirichlet accurately models the brand buying behaviour. The tests compare the observed and Dirichlet theoretical values for both penetration and average purchase frequency in four ways. Using the estimated and the observed metrics 1) the comparisons of the averages, 2) correlations, 3) mean absolute deviations (MAD), and 4) mean absolute percentage errors (MAPE). Therefore, the second research question is:

RQ2: Do categories containing proprietary, private label, and non-branded fresh produce still operate within the Dirichlet goodness-of-fit tests?

The DJ pattern determines the expected loyalty towards individual brands within the context of category-wide buying behaviour. However, consumers purchase more than one brand within a category (Banelis *et al.* 2013). Therefore, the DoP method (Ehrenberg & Goodhardt 1969) and its application (Anesbury *et al.* 2018a) examines multi-brand loyalty.

Duplication of purchase pattern of cross-brand purchases

DoP is an empirical generalisation stating that all brands share their customers with other brands within the category, in line with their size. Brands share more of their customers with larger brands and fewer customers with smaller brands (Sharp 2010). DoP originated from research analysing television channel viewer's loyalty, finding other factors (i.e., program content) had little influence (Ehrenberg & Goodhardt 1969; Goodhardt 1966). DoP also applies to radio listening (Lees & Wright 2013) and FMCGs, including, cereals (Anesbury *et al.* 2018b), organic foods (Bryła 2018), and fair trade coffee and tea (Winchester *et al.* 2015).

This study determines how proprietary brands, private-label brands, and non-branded produce share customers. DoP can determine if brands share customers unexpectedly. Deviations occur if brands share more or fewer customers than expected. Proprietary brands should share a higher proportion of their customers with larger private label or non-branded competitors and fewer with small private label brands or non-branded produce. However, private labels share consumers excessively (but not exclusively) with each other, and less with proprietary brands (Prendergast & Marr 1997; Stern 1994), but examining the pattern for non-branded produce is novel. In the pharmaceutical industry, while there is minimal over-sharing within proprietary brands and non-branded (generic) drugs, sharing occurs between them (Stern 1994). Further, Dawes & Nenycz-Thiel (2013) found that private labels compete against proprietary brands within the same store and private label brands in different stores. Higher competition amongst private labels of different retailers occurs when the categories have high purchase frequencies (which is the case for fresh categories). Prior research also tells us that private label penetrations are higher in lower consequence categories (i.e., minimal quality difference amongst brands), and is lower where previous category experience is necessary (Batra & Sinha 2000; Baltas 2003).

Private label shopper profiles may be diverse. While earlier studies find that private label buyers have lower incomes, are price conscious, and are older (Prendergast & Marr 1997; Ailawadi *et al.* 2001), more recent research found private label buyers have higher social status (Baltas 2003), and they appeal to a diverse array of consumer segments (Cuneo *et al.* 2019). The conflicting evidence regarding consumer demographics and their tendency to prefer private labels brands leads to our third research question:

RQ3: Do proprietary, private label, and non-branded fresh produce share customers as expected by duplication of purchase law?

Data and Method

Data description

To analyse the loyalty towards proprietary, private label, and non-branded products, and the competition between them, we examine Nielsen panel data from the US in 2015 (Kilts Centre for Marketing 2019). The dataset contains 45,958 households making up 8,123,409 purchases from ten different fresh categories (apples, oranges, carrots, lettuce, mushrooms, spinach, tomatoes, onions, potatoes, and strawberries) from the top three grocery retailers. As with the previous research examining the loyalty towards or perceptions of private label brands (Prendergast & Marr 1997; Nenycz-Thiel & Romaniuk 2014, 2016), this study analyses the data of each of the three retailers separately. Including multiple retailers is an advantage over past research (Hansen *et al.* 2006) as it gives insights into buyer behaviour patterns for private labels of different retailer's. Further, examining ten categories for three retailers, using disaggregate and aggregate data, provides us with a multiple sets of data approach (Bound & Ehrenberg 1989; Ehrenberg 1966, 1990). The built-in replication determines if an observation is once-off or reoccurring in different contexts. In this study, the analysis includes multiple categories and retailers. It is also essential to analyse large food retailers to ensure that they possess private label brands.

The current study analyses all three retailers individually and all ten categories at two different levels, disaggregated and aggregated. The study examines disaggregated proprietary brands within each category (Dawes & Nenycz-Thiel 2013) and examines an aggregated proprietary brand. Due to the data structure, the creation of aggregated proprietary superbrands was necessary to directly compare buying behaviour with the private label and non-branded products. By default, Nielsen aggregate private label and non-branded data, and therefore, the aggregation of proprietary brands were necessary to make an accurate comparison. The proprietary superbrand is an aggregation of all proprietary brands within one retailer, under one umbrella. For example, for retailer #1, an aggregation of the sales of eight apple

brands, including Trout, North Bay, and Chelan Fresh was made. The aggregation is a very important feature of the Dirichlet (Goodhardt *et al.* 1984) that allows the analysis of behaviour and ensures correct comparison of results. As demonstrated in this study, the feature goes beyond the aggregation of small brands as ‘other’ (Driesener *et al.* 2017; Ehrenberg *et al.* 2004; Graham *et al.* 2017; Scriven *et al.* 2017).

First, the three disaggregated proprietary brands and the aggregated private label and non-branded produce were analysed. Second, the aggregated ‘superbrands’ were analysed. That is, within each category, all proprietary brands, private label brands, and non-branded fresh produces (with penetration and market share higher than 1%) were aggregated. Previous studies have analysed the aggregation of smaller brands as a ‘superbrand’, displaying no negative affect on the model specifications (Goodhardt *et al.* 1984; Habel & Lockshin 2013). The two levels of analysis will give insights into the general purchase behaviour of proprietary, private label, and non-branded products.

The analysis being with double jeopardy - determining if consumers are purchasing proprietary, private label, and non-branded fresh fruits and vegetables as expected. Adopting the 10% deviation of observed and theoretical Dirichlet values (Kahn *et al.* 1988), identifies brands buying more, or less frequently than expected for their size. Next, the ANOVA calculations of the disaggregated data, using the mean penetration and average purchase frequencies for three retailers, show any statistically significant differences between the proprietary, private label, and non-branded products. ANOVA calculations of the Dirichlet model of proprietary superbrands tests whether the mean values of several independent groups, which are defined by a categorical independent variable (the three retailers), differ. Given the 10% deviation benchmark limitation (Kahn *et al.* 1988), the study uses the eight goodness-of-fit tests (Driesener *et al.* 2017) to determine if the fresh category buying is in a Dirichlet manner.

The tests involve the comparison between the observed and Dirichlet theoretical values for both

penetration and average purchase frequency in four ways - comparisons of the averages, correlations, MAD and MAPE.

The analysis continues with duplication of purchase - determining if consumers are purchasing across proprietary, private label, and non-branded fresh fruits and vegetables as expected. That is, brands will share customers in line with their size. To determine if there is higher, lower, or expected consumer sharing, we employ the partition sharing index (PSI). PSI calculates the level of customer sharing between brands of relative size. A PSI of 1.0 shows the brands share customers as expected. A PSI of 0.25 states that brands share 75% fewer customers than expected. A PSI of 1.25 indicates that the two brands share 25% more customers than expected. Sjöstrom *et al.* (2014) stated a $PSI > 1.20$ warrants further analysis for managerial conclusions. Further, the interpartition PSI calculates the level of customer sharing between all proprietary brands with private label brands and between all proprietary brands with non-branded products. The same analysis occurs for aggregated data with proprietary superbrands.

Results

Double Jeopardy

Figure 1 shows the observed and theoretical values of the disaggregated tomato data. The Dirichlet workbook, developed by Kearns (2010) calculates the theoretical values for penetration (x-axis) and the average purchase frequencies (y-axis).

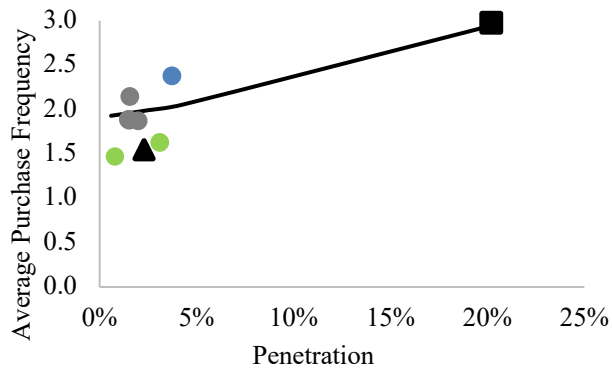


Figure 1: Double jeopardy and Dirichlet benchmark (US, disaggregate tomato brands, retailer #2, 2015)

Note: Grey, green, and blue dots represent observed data. The black line visualises the theoretical values. The greater the distance between the dots and the line, the greater the deviations from expectation. Blue and green dots are the brands that deviate more than 10% from theoretical values. Niche brands are blue; green dots are CoP. The brands that are as expected are grey. The triangle represents the non-branded product; the square represents the private label.

We systematically calculate the DJ observed and theoretical values for all fresh categories and all retailers. Table 1 data shows that 44% of disaggregate proprietary brands behave as expected, 18% behave as niche, and 37% as CoP. 67% of private label brands behave as expected, 3% behave as niche, and 40% as CoP. Further, 60% of non-branded products behave as expected, 0% behave as niche, and 40% as CoP.

When examining the data of the aggregated proprietary brands, similar results were found, with the majority of brands behaving as expected. Interestingly, the classification of brands is different for proprietary brands and private label brands, while non-branded produce follows the same behaviour. When the proprietary brands are separate, 44% behave as expected, but are 83% when aggregated. Only the mushroom, spinach and onion category do not behave as expected; all others behave as DJ predicts. When analysing private labels, 67% of the separate proprietary brands behave as expected, while 57% when aggregated. The numbers for non-branded produce are identical for both datasets.

Table 1: Overview of DJ results (US, disaggregate and aggregate tomato brands, all retailers, 2015)

Produce categories	<i>n (brands)</i>	Expected (%)	Niche (%)	Change-of-Pace (%)
Disaggregated				
Lettuce	14	58	16	26
Mushrooms	12	56	19	25
Apples	14	55	5	41
Carrots	11	55	9	36
Spinach	18	42	0	58
Potatoes	9	41	18	41
Tomatoes	23	41	32	27
Oranges	15	38	14	48
Strawberries	20	28	25	47
Onions	10	27	45	27
Proprietary brands	146	44	18	37
Private Label	30	67	3	30
Non-Branded	30	60	0	40
Aggregated				
Proprietary brands	30	83	3	13
Private Label	30	57	3	40
Non-Branded	30	60	0	40

The ANOVA results show that proprietary brands and private label brand values differ significantly; while proprietary brands and non-branded, as well as non-branded and private labels, do not differ significantly. Therefore, proprietary brands and private labels have different purchase frequencies and penetrations, while proprietary brands and non-branded, as well as non-branded and private labels, show no difference in purchase frequencies and penetrations across all retailers.

Table 2: ANOVA results of DJ and Dirichlet benchmarks (US, aggregate tomato brands, all retailers, 2015)

		Proprietary Brands	Non-Branded	Private Labels
		Mean/SD	Mean/SD	Mean/SD
Mean of all retailers	Penetration (%)*	27.3 ^a /12.8	11.9 ^{ab} /11.7	0.2 ^b /0.3
	Average purchase frequency*	2.9 ^a /0.8	1.8 ^{ab} /0.7	1.0 ^b /0.0

Notes: o = observed, significance level $p = 0.05$, different letters a, b signify differences between the brands according to post hoc test: Tukey

Employing Driesener et al. (2017) tests of fit, using the data of Figure 1 - tomatoes disaggregate analysis for retailer #2 was 8/8 (minimum 5/8). Table 3 shows 76% (46 of 60) analyses, and the categories have five or more tests passed. The majority of the categories, including non-branded products, operate in a Dirichlet world (Sharp et al. 2012).

Table 3: Dirichlet Model fit (US, disaggregate and aggregate tomato brands, all retailers, 2015)

Category Retailer	Aggregated			Disaggregated		
	#1	#2	#3	#1	#2	#3
Apple	6	8	8	6	8	7
Oranges	6	8	8	6	8	5
Carrots	4	8	8	4	8	7
Lettuce	5	6	8	4	6	8
Mushrooms	4	4	7	4	4	7
Spinach	4	4	7	4	3	5
Tomatoes	6	8	8	4	8	7
Onions	7	8	8	7	7	7
Potatoes	8	8	7	7	8	8
Strawberries	8	4	7	7	3	8

Duplication of purchase

DoP metricises customer sharing between disaggregate proprietary brands, and aggregated private labels and non-branded tomatoes superbrands. Table 4 shows Sunset shares 59% of its customers with non-branded tomatoes, 30% with others, 29% with Ol'e Vegetables, and 1% with private label brands.

The 1.10 PSI in Table 5 shows non-branded fresh produce share 10% more customers with private label brands than expected. Proprietary tomato brands of retailer #1 share 10% more of their customers than expected. Overall, they share 12% more of their customers with private labels, while they share 8% less with non-branded tomatoes. The results of retailer #2, and retailer #3 of the tomato duplication of purchase (Table 8, and Table 10) and partition sharing indexes (Table 9, and Table 11) are within the appendix. We systematically analyse all ten fresh categories interpartition PSI of private label brands and non-branded produce with proprietary brands.

Table 4: Duplication of purchase table (US, disaggregate tomato brands, retailer #1, 2015)

Buyers of...	Pen (%)	Who also bought...																
		Non-Branded	Other	Sun-set	Ol'e Vege-tables	Santa Sweets	Poli-cella	Inter-grow	Gre-cos	5 Reyes	Bonna Terra	Golden Sun	Fresh Point	Peak	Red Sun	Top Line	Flavor 1st Growers & Pickers	Private Label
Non-Branded	25.4		29	16	11	8	7	5	6	6	5	4	3	3	4	2	2	1
Other	10.5	70		19	14	11	7	5	7	6	9	3	2	1	5	3	3	1
Sunset	6.8	59	30		29	4	3	5	5	4	1	4	3	2	2	1	6	1
Ol'e Vege-tables	5.2	56	27	38		3	3	3	4	6	1	1	0	0	0	2	3	1
Santa Sweets	3.1	69	36	9	4		7	2	7	10	12	6	12	3	11	12	0	1
Policella	2.7	66	25	7	5	8		0	8	8	9	10	0	10	3	0	0	0
Intergrow	2.1	64	25	17	8	3	0		5	0	2	6	1	1	2	0	4	1
GrecoS	2.0	78	37	15	9	10	11	6		9	14	5	0	12	9	0	0	0
5 Reyes	1.7	82	39	17	18	17	13	0	11		16	1	0	0	2	5	0	0
Bonna Terra	1.7	81	54	3	2	22	15	2	17	16		8	0	8	9	4	0	0
Golden Sun	1.7	56	20	18	3	12	16	8	6	1	8		25	18	16	0	2	0
Fresh Point	1.4	51	17	16	1	27	0	1	0	0	0	28		0	16	0	0	0
Peak	1.4	51	7	9	1	6	20	2	18	0	10	21	0		13	0	0	1
Red Sun	1.3	72	42	11	0	25	7	3	13	3	12	20	17	13		0	0	0
Top Line	1.3	48	25	5	7	29	1	0	0	7	6	0	0	0	1		0	1
Flavor 1st Growers & Pickers	0.9	56	30	44	17	0	1	9	0	0	0	3	0	0	0	0		2
Private Label	0.2	77	54	31	23	9	0	9	3	0	3	3	0	6	3	6	9	
Average Duplication		65	31	17	10	12	7	4	7	5	7	8	4	5	6	2	2	1

Table 5: Partition Sharing Indexes (US, disaggregate tomato brands, retailer #1, 2015)

	Pen (%)	Non-Branded	Private Label	Other	Peak	Gre-cos	Golden Sun	Santa Sweets	Red Sun	Fresh Point	5 Reyes	Poli-cella	Sun-set	Top Line	Ol'e Vege-tables	Inter-grow	Flavor 1st Growers & Pickers	Bonna Terra
Non-Branded	25.4		1.1	1.0	0.7	1.1	0.8	1.0	1.0	0.7	1.2	0.9	0.8	0.7	0.8	0.9	0.8	1.2
Private Label	0.2	1.1		1.9	1.5	0.5	0.6	1.0	0.8	0.0	0.0	0.0	1.7	1.6	1.6	1.5	3.5	0.6
Other	10.5	1.0	1.9		0.2	1.3	0.7	1.3	1.4	0.6	1.4	0.9	1.0	0.9	0.9	0.9	1.0	1.9
Peak	1.4	0.7	1.5	0.2		3.2	4.7	0.7	3.5	0.0	0.0	2.7	0.5	0.0	0.1	0.3	0.0	2.0
Gre-cos	2.0	1.1	0.5	1.3	3.2		1.2	1.2	2.4	0.0	1.9	1.5	0.8	0.0	0.6	1.0	0.0	3.1
Golden Sun	1.7	0.8	0.6	0.7	4.7	1.2		1.4	4.4	6.3	0.3	2.2	0.9	0.0	0.2	1.3	0.7	1.8
Santa Sweets	3.1	1.0	1.0	1.3	0.7	1.2	1.4		2.9	3.2	2.0	0.9	0.5	3.4	0.3	0.4	0.0	2.6
Red Sun	1.3	1.0	0.8	1.4	3.5	2.4	4.4	2.9		4.4	0.6	0.9	0.6	0.1	0.0	0.6	0.0	2.5
Fresh Point	1.4	0.7	0.0	0.6	0.0	0.0	6.3	3.2	4.4		0.1	0.0	0.9	0.0	0.1	0.2	0.0	0.0
5 Reyes	1.7	1.2	0.0	1.4	0.0	1.9	0.3	2.0	0.6	0.1		1.7	0.9	1.4	1.3	0.1	0.0	3.3
Policella	2.7	0.9	0.0	0.9	2.7	1.5	2.2	0.9	0.9	0.0	1.7		0.4	0.1	0.4	0.0	0.1	2.0
Sunset	6.8	0.8	1.7	1.0	0.5	0.8	0.9	0.5	0.6	0.9	0.9	0.4		0.3	2.0	0.9	2.4	0.1
Top Line	1.3	0.7	1.6	0.9	0.0	0.0	0.0	3.4	0.1	0.0	1.4	0.1	0.3		0.5	0.0	0.0	1.2
Ol'e Vege-tables	5.2	0.8	1.6	0.9	0.1	0.6	0.2	0.3	0.0	0.1	1.3	0.4	2.0	0.5		0.6	1.2	0.1
Inter-grow	2.1	0.9	1.5	0.9	0.3	1.0	1.3	0.4	0.6	0.2	0.1	0.0	0.9	0.0	0.6		1.5	0.4
Flavor 1 st Growers & Pickers	0.9	0.8	3.5	1.0	0.0	0.0	0.7	0.0	0.0	0.0	0.0	0.1	2.4	0.0	1.2	1.5		0.0
Bonna Terra	1.7	1.2	0.6	1.9	2.0	3.1	1.8	2.6	2.5	0.0	3.3	2.0	0.1	1.2	0.1	0.4	0.0	

Table 6 shows on average in the mushroom category, proprietary brands share 12% more customers than expected; sharing 32% less with private labels, but 380% more with non-branded mushrooms. On average, the PSI of proprietary brands of all retailers is 1.25, which means they are sharing 25% more customers than expected. They share 12% fewer customers with private label and 49% more customers with non-branded produce than expected. Overall, the results show that proprietary brands share more customers than expected; sharing less with private label brands, and sharing more customers than expected with non-branded produce.

Table 6: Partition Sharing Index (US, disaggregate tomato brands, all retailers, 2015)

Category average	Partition sharing index (PSI)	Interpartition (PSI)	
	Proprietary brands	Private Label	Non-Branded
Apples	1.41	1.00	0.94
Oranges	1.20	1.23	1.00
Carrots	1.61	0.88	0.99
Lettuce	1.29	0.75	1.64
Mushrooms	1.12	0.68	4.80
Spinach	0.68	1.13	0.96
Tomatoes	1.15	0.81	0.99
Onions	1.09	0.87	1.11
Potatoes	1.40	0.86	1.01
Strawberries	1.13	0.31	1.15
Average Retailer 1	1.17	0.96	1.85
Average Retailer 2	1.26	0.83	1.59
Average Retailer 3	1.34	0.85	1.03
Average of all Retailers	1.25	0.88	1.49

Additionally, the results of the interpartition (PSI) of the aggregated data set show that across the ten categories, for the three retailers, proprietary brands share 2% fewer customers with private label brands, and 17% more customers with non-branded produce, than expected. There is a slight deviation with retailer #1, where proprietary and private label brands share 15% more customers; potentially due to retailer #1 highly advertising their private label brands, and thus, consumers are more aware of them than of retailer #2 and #3. Another reason might be that

retailer #2 and #3 have fewer private label brands in the fresh categories, and therefore the availability of non-branded produce is higher.

Discussion and implications

Our research enriches the analytical tool kit of marketing researchers by showcasing the application of two known FMCGs consumer behaviour models (i.e., double jeopardy (Ehrenberg *et al.* 1990), and duplication of purchase (Goodhardt 1966)) to a novel context. The fresh category economic significance for all supply-chain members (USDA 2018) urges the development of benchmarks to guide the marketing research industry, particularly, with the recent development of proprietary and private label brands.

Our research illustrates the application of consumer behavioural metrics, to measure consumer loyalty towards proprietary brands, private label brands, and non-branded produce, and the levels of customer sharing between them. Table 7 shows that all three brands, at an aggregate level, behave as expected - given established FMCGs category benchmarks. The inclusion of non-branded produce in the analysis (complementing the branded and private labels) does not interfere with Dirichlet modelling, and customer sharing is as expected. At a disaggregated level, the patterns are mostly as expected, with a higher percentage of DJ deviations, slightly fewer categories fitting the Dirichlet benchmarks, and some slight oversharing of customers.

Table 7: Overview of research questions and results

Research Questions	Aggregated Brands	Disaggregated Brands
RQ1: Are proprietary, private label, and non-branded fresh produce bought as expected, given the double jeopardy pattern?	Yes - only 3% of proprietary brands behave as niche and 40% of private label and non-branded behave as CoP.	Mostly - 18% of proprietary brands behave as niche, and 30% of private label and 40% of non-branded behave as CoP.
RQ2: Do categories containing proprietary, private label, and non-branded fresh produce still operate within the Dirichlet goodness-of-fit tests?	Yes - 80% of the categories had an acceptable level of fit.	Mostly - 73% of the categories had an acceptable level of fit.
RQ3: Do proprietary, private label, and non-branded fresh produce share customers as expected by duplication of purchase law?	Yes – proprietary brands share just 2% fewer customers with private label brands, and 17% more customers with non-branded produce.	Mostly – proprietary brands share 25% more customers with themselves, 12% fewer customers with private label, but 49% more with non-branded produce.

For decades, marketers have known that within a store, consumers purchase proprietary and private label brands – they now know they similarly purchase non-branded produce (commodity). Overall, consumers are purchasing non-branded products in the same way they purchase proprietary and private label brands of a similar size. Therefore, non-branded products within a retailer are bought by consumers in the same manner as either proprietary or private label brands in a different retailer. There are some slight differences, in that non-branded products are bought by slightly more consumers, who repeat buy them less frequently than expected. The suspicion is non-branded products do not share the benefits of lower quality and price (Kumar & Steenkamp 2007; McEnally & Hawes 1984), or memory structures of private labels (Nenycz-Thiel *et al.* 2009; Nenycz-Thiel & Romaniuk 2012). Similarly, non-branded products do not have the distinguishability or consistent quality of proprietary brands (Laaksonen 1994; Keller & Lehmann 2006), which increase the probability of repeat purchase (Ehrenberg *et al.* 2004; Goodhardt *et al.* 1984).

Overall, with disaggregate proprietary brands, the results matched earlier FMCG studies (i.e., slightly higher incidence of CoP, rather than niche) (Scriven *et al.* 2017). In contrast, the aggregated results differ from earlier studies as they show fewer incidences of both niche and

CoP. The lower likelihood of fresh brands being CoP might be due to modern cultivation in a controlled environment (e.g., heated greenhouse and year-round availability).

Where there were deviations, it is due to functionality at a category level. That is, many people purchase from the category, but not often (do not desire the taste often), where the category is only required occasionally (only used in select recipes). There are also instances at a brand level, where the private label and non-branded fresh produce are less likely to be niche. This occurs when it is harder to communicate lower quality and lower price to consumers. One reason for this could be the lack of packaging. In an age of consumer backlash against plastic packaging (Klaiman *et al.* 2016), retailers may opt to distinguish themselves by offering a unique variety, or to communicate sensory cues such as taste or texture (Swahn *et al.* 2012; Imm *et al.* 2012). The apple category contains the botanical variety of communication (e.g., Jonagold, Elstar, Granny Smith), while the tomato category sometimes communicates taste and usability. CoP results are similar for the aggregated and disaggregated data.

When buying from the category on multiple occasions, consumers are purchasing across proprietary, private label, and non-branded products. Consumers are not limiting their purchases to a single category, having purchased from the cheapest option, or the most consistent quality option. Instead, these results indicate that consumers contain all three types of brands within their repertoire. Consumers are purchasing the more expensive, higher consistent quality proprietary brands, and the non-branded products that are cheap and vary in quality. In the instance where proprietary brands share most customers and fewer with private label or non-branded products, the retailer may have more proprietary brands in their assortment. Furthermore, the customer does not always have a choice between all three brand options. Some produce might only be available in one brand version.

Theoretical implications

The research has several theoretical contributions. This research expands the known conditions of the NBD-Dirichlet model – more specifically, the double jeopardy and duplication of purchase patterns (Ehrenberg et al. 1990; Goodhardt 1966), into a new context of frequently bought commodity products – fresh fruits and vegetables. Of particular novelty is the examination of a condition of historical dominance of non-branded alternatives within the category, and the recent emergence of proprietary and private label brands.

Our research builds on and reinforces the earlier research of Anesbury et al. (2018a), who analyses fresh category loyalty with claimed behavioural data. The current research analyses observed behavioural data, at a brand level, once again finding the same FMCG consumer behaviour patterns. The new evidence within this study demonstrates that even a category that is severely affected by seasonality, price, origin, availability, and quality of fresh fruit and vegetables (Rekhy & McConchie 2014) still operates in a Dirichlet world (Sharp et al. 2012).

One questionable aspect of previous Dirichlet model deviations is the seemingly arbitrary 10% deviation benchmark (Anesbury et al. 2018b; Kahn et al. 1988; Scriven et al. 2017). Our research, while using this approach, provides additional support for the work of Driesener et al. (2017) who proposed using eight goodness-of-fit measures to provide a more robust determination of Dirichlet modelling.

Last, our research adds additional support for the Dirichlet model's ability to go beyond an aggregated 'all other' brand (Goodhardt et al. 1984). That is the aggregation of all remaining small brands - (Driesener et al. 2017; Ehrenberg et al. 2004; Graham et al. 2017; Scriven et al. 2017), to the creation of multiple distinct grouping of brands sharing a similar characteristic (i.e., superbrands - (Goodhardt et al. 1984; Habel & Lockshin 2013)).

Practical implications

The research helps marketers operating in the fruit and vegetable markets to better understand how consumers purchase proprietary, private label, and non-branded products. It shows that known consumer buying behaviour patterns observed in the FMCG literature for decades (Goodhardt 1966; Ehrenberg et al. 1990), are also evident in this novel context. This applicability means that fresh marketers can increase consumption by increasing penetration, rather than loyalty (Romaniuk et al. 2014). Remarkably, this is true regardless of the brand being proprietary, private label, or non-branded.

Those who manage proprietary, or private label brands still have a clear advantage over non-branded produce. They can build CBBE (Aaker 1991; Keller 1993; Zeithaml 1988), and mental availability (Romaniuk 2013, 2016). Further, proprietary brands have a distinct advantage over private label brands. Their ability to be bought from multiple retailers (Kumar & Steenkamp 2007), means they can increase their physical availability (Romaniuk & Sharp 2016), beyond anything a private label could ever hope to achieve (while keeping in mind physical availability can also be improved within store via relevance and prominence).

Given that consumers of proprietary brands purchase private label and non-branded produce, and vice versa, retailers must stock a variety of brands. The clear display of polygamous loyalty, manifesting as repertoire buying behaviour (Banelis et al. 2013; Trinh et al. 2017) is evident even in a category where brands are only recently emerging. For growers, the expectation is that consumers will not solely purchase only that brand, or love that brand (Batra et al. 2012), and setting such goals is unrealistic and counterproductive to growth.

Other studies show that consumers are willing to pay price premiums for proprietary brands, but not for non-branded products (Sethuraman 2003; Steenkamp *et al.* 2010). Consumers, in turn,

benefit from the typical advantages of branded products. They benefit from consistent quality (Zeithaml 1988), ease of finding the fresh produce within stores (Shocker *et al.* 1991), and, therefore, their ability to repeat purchase (i.e., be loyal customers) (Kotler 1967). From a retailer's perspective, creating their own private label brands allows them to control their in-store space further, give their products a better positioning, add merchandising, which may increase sales and profitability (Romaniuk *et al.* 2014).

For those working in marketing research and analytical roles, they can confidently include non-branded products within their NBD-Dirichlet analyses. They can be sure to know that consumers will have similar levels of loyalty towards non-branded products as they do for proprietary or private label brands of the same size, and that consumers will purchase predictably. These insights allow marketing researchers to expand their analytical tool kit when they work with fresh categories data. They now have benchmarks for what to expect when they apply the double jeopardy and duplication of purchase analyses to proprietary, private label and commodity-type products of fruits and vegetables.

Further, the introduction of pre-packed fresh offers (as proprietary brands), such as perfectly sized fruit and vegetables to fit kids' lunch boxes, meet consumers' need for convenience – an increasingly prevalent trend. For retailers, this allows the expansion of the fresh offering, from non-branded (loose), to proprietary or private label (pre-packed) options. Given that fresh produce generally has higher profit margins than other categories in the supermarket, expanding the fresh offer will contribute to the retailer's overall bottom line. Additionally, including misshapen fresh produce at a lower price point, could meet consumers' emerging demand for strategies to reduce food waste, while also offering customers with different paying abilities more choices. The result could also expand the overall fresh sales, as cheaper options or more

convenient pre-packed offers could bring to the market new consumers who would not have bought fresh categories before. For example, those who could not afford it (for cheaper products), or those who were living in smaller apartments and did not want to deal with raw produce (i.e., whole cabbage, zucchini, carrot), but would happily buy a pre-washed, pre-cut pack for a stir-fry.

Limitation and future research

Data used within this manuscript was solely from the United States. Extending the findings to other countries will generalise the results and account for any cultural differences. The study analyses brands, but did not account for different variants, including organic production, price-premium, or sustainably sourced produce. Future research should replicate this study to these contexts – previously done for variants (Singh *et al.* 2008) and categories (Dunn *et al.* 2019).

Future research should investigate the relationship between price loyalty and brand loyalty. Specifically, if consumers are loyal towards the proprietary, private label or non-branded products, or if they are loyal toward the price tiers (i.e., always the lowest price within the category). Customers may set cut-off prices in their mind and only purchase brands below the line. This research analyses one private label type. Retailers are introducing different private label qualities, and future research should analyse the different quality levels of private labels.

Moreover, future research should examine if and how consumers perceive proprietary, private-label, and non-branded items. Previous FMCG research examined trust, value for money, and quality aspects (Nenycz-Thiel & Romaniuk 2016). Further, extending the research of Nenycz-Thiel & Romaniuk (2014) for FMCG may allow for the examination of patterns in brand image data for private label and proprietary brands - including non-branded.

Last, while the 10% deviation of observed from theoretical values are considered the Dirichlet benchmark (Anesbury *et al.* 2018b; Kahn *et al.* 1988; Scriven *et al.* 2017), the percentage is arbitrary. Further research needs to establish an empirically grounded deviation threshold or an equation for calculating the threshold, possibly using the category penetration or purchase rate.

Declaration of interest

The authors have no potential conflicts of interest to declare.

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Disclaimer

1. Researcher(s) own analyses calculated (or derived) based in part on data from The Nielsen Company (US), LLC and marketing databases provided through the Nielsen Datasets at the Kilts Center for Marketing Data Center at The University of Chicago Booth School of Business.
2. The conclusions drawn from the Nielsen data are those of the researcher(s) and do not reflect the views of Nielsen. Nielsen is not responsible for, had no role in, and was not involved in analysing and preparing the results reported herein.

Appendices

Table 8: Duplication of purchase table (US, disaggregate tomato brands, retailer #2, 2015)

Buyers of...	Pen (%)	Who also bought...								
		Private Label	Desert Glory Nature Sweet Chrb	Other	Non-Branded	Nature Sweet	Sunbursts	Sunset	Tasti-Lec	Hokee
Private Label	20.2		11	9	7	6	4	5	4	1
Desert Glory Nature Sweet Chrb	3.7	58		13	13	25	15	2	6	2
Other	3.1	60	15		10	9	8	11	3	6
Non-Branded	2.3	63	21	14		8	12	7	1	0
Nature Sweet	2.0	62	48	14	10		16	3	5	1
Sunbursts	1.5	57	35	16	19	20		3	2	1
Sunset	1.5	65	6	24	11	4	3		3	0
Tasti-Lec	1.5	53	14	6	2	7	2	3		0
Hokee	0.8	37	10	25	1	2	2	0	0	
Average Duplication		57	20	15	9	10	8	4	3	2

Table 9: Partition Sharing Indexes (US, disaggregate tomato brands, retailer #2, 2015)

	Pen (%)	Non-Branded	Private Label	Desert Glory Nature Sweet Chrb	Other	Hokee	Nature Sweet	Sunset	Sunbursts	Tasti-Lee
Non-Branded	2.3		0.9	1.6	1.3	0.1	1.2	1.4	2.3	0.3
Private Label	20.2	0.9		0.8	0.9	0.5	0.9	0.9	0.8	0.7
Desert Glory Nature Sweet Chrb	3.7	1.6	0.8		1.2	0.8	3.7	0.4	2.7	1.1
Other	3.1	1.3	0.9	1.2		2.3	1.3	2.2	1.5	0.6
Hokee	0.8	0.1	0.5	0.8	2.3		0.3	0.0	0.4	0.0
Nature Sweet	2.0	1.2	0.9	3.7	1.3	0.3		0.6	3.0	1.0
Sunset	1.5	1.4	0.9	0.4	2.2	0.0	0.6		0.6	0.7
Sunbursts	1.5	2.3	0.8	2.7	1.5	0.4	3.0	0.6		0.4
Tasti-Lee	1.5	0.3	0.7	1.1	0.6	0.0	1.0	0.7	0.4	

Table 10: Duplication of purchase table (US, disaggregate tomato brands, retailer #3, 2015)

Buyers of...	Pen (%)	Who also bought...																			
		Non-Branded	Other	Sunset	Santa Sweets	Red Sun	Desert Glory Nature Sweet Chrb	Private Label	Del Cabo	Desert Glory Nature Sweet	Village Farms	Nature Sweet	Sunset Zima	Sunset Y.E.L.O	Victory Garden	Del Campo	Andrew & Wllmsn Frsh Prdc-Nbl	Green Giant	Chubby Cheeks	Flavor-Pic Tomato Co.	Sunbursts
Non-Branded	4.8		24	12	10	7	4	2	4	5	2	2	3	2	2	4	2	1	2	1	1
Other	3.8	31		12	9	6	4	3	4	6	4	2	4	4	2	3	1	1	3	1	1
Sunset	1.7	35	27		8	9	3	3	8	5	8	1	11	9	1	2	1	0	2	0	0
Santa Sweets	1.5	34	22	9		3	4	3	1	6	1	3	1	1	2	3	2	1	3	0	3
Red Sun	0.8	43	31	19	5		5	1	7	5	6	3	3	5	1	3	2	1	0	0	1
Desert Glory Nature Sweet Chrb	0.7	26	20	7	9	6		7	3	3	3	11	0	0	3	2	4	1	0	0	7
Private Label	0.5	14	17	10	7	2	9		1	2	2	1	0	0	0	1	1	0	2	1	2
Del Cabo	0.5	34	27	27	2	11	4	1		8	7	1	10	7	5	2	1	0	0	0	1
Desert Glory Nature Sweet	0.5	54	46	19	19	8	4	2	9		6	1	6	7	3	7	4	0	1	1	0
Village Farms	0.4	28	41	31	3	12	5	3	9	6		1	14	10	0	1	1	1	6	0	1
Nature Sweet	0.3	22	19	5	13	6	23	2	2	2	2		3	2	2	0	2	2	0	0	11
Sunset Zima	0.3	46	49	59	7	8	0	0	16	8	18	3		33	2	2	2	0	0	0	0
Sunset Y.E.L.O	0.3	39	56	52	7	15	0	0	13	11	15	2	37		4	2	0	2	0	0	0
Victory Garden	0.3	31	27	6	12	4	8	0	10	6	0	2	2	2		2	4	2	0	0	0
Del Campo	0.3	63	35	14	16	8	6	2	4	12	2	0	2	4	2		2	2	4	2	2
Andrew & Wllmsn Frsh Prdc-Nbl	0.3	33	18	6	10	6	12	2	2	8	2	2	2	2	4	2		0	0	0	0
Green Giant	0.3	10	17	0	8	2	4	0	0	4	2	2	0	0	2	2		0	0	0	0
Chubby Cheeks	0.2	34	38	11	19	0	0	4	0	2	11	0	0	2	0	4		0	0	0	0
Flavor-Pic Tomato Co.	0.2	16	24	0	3	0	0	3	0	3	0	0	0	0	0	3		0	0	0	0
Sunbursts	0.1	30	30	4	30	7	33	7	4	33	4	26	0	0	0	4		0	0	0	0
Average Duplication		33	30	16	10	6	7	2	5	7	5	3	5	5	2	3	2	1	1	0	2

Table 11: Partition Sharing Indexes (US, disaggregate tomato brands, retailer #3, 2015)

	Pen (%)	Non-Branded	Private Label	Desert Glory Nature Sweet	Desert Glory Nature Sweet Chrb	Sunbursts	Nature Sweet	Other	Village Farms	Chubby Cheeks	Victory Garden	Andrew & Wllmsn Frsh Prdc-Nbl	Flavor-Pic Tomato Co.	Red Sun	Santa Sweets	Del Cabo	Sunset Y.E.L.O	Sunset	Green Giant	Sunset Zima	Del Campo
Non-Branded	4.8		0.4	1.4	0.7	0.8	0.6	0.8	0.7	0.9	0.8	0.8	0.4	1.1	0.9	0.9	1.0	0.9	0.3	1.2	1.6
Private Label	0.5	0.4		0.5	1.5	1.7	0.3	0.6	0.6	1.0	0.0	0.5	0.6	0.3	0.6	0.2	0.0	0.7	0.0	0.0	0.4
Desert Glory Nature Sweet	0.5	1.4	0.5		0.8	4.3	0.4	1.5	1.7	0.5	1.5	2.1	0.7	1.2	1.6	2.2	2.9	1.4	0.5	2.1	3.0
Desert Glory Nature Sweet Chrb	0.7	0.7	1.5	0.8		5.7	4.0	0.6	0.9	0.0	1.3	2.1	0.0	0.9	0.7	0.7	0.0	0.5	0.7	0.0	1.0
Sunbursts	0.1	0.8	1.7	4.3	5.7		9.4	1.0	1.1	0.0	0.0	0.0	0.0	1.2	2.5	0.9	0.0	0.3	0.0	0.0	1.7
Nature Sweet	0.3	0.6	0.3	0.4	4.0	9.4		0.6	0.5	0.0	0.7	0.7	0.0	1.0	1.0	0.4	0.7	0.3	0.8	1.2	0.0
Other	3.8	0.8	0.6	1.5	0.6	1.0	0.6		1.3	1.2	0.9	0.6	0.8	1.0	0.7	0.9	1.8	0.9	0.5	1.6	1.1
Village Farms	0.4	0.7	0.6	1.7	0.9	1.1	0.5	1.3		3.2	0.0	0.6	0.0	1.8	0.2	2.2	4.4	2.3	0.6	5.4	0.6
Chubby Cheeks	0.2	0.9	1.0	0.5	0.0	0.0	0.0	1.2	3.2		0.0	0.0	0.0	0.0	1.6	0.0	0.9	0.8	0.0	0.0	1.9
Victory Garden	0.3	0.8	0.0	1.5	1.3	0.0	0.7	0.9	0.0	0.0		1.9	0.0	0.6	1.0	2.4	0.8	0.4	0.9	0.7	0.9
Andrew & Wllmsn Frsh Prdc-Nbl	0.3	0.8	0.5	2.1	2.1	0.0	0.7	0.6	0.6	0.0	1.9		0.0	1.0	0.9	0.5	0.9	0.5	0.0	0.8	0.9
Flavor-Pic Tomato Co.	0.2	0.4	0.6	0.7	0.0	0.0	0.0	0.8	0.0	0.0	0.0	0.0		0.0	0.2	0.0	0.0	0.0	0.0	0.0	1.2
Red Sun	0.8	1.1	0.3	1.2	0.9	1.2	1.0	1.0	1.8	0.0	0.6	1.0	0.0		0.5	1.8	2.3	1.4	0.3	1.3	1.2
Santa Sweets	1.5	0.9	0.6	1.6	0.7	2.5	1.0	0.7	0.2	1.6	1.0	0.9	0.2	0.5		0.2	0.6	0.7	0.7	0.6	1.3
Del Cabo	0.5	0.9	0.2	2.2	0.7	0.9	0.4	0.9	2.2	0.0	2.4	0.5	0.0	1.8	0.2		3.1	2.0	0.0	4.0	1.0
Sunset Y.E.L.O	0.3	1.0	0.0	2.9	0.0	0.0	0.7	1.8	4.4	0.9	0.8	0.9	0.0	2.3	0.6	3.1		3.8	0.0	14.1	1.7
Sunset	1.7	0.9	0.7	1.4	0.5	0.3	0.3	0.9	2.3	0.8	0.4	0.5	0.0	1.4	0.7	2.0	3.8		0.0	4.4	1.0
Green Giant	0.3	0.3	0.0	0.5	0.7	0.0	0.8	0.5	0.6	0.0	0.9	0.0	0.0	0.3	0.7	0.0	0.0	0.0		0.0	0.9
Sunset Zima	0.3	1.2	0.0	2.1	0.0	0.0	1.2	1.6	5.4	0.0	0.7	0.8	0.0	1.3	0.6	4.0	14.1	4.4	0.0		0.7
Del Campo	0.3	1.6	0.4	3.0	1.0	1.7	0.0	1.1	0.6	1.9	0.9	0.9	1.2	1.2	1.3	1.0	1.7	1.0	0.9	0.7	

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