RE-EXAMINING AGE-RELATED LOYALTY FOR LOW-INVOLVEMENT PURCHASING

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ABSTRACT

Purpose – Research into age-related loyalty stalled after the emergence of contradictory empirical findings and criticism of chronological age as a naïve measure. These issues are addressed with results that may encourage fresh research in the area.

Design/methodology/approach – An online brand choice survey (n=1,862) is undertaken to study age-related loyalty in three low-involvement categories. The polarisation index (φ) is adopted as the measure of loyalty to control for confounding influences present in prior research. Results for chronological age are also compared with results for measures of cognitive, biological and social age, as well as household lifecycle.

Findings – Contrary to prior research, age-related increases in brand loyalty are detected in two of the three low-involvement categories studied. The third category does not show detectable loyalty for any age group. While increases in brand loyalty are broadly present across all age measures, no alternative outperforms chronological age in detecting variations in age-related loyalty.

Research limitations/implications – This is the first evidence that age-related brand loyalty is present in low involvement categories. However, effects are small, and easily obscured by confounding factors. More research is needed to determine how results vary by category.

Practical implications – Despite showing minor increases in loyalty, older consumers still purchase from a wide portfolio of brands and so should not be ignored by marketers. Future research can investigate brand loyalty for older consumers by adopting the method of analysing differences in polarisation (φ) for chronological age groups.

Originality/value – Previous contradictory findings and methodological concerns about measurement of age-related loyalty are resolved through use of the polarisation index (φ) to measure loyalty, and confirmation that chronological age performs as well as any other age measure.

Keywords Brand loyalty; Older consumers; Polarisation index; Juster scale; Dirichlet model; Brand performance measures

Paper type Research paper

1.0 Introduction

Researchers have devoted relatively little attention to understanding how age influences consumer loyalty patterns (Evanschitzky and Woisetschläger, 2008, Lambert-Pandraud *et al.*, 2005, Uncles and Lee, 2006). Some marketing practitioners and advertisers hold onto erroneous beliefs that older consumers have low spending power and are loyal to well-established brands, resulting in heavier investment in younger consumers (Thompson and Thompson, 2009, Yoon and Cole, 2008, Moschis, 2003). In particular, older consumers are under-represented in advertisements with only 15% of media images in the United States depicting consumers aged 50 years and above (AARP, 2019). Yet, evidence does not support this neglect as Phua *et al.* (2020) show older consumers regularly buy new brands and Anesbury *et al.* (2021) find that dead sub-brands were more likely to have skewed towards younger buyers.

The neglect of older consumers by both academics and practitioners is surprising given the mature segment continues to grow in size and purchasing power. By 2050, it is predicted that consumers aged 60 years and over will represent 21.5% of the world's population, while those aged 80 years and over will represent close to 30% of the population in Europe, North America, and Oceania (United Nations, 2015). As the global population ages, baby boomers (born 1943-1963) have become the wealthiest generation and account for the greatest annual spend ($548 billion) of any generational cohort in the United States (Epsilon, 2019).

Existing research on how age influences brand loyalty is restricted to a few studies that focus predominately on cars, perfume, and fast-moving consumer goods (FMCGs). In the high-involvement categories of cars and perfume, older consumers have smaller consideration sets,

higher brand loyalty, and a greater preference for well-established brands compared to younger consumers (Evanschitzky and Woisetschläger, 2008, Lambert-Pandraud *et al.*, 2005, Maddox *et al.*, 1978, Lambert-Pandraud and Laurent, 2010). In contrast, research in low-involvement categories reports that while there are age-related differences in category purchase rates, brand loyalty patterns appear not to differ across age groups (Uncles and Ehrenberg, 1990, Singh *et al.*, 2012, Uncles and Lee, 2006).

These contradictory results create a puzzle for theorists interested in age-related loyalty. However, a limitation of existing studies of low-involvement categories is that the brand performances measures (BPMs) used to measure loyalty may be confounded by differing category purchase rates and market shares across age groups. Therefore, to conclude whether or not age-related differences in brand loyalty extend from high-involvement categories to low-involvement categories, fresh research is needed using loyalty measures independent of these confounds. A further limitation is the use of chronological age, as it is viewed as an unsophisticated measure due to heterogeneity among older consumers (Nelson and Dannefer, 1992). Researchers have considered other age-related explanations of consumer behaviour such as cognitive, sociological and biological age (e.g. Evanschitzky and Woisetschläger, 2008), as well as the impact of life circumstances and events (Mathur *et al.*, 2003, Mathur *et al.*, 2008, Eastman and Liu, 2012). However, as Zniva and Weitzl (2016) indicate these alternative measures are used sparingly across studies and it is not clear whether research using chronological age is sufficient to establish generalisations about age-related loyalty.

Given the need for improved understanding of how age influences consumer behaviour, the relative lack of prior research, presence of contradictory findings, potential for confounding influences, and questions over the most appropriate measure of age-related changes, the present research seeks to resolve these past uncertainties and thereby encourage fresh

research into age-related loyalty. It does so by adding (i) substantive new evidence and (ii) addressing two key methodological concerns that contribute to uncertainty about prior findings in age-related loyalty. Specifically, the research addresses the following questions:

RQ1: Does brand loyalty differ between older and younger consumers in low-involvement categories, once the potentially confounding effects of category buying rates and brand shares are taken into account?
RQ2: Which measures of age best describes patterns of brand loyalty for older consumers?

Using an online survey (n=1,862) we therefore investigate age-related loyalty patterns in three low-involvement categories: supermarket store choice, toothpaste and fruit juice. Loyalty patterns are explored using benchmarks from the NBD-Dirichlet (Dirichlet) model, a commonly used stochastic model that describes purchasing in a stationary and unsegmented market (Goodhardt *et al.,* 1984, Ehrenberg *et al.*, 2004). As mentioned earlier, the descriptive brand performance metrics typically reported when using the Dirichlet model (see. Table II) are dependent upon both the frequency with which the category is purchased and also the number and market shares of competing brands in the category.

To overcome these potential confounds we report a loyalty measure that is independent of category purchasing rates and individual market shares; the polarisation index (φ). We then compare results for φ across alternative age measures (chronological, cognitive, sociological and biological age) as well as household lifecycle (HLC) to determine which measure best captures variations in brand loyalty between age segments.

Consistent with previous literature we find that brand loyalty remains relatively low for all chronological age groups, with most consumers regularly switching between a portfolio (repertoire) of brands. However, unlike previous research, results do show increases in brand

loyalty across age groups for two of the three low-involvement categories studied, suggesting that prior conflicting results may be in part due to confounding factors in the methods used. While age-related increases in brand loyalty are broadly present for all alternative age measures, none consistently outperform chronological age in detecting variations in loyalty. These results provide fresh evidence on the relationship between age and loyalty and provide a methodological blueprint for future age-related research – that is, the measurement of loyalty through the polarisation index (φ), and confidence in the use of chronological age as a measure.

2.0 Literature Review

2.1 Age-related patterns of purchasing

The first comprehensive analysis of the influence of age on consumer purchasing was the examination of repeat purchase rates for automobiles by Lambert-Pandraud *et al.* (2005). Results from 28,913 French car buyers revealed higher brand loyalty among older consumers who repurchased their previous car brand more often than younger consumers. Specifically, 42% of under 40 year-olds repurchased their previous brand, compared to 54% for the 40-59 year-olds, 66% for the 60-74 year-olds, and 72% for the over 74 year-olds. Evanschitzky and Woisetschläger (2008) found similar results with data from 988 German respondents, confirming that chronological age had a positive influence on brand loyalty in the automobile category. A subsequent study of the French perfume market found older women also remain more attached to their previously purchased brand while younger women were more innovative consumers who switched more frequently between perfume brands (Lambert-Pandraud and Laurent, 2010). The findings in the French perfume market show age-related

increases in brand loyalty are likely to occur in multiple high-involvement categories, and are not confined to automobiles.

However, age-related increases in brand loyalty have not been detected for BPMs in studies of low-involvement purchase categories. While research confirms the presence of age-related differences in the *frequency* with which consumers purchase low-involvement categories, the *brand loyalty* patterns within such categories typically do not differ across age groups (Uncles and Ehrenberg, 1990, Singh *et al.*, 2012, Uncles and Lee, 2006, Yang *et al.*, 2005).

For example, Uncles and Ehrenberg (1990) discovered that the portfolio size (number of brands purchased) of older consumers is similar to younger consumers once adjusted for differences in category buying rates. Uncles and Lee (2006) and Singh *et al.* (2012) demonstrated that brand choice does not vary with age as leading brands (in terms of market share) are consistent across age groups. Additionally, these authors reveal similar Double Jeopardy patterns are present for each age group; that is, brands with smaller market shares have fewer buyers who tend to purchase the brand slightly less frequently. Double Jeopardy is a lawlike pattern reported across many product categories, countries, and time periods (Ehrenberg *et al.*, 1990, Wright *et al.*, 1998, Sharp, 2010), so the existence of consistent Double Jeopardy patterns found across all age groups indicates each age-group continues to exhibit typical loyalty.

2.2 Measuring behavioural loyalty

When examining age-related loyalty, the BPMs commonly obtained from panel data include market share, penetration, portfolio size, purchase frequency, share-of-category requirements

and sole loyalty rates, with the latter three commonly reported as measures of brand loyalty (Ehrenberg *et al.*, 2004). Analysis of BPMs reveal many lawlike patterns of buying behaviour observable across a wide range of product and service categories, countries, and time periods, including the Double Jeopardy pattern mentioned above and used in some previous studies to examine loyalty across age groups (Uncles and Lee, 2006, Singh *et al.*, 2012). These lawlike patterns are consistently and accurately benchmarked through the application of the NBD-Dirichlet model of purchase incidence and brand choice (Goodhardt *et al.*, 1984). The NBD component models category purchase rate as a mixed gamma-poisson process, with individual poisson purchasing means being gamma distributed across the population of buyers. The Dirichlet (multivariate Beta) component models the distribution of brand choices, given that a category purchase is made, using the S parameter, calculated as the weighted mean of the sum of the parameters of the Beta distribution (α, β) for each brand.

The Dirichlet S parameter therefore represents the average consistency of choices (loyalty) across the whole category and population studied. This measure applies irrespective of the category purchase rate (NBD parameters) or particular brand (market share). The BPMs used in prior studies therefore do not provide a pure measure of loyalty, but instead represent the expression of underlying loyalty (S parameter) for a particular category purchase rate and particular set of market shares. Hence comparisons of BPMs are not true measures of differences in underlying loyalty as they may be confounded by any differences in category purchase rates and market shares between age groups. In contrast, comparisons between age groups using the S parameter directly as a measure of loyalty would not be subject to any such confounds.

The S parameter is nonetheless somewhat cumbersome. It ranges from zero to infinity, with a value of zero indicating individual brand choice is totally consistent and every buyer is 100% loyal to a single brand, and a value of infinity indicating that individual brand choice constantly changes with no consistency (loyalty) whatsoever. It is useful to transform S into the more intuitive measure φ, known as the *polarisation index*, as follows:

$$\varphi = \frac{1}{1 + S} \qquad \text{where } 0 \leq \varphi \leq 1$$

In contrast to the S parameter, φ ranges from zero to one, and so is more easily interpretable. If φ is zero, there is zero loyalty (maximum brand switching), whereas if φ is one there is 100% loyalty (no brand switching at all) – hence the closeness of φ to one indicate the degree of *polarisation* of loyalty. As with S, φ is independent of category purchase rates and unaffected by brand share.

φ was first used to analyse television program loyalty by Sabavala and Morrison (1977) and nowadays is regularly used to measure loyalty in the wine industry (Jarvis and Goodman, 2005, Jarvis *et al.*, 2007, Krystallis and Chrysochou, 2010, Casini *et al.*, 2009, Corsi *et al.*, 2011). Studies have also measured φ in other FMCG categories, such as dairy products, cigarettes, soft drinks and healthy food (Krystallis and Chrysochou, 2011, Krystallis, 2013, Sjostrom *et al.*, 2014, Anesbury *et al.*, 2018). While φ is easily derived from the Dirichlet S parameter, it also represents a transformation of the Hendry model switching constant, the Bass correlation measure, and the parameters of the Beta distribution (Sabavala and Morrison, 1977) and so can be seen a more general expression of the probabilistic choices widely found in the study of buyer behaviour.

Should age-related loyalty be present, older age-segments would have a higher value of φ than younger age-segments. How this would translate into changes to observed BPMs is illustrated below by simulation, using the DIRICHLET program (Kearns, 2009) to generate theoretical BPMs for different values of φ for the average brand in one of the studied age groups (Table I). In this simulation only φ varies, and not category purchase rate or market share, to give an intuitive demonstration of how BPMs change with φ while confounding factors are held constant.

"INSERT TABLE I HERE"

The simulation illustrates that increases in φ affect loyalty-related BPMs to varying degrees. Changes in repeat buying and portfolio size are rather consistent with a 0.1 increase in φ resulting in roughly a 5% increase in repeat buying and 0.1 - 0.2 reduction in portfolio size for the simulated data. In contrast, purchase frequency and sole loyalty increase exponentially. For example, as φ increases from 0.10 to 0.20 there are small changes in purchase frequency (+0.1) and sole loyalty (+2%); however, as φ increases from 0.80 to 0.90 there are larger changes in purchase frequency (+0.5) and sole loyalty (+19%).

Clearly the polarisation index φ has attractive properties as a measure of loyalty, being easily calculated from the parameters of the Dirichlet model, theoretically accurate as a measure of underlying loyalty, and unaffected by confounding influences from differing market shares and category purchase rates. The present study therefore adopts φ as the measure of loyalty.

2.3 Alternative age measures

Despite heavy use in consumer research, *chronological age* as a measure faces long-standing criticism due to heterogeneity in health and behaviour among older adults (Nelson and Dannefer, 1992). According to Moschis (2012), age-related changes in behaviour vary as individuals age psychologically, biologically, and socially at different rates and stages throughout their lifetime, leading to substantial differences between older adults. Some therefore argue that chronological age is an ineffective determinant of purchase behaviour (Ahmad, 2002, Barak and Schiffman, 1981). A few researchers apply alternative age measures, such as cognitive, sociological, and biological age (e.g. Evanschitzky and Woisetschläger, 2008), as well as life events (Mathur *et al.*, 2003, Mathur *et al.*, 2008, Eastman and Liu, 2012) to predict purchase behaviour. A more recent literature review by Zniva and Weitzl (2016) highlights that these alternative age measures are used infrequently and suggests future work consider alternative age measures. Details of each age measure are provided below.

- *Cognitive age* is a self-reported measure based on the age a person feels, looks, acts, and their perceived interests (Barak and Schiffman, 1981) with most adults reporting they feel younger than their chronological age (Mathur and Moschis, 2005). Marketers have occasionally applied cognitive age as an alternative to chronological age in predicting consumer behaviour (Mathur and Moschis, 2005, Szmigin and Carrigan, 2000, Evanschitzky and Woisetschläger, 2008, Teller *et al.*, 2013). In particular, Evanschitzky and Woisetschläger (2008) found cognitive age has a positive influence on brand loyalty. However, cognitive age may not provide better predictive power than chronological age as they are highly correlated (Evanschitzky and Woisetschläger, 2008).

- *Biological age* reflects declines in physiological abilities over time due to accumulated damage to the cells and tissues within the body (Moschis, 2012, Adams and White, 2004). Biological changes in later life can involve declines in hearing and vision, and onset of chronic conditions and diseases, and is regularly measured through self-reported health status (Zniva and Weitzl, 2016). For example, Evanschitzky and Woisetschläger (2008) measured biological age using self-reported responses on difficulties in mobility; however, they found biological age did not have a significant impact brand loyalty in the automobile category. An alternative method is to measure biological age through objective reports of health status (Zniva and Weitzl, 2016) such as lengthy hospitalization or rehabilitation, hearing impairment, assistance in day-to-day living, diagnosis of a chronic condition or long-term illness, and eye issues (Mathur and Moschis (2005).

- *Social age* represents changes to the roles and relationships that adults experience later in life (Moschis, 2012) leading to reductions in social network size (Carstensen, 1992, Lang and Carstensen, 1994). Reductions in social network size result in less word-of-mouth and subsequently impact decision-making and purchase behaviour (East *et al.*, 2014). While marketers have rarely investigated the impact of *social age* on consumer behaviour (Zniva and Weitzl, 2016) it can be measured through the frequency and impact of social interactions (Evanschitzky and Woisetschläger (2008).

- *Life events* consist of expected (e.g. retirement, empty nest) and unexpected (e.g. death of a spouse, major accident) life-altering events associated with ageing (Moschis, 2012, Zniva and Weitzl, 2016). As adults experience such events they tend to shift into older age-related roles that also impact the psychological, biological, and

social ageing dimensions (Zniva and Weitzl, 2016, Moschis, 2012). Studies by Mathur *et al.* (2003), Mathur *et al.* (2008) demonstrate that life events can cause stress and altered brand preferences. Other studies measure similar effects by examining how household lifecycle (HLC) affects loyalty patterns (e.g. Trinh *et al.*, 2014), as this efficiently captures many life events (e.g. Birth of children, empty nest, and retirement) and therefore presents a simplified measure for comparison against other age measures.

In summary, age-related differences in loyalty are limited to a small number of studies over the last 30 years with contradictory results. The lack of literature, potential confounding effects of category purchase rates and market shares on loyalty-related BPMs, and the unquestioning use of chronological age in the face of widespread criticism, all justify the need for further research.

3.0 Methodology

3.1 Data collection – online survey

Data were gathered from a cross-sectional online survey of the New Zealand public (n=1,862) with respondents recruited by a commercial panel provider. Respondent demographics were subject to quota selection to ensure the sample is broadly representative of the New Zealand population with respondents ranging between 18 and 96 years of age.

Respondents were questioned about their purchasing in three categories using the Juster scale, an eleven-point purchase probability scale that has multiple visual, verbal, and numeric cues. The scale was developed by the US Bureau of the Census (Juster, 1966) and has since

been subject to many further applications and tests (e.g. Wright and MacRae, 2007, Day *et al.*, 1991, Gabor and Granger, 1972). It is a prospective, prompted, scale that seeks considered reports of underlying purchase propensities. The scale is therefore less subject than other methods to recall biases, such as telescoping of recalled events forward or backward in time, over-reporting from clumping of adjacent time periods together, or under-reporting due to memory decay. Meta-analysis demonstrates Juster estimates of demand are unbiased with relatively low dispersion for established products and services (Wright and MacRae, 2007), while comparison of Juster-based market statistics to corresponding panel data shows them to be accurate as well as sufficient to estimate the Dirichlet model (Wright *et al.*, 2002).

Shopper panel data does not contain measures of cognitive, social, or biological age required for this study, so a survey is optimal for collecting data on these various age measures. The use of Wright et al.'s (2002) method for calculating BPMs from Juster-based inputs allows direct comparison of age measures and BPMs *for the same respondents*. The use of Juster-based inputs follows precedent as both Uncles and Lee (2006) and Singh *et al.* (2012) applied this method of data collection to study age-related loyalty. For formulas of the Juster-based estimators for BPMs, and for detailed empirical validation of these formulas, see Wright *et al.* (2002).

3.2 Product categories and behavioural loyalty measures

Three categories are investigated; toothpaste, fruit juice, and supermarket store choice. In each category, respondents are asked to provide Juster-based probabilities of purchase and most likely purchase frequencies for the five leading brands and 'any other' brands. Supermarket patronage and fruit juice purchases are framed as likelihoods over a four-week

period and toothpaste purchases are framed as likelihoods over a three-month period. The timeframes selected are based on the purchase incidence of each category and the recommendation by Uncles and Lee (2006) to measure purchase probabilities over slightly longer time periods. The toothpaste category is chosen as it was studied by Singh *et al.* (2012), while fruit juice and supermarket store choice provide an extension of prior work by using categories not yet investigated, and in the case of supermarkets also represent the first study of age-related loyalty in supermarket store choice.

The BPMs investigated are market share, brand penetration, and purchase frequency, all based on purchase occasions. Average portfolio size is also reported, calculated as the sum of all brand penetrations. While shopping data may be subject to debate over the most appropriate aggregation of pack sizes and purchase quantities, and differences between the buyer and the user, the approach taken here - to measure purchase occasions by the buyer - are standard in panel data analysis.

The common methods used to fit the Dirichlet model and deriving theoretical norms are from either individual panel data records using the BUYER software (Uncles, 1989), counts of purchase frequencies using maximum likelihood iteration in EXCEL (Rungie, 2003), or aggregate market statistics using the DIRICHLET software (Kearns, 2009). The DIRICHLET software is the most commonly applied in practice and is suitable for Juster-based estimates of BPMs. 'Theoretical' Dirichlet BPMs are therefore estimated using DIRICHLET from penetrations and average purchase frequencies for the overall category and for each brand, repeated for each age group. The Dirichlet S parameter, used to calculate φ, is obtained as described earlier from the Beta distribution estimated for each brand.

3.3 Selection of age groups and age measures

For *chronological age*, the present study adopts the three groupings used by Uncles and Lee (2006); 39 years and below, 40-59 years, and 60-74 years, as well as an additional 75 years and above age group used by Lambert-Pandraud *et al.* (2005) to represent "old-old" consumers. The inclusion of the "old-old" is in line with the recommendation by Cole *et al.* (2008) of adjusting the age categories as people live, work, and stay active longer nowadays.

Cognitive age is measured using a multi-dimensional scale developed by Barak and Schiffman (1981) that asks respondents to select the age they 'feel', 'look', 'act', and perceive their 'interests' reflect. Each dimension is recorded on an ordinal scale inclusive of ten-year age-decade reference groups ranging from 'teens' to '90s'.

Biological age is measured through Mathur and Moschis (2005) approach to recording experienced biological life events. Respondents indicate whether they have personally experienced lengthy hospitalisation or rehabilitation, hearing impairment, an eye problem that cannot be corrected with glasses, needed assistance in day-to-day living, or been diagnosed with a chronic condition or long-term illness. A summated 0-5 point age index is used to represent an individual's biological age (Mathur and Moschis, 2005).

Social age is measured following the approach developed by Carstensen (1992) and subsequently amended by Evanschitzky and Woisetschläger (2008). Respondents report the degree of emotional closeness, satisfaction, and frequency of interactions they have with family members, friends, and colleagues on 7-point Likert scales (Evanschitzky and Woisetschläger, 2008). Responses across the Likert scales are summed to provide social age.

Life events are measured using an adjusted version of Murphy and Staple's (1979) household lifecycle. Respondents are split into four categories based on their age, marital and parental status. 'Pre-family' includes respondents under 35 years old, either single, married or living with a partner, with no dependent children; 'family' includes respondents under 65 years old, married or living with a partner, with dependent children; 'post/no family' includes respondents 35 years and above, married or living with a partner, with no dependent children; and 'single elderly' includes respondents 65 years and above, single, separated, widowed, or divorced, with no dependent children. While the traditional HLC is becoming less relevant due to an increase in non-traditional households, such as single parent households (Wilkes, 1995), most respondents fall within the four HLC categories used. Respondents that do not fall within the four categories are removed from the HLC analysis due to insufficient group sample sizes – there are not enough of them to provide a meaningful analysis.

3.4 Analytical approach

The first task is to replicate prior work by Uncles and Lee (2006) and Singh *et al.* (2012) comparing BPMs obtained from the NBD-Dirichlet model using probabilistic Juster-scale estimators across chronological age groups (RQ1). Next, prior research is extended through application of polarisation index φ to chronological age groups to assess whether controlling for in category purchase rates and market shares leads to any different conclusions (RQ1). Finally, the analysis of φ is extended to alternative age measures to determine which best captures the maximum variation in loyalty present for different groups (RQ2).

Studies of age-related effects are also potentially subject to confounding influences from cohort membership and the specific time period chosen (Jaspers and Pieters, 2014, Rentz and Reynolds, 1981, Yoon *et al.*, 2009). For example, loyalty found for people born in the 1950's

could be due to age, but also cohort effects for 50's baby boomers or history effects related to the specific time period for which data is collected. The present design controls for history effects as the survey timing does not differ between age groups; however, it does not directly control for cohort effects. To the extent that core results from prior studies are replicated with the different time periods and countries studied, cohort effects can nonetheless be ruled out as an explanation for loyalty differences.

4.0 Results

4.1 Differences in category purchasing across age groups (RQ1)

Table II reports category purchasing statistics by chronological age group. Penetration rates do not vary much for supermarket store choice, although they decline with age for the toothpaste and fruit juice categories. Conversely, average category purchase frequency and portfolio size show consistent decline with age, in all three categories.

"INSERT TABLE II HERE"

The source of age-related decline in purchase frequency is unknown. One explanation is the reduction of household sizes across age groups in the sample (Uncles and Ehrenberg, 1990). The average household size varied from 3.4 persons for the under 40 year-olds to 3.0 persons for the 40-59 year-olds, 2.0 persons for the 60-74 year-olds, and finally 1.7 persons for the over 74 year-olds. Another possible reason is that older consumers have difficulty accessing supermarkets (Meneely *et al.*, 2009). Difficulty accessing retailers would affect supermarket patronage and subsequently the purchase frequency of products sold within the supermarkets.

Smaller portfolio sizes among older consumers indicate less brand switching and so could superficially be interpreted as evidence of age-related loyalty. However, a competing explanation can be found in lower category purchase frequencies among older consumers, as research shows that portfolio size decreases as the category buying rate declines (Banelis *et al.*, 2013). As the older age groups buy from categories less frequently, there is less opportunity to switch brands, leading to smaller portfolios than found in younger age groups. Thus, patterns in portfolio size highlight the difficulties of disentangling purchase rate and loyalty effects, emphasising the need for a measure of loyalty that does not confound the two.

4.2 Differences in brand performance measures across age groups (RQ1)

The DIRICHLET program estimates the Dirichlet model from category penetration, category purchase rate, brand penetration and brand average purchase frequency. The fit of the model is typically assessed on the last two of these metrics. When examining brand performance measures, it is useful to first consider the overall fit of the Dirichlet model as well as the typical patterns of purchase loyalty present (Table III). For each age group, fruit juice brands are listed in Juster-derived market share order with BPMs derived from the Juster scale (O) reported together with the corresponding theoretically predicted measures from DIRICHLET (T). BPMs are not reported for supermarket choice and toothpaste to avoid repetition of results as very similar patterns are observed in these categories.

"INSERT TABLE III HERE"

Comparisons between observed and theoretical brand performance measures reveal Juster estimates strongly reflect theoretical expectations. The closeness of observed and theoretical penetration and purchase frequency values within each age group is consistent with findings

in Australia and Japan by Uncles and Lee (2006) and Singh *et al.* (2012) respectively. Further, a clear Double Jeopardy pattern exists in each age group as brands with high market shares have a greater number of buyers (penetration) who purchase the brand slightly more often (purchase frequency) than brands with low market shares. The consistent presence of the Double Jeopardy pattern across each age group shows that older consumers have similar within-category loyalty patterns to younger consumers. This pattern also occurs in the supermarket and toothpaste categories (not shown). Overall, the results demonstrate that observed measures derived from the Juster scale fit the Dirichlet theoretical norms and that each age group displays typical Dirichlet-like purchase and loyalty patterns.

Decreases in the proportion of consumers purchasing the average brand are observed across age groups. For example, the average fruit juice brand is purchased by 42% of consumers aged under 40 years old, 36% of 40-59 year-olds, 23% of 60-74 year-olds, and 22% of over 74 year-olds. This decrease in brand penetration is reflective of the decrease in category purchase rate across age groups (Table II). In other words, a smaller proportion of older consumers (60 years and over) purchase fruit juice and this leads to a smaller proportion purchasing each brand. Age-related declines in category purchase rate similarly explain the declining purchase frequency across age groups for the average brand.

Turning to consider market leading brands, Table IV displays the top six brands in market share order across each age group for the three categories. In each case, there is little change in the order across age groups. There are some exceptions, but these are minor; for example, PAK'nSAVE is ranked 2nd in terms of market share for the under 40 year-olds and 40-59 year-olds. However, it is ranked 3rd for the 60-74 year-olds and over 74 year-olds age, with New World holding greater market share among these older consumers. Minor differences in

the fruit juice category are also reported with Just Juice ranked 1st for the two youngest age groups and 2nd for the two oldest age groups.

"INSERT TABLE IV HERE"

The similarity in market shares among leading brands between age groups is consistent with prior research on age-related loyalty. The result is expected given research shows that competing brands have similar customer profiles (Anesbury *et al.*, 2017, Kennedy and Ehrenberg, 2001, Hammond *et al.*, 1996). Each brand has a similar proportion of younger and older consumers, as do their competitors, so a brand with a high market share in one age group is expected to have a similar market share in the other age groups. Overall, the similarity of leading brand market shares across all age groups provides evidence of no major age-related differences in brand loyalty patterns.

4.3 Polarisation index (φ) across chronological age groups (RQ1)

The analysis so far indicates that while age-related purchase patterns are consistent across age groups, there is mixed evidence given age-related changes in portfolio size but no age-related changes to other patterns of loyalty. As noted earlier, changes to age-related loyalty could potentially be explained or indeed obscured as a function of the category buying rate and changes to the market share of individual brands. To overcome these potential confounds, Table V reports φ across chronological age groups for the three categories. When interpreting the polarisation index, recall that φ values close to one indicate high loyalty and limited brand switching.

"INSERT TABLE V HERE"

The results in Table V reveal extremely clear patterns of age-related loyalty for the categories examined. Brand loyalty is low for all categories and age groups, as indicated by φ being less than 0.50 and close to zero in the case of fruit juice showing an absence of loyalty in this category. Low brand loyalty is expected as consumers tend to switch regularly between a portfolio of brands in low-involvement categories. Despite low loyalty, there is a clear increase in φ across chronological age groups in the supermarket (0.21 to 0.35) and toothpaste (0.03 to 0.20) categories, while φ does not differ across age groups in the juice category. This indicates that older consumers are more loyal to supermarket and toothpaste brands than younger consumers even after controlling for category purchase rates and market shares.

The presence of age-related loyalty for low-involvement categories is confirmed for two out of the three categories investigated, and this includes the first reports in the literature on age-related loyalty for supermarket store choice. Interestingly, using φ to control for decreasing toothpaste purchase rates across age groups revealed increases in brand loyalty not previously detected by Singh *et al.* (2012) for toothpaste purchases in Japan. While differences in the toothpaste markets between Japan and New Zealand may exist, the results highlight the advantage of φ for detecting age-related differences in loyalty not captured by examining BPMs directly. Conversely, the decline in portfolio size shown in descriptive analysis of fruit juice is shown to be a function of declining category purchase rates and not a result of any increases in loyalty. No age-related differences are found for fruit juice; however, this can be accounted for by the absence of loyalty in that category. Before loyalty can differ, it must first be present.

4.4 Relationship between chronological age and alternative age measures (RQ2)

What about alternative age measures as explanations of age-related loyalty? Table VI shows chronological age (mean = 57.1) has a strong positive correlation (r=.85, p<.01) with cognitive age (mean = 51.6), suggesting that as consumers age chronologically their perceived age also increases, albeit lagged by five and half years. Similar relationships between chronological and cognitive age are found in previous studies (Wilkes, 1995, Mathur and Moschis, 2005). Not surprisingly, the HLC stage is also highly correlated with chronological age (r=.84, p<.01) as people typically pass through life stages as they age chronologically. Chronological age is also positively correlated with biological age (r=.31, p<.01) and social age (r=.16, p<.01), demonstrating that people experience more biological life events and have fewer meaningful social interactions as they age.

"INSERT TABLE VI HERE"

For ease of comparison with the chronological age groups reported earlier, each alternative age measure is also split into four groups for further analysis. Quartile groups are formed through box-and-whisker plots for cognitive and social age, while for biological and HLC measures groups were formed by combining sub-groups.

Table VII reports the polarisation index across groups for each age measure, based on a separate estimation of the Dirichlet for each quartile group. The maximum difference reported in Table VII highlights the variation in φ captured by each age measure – in effect the discriminatory ability of the measures. This discriminatory ability is generally low indicating age-related loyalty effects are modest.

"INSERT TABLE VII HERE"

Although loyalty remains low for all categories and all age groups, these findings suggest that as consumers' age chronologically and cognitively, as well as progressing through stages in the HLC, they become increasingly loyal towards supermarket choice and toothpaste brands. In the case of juice, no age measures appear to detect any large changes in φ across age groups. This suggests that no ageing process affects loyalty for juice brands as loyalty in this area remains very low.

Further examination of the performance of alternative age-group measures describing age-related loyalty is therefore restricted to the supermarket and toothpaste categories. Chronological age, cognitive age, and HLC exhibit similar variation in φ between age groups for both the supermarket category (0.15, 0.18, and 0.19 respectively) and toothpaste category (0.18, 0.16, 0.14 respectively). The consistency is not surprising given the strong correlation between these measures (Table VI). In contrast, biological age and social age exhibit lower variation in φ for both the supermarket category (0.09 and 0.10 respectively) and toothpaste category (0.07 and 0.07 respectively).

Thus, chronological and cognitive age, as well as HLC are the best discriminators of age-related loyalty patterns, while biological and social age are the worst. Interestingly, despite the literature suggesting that chronological age is an unsophisticated age measure, no alternative age measures appear to provide better discrimination of age-related loyalty patterns. As no age measure detects age-related loyalty for juice, the findings further suggest that age-related loyalty may be category specific, even within low-involvement categories.

5.0 Discussion and implications

5.1 Discussion

The present research extends studies by Uncles and Lee (2006) and Singh *et al.* (2012) that cast doubt on the impact of chronological age on brand loyalty. Extensions to these studies are made in two important ways. First, through application of the polarisation index as a loyalty measure independent of category purchase rates and market shares. Second, through examination of whether alternative age measures (cognitive age, biological age, social age, and HLC) are any better as discriminators of loyalty changes than is chronological age.

To ensure differences in results were not due to differences in method, the analysis first confirmed that the original findings of Uncles and Lee (2006) and Singh *et al.* (2012) could be reproduced using the same methods. This allowed demonstration of the presence of age-related differences in category purchase patterns and brand performance measures in our data, as well as similarity in Double Jeopardy patterns and consistency in leading brands across the four chronological age groups. The similarity of results across widely separate countries and time periods also allows the exclusion of cohort effects as an explanation of the results. Nonetheless, as with prior studies, age-related declines in category purchase rates and variations in market share could not be ruled out as explanations of the observed changes in brand performance measures.

However, use of the polarisation index (φ) to address the potential confounding influences revealed that older consumers *are* more loyal than younger consumers in the supermarket and toothpaste categories, even though overall levels of loyalty were low. The result supports previous findings of age-related loyalty in high-involvement product categories (Lambert-Pandraud and Laurent, 2010, Lambert-Pandraud *et al.*, 2005), as well as making several

further novel contributions. First, it applies an approach to measuring age-related loyalty that is not confounded by differences in category purchase rates or market shares. Second, by applying this approach, it successfully identifies patterns of age-related brand loyalty that previous studies by Uncles and Lee (2006) and Singh et al. (2012) were unable to confirm. It is understandable that these prior studies failed to detect differing loyalty across age groups, as they had relied on descriptive measures such as portfolio size, purchase frequency and sole loyalty that are confounded by changes to category purchase rates and market shares. Third, it extends research on age-related loyalty to supermarket store choice. Fourth, it demonstrates that loyalty can vary considerably between categories.

Another substantial contribution of the present research is the assessment of the relative discriminatory ability of chronological age in identifying age-related loyalty patterns. The results for chronological age are similar to both cognitive age and HLC, whereas biological and social age are less effective at capturing age-related differences in loyalty. The poor performance of biological and social age suggests that changes in our ability to process information, or gather WOM, do not greatly increase age-related loyalty in low-involvement categories. Further, no alternative age measure performs better at predicting age-related loyalty to merit a major overhaul of age measurement. Therefore, our research indicates there is no need to develop and adopt more sophisticated age measures when predicting changes in loyalty. Chronological age is sufficient and in the absence of further evidence there is no reason to think that cognitive age and HLC capture any other constructs than those represented by chronological age.

5.2 Implications

As increasing age-related loyalty is confirmed for two low-involvement categories, while the third category shows no loyalty for any age group, the basic result of age-related loyalty is more general than previously thought and so bears greater examination. The apparent previous disconfirmation of age-related increases in loyalty extending from high-involvement categories to low-involvement categories has now been partially reversed. Greater knowledge of loyalty patterns is now needed across a range of other categories to determine how widely these findings hold, and what natural variation in loyalty exists between categories. Further as chronological age captures age-related loyalty changes as well as any other age measure, it is sufficient for academics and practitioners to rely solely on chronological age when attempting to predict changes in loyalty (although cognitive age and household life cycle are acceptable substitutes). In contrast, the present results rule out biological or social age as superior explanations of age-related loyalty.

From a methodological perspective, a further contribution is the identification of an improved method to measure age-related loyalty. Applying the polarisation index across age groups avoids confounds from market share and category purchase rate effects. The methodology carried out in the present study should therefore be adopted in future studies in other categories and countries.

A managerial implication is that advertisers and marketing practitioners should not ignore the mature market as older consumers still purchase from a wide portfolio of brands. The evidence of older consumers regularly switching between multiple brands runs counter to negative stereotypes that older consumers are already highly loyal to well-established brands (Yoon and Cole, 2008). Instead, the research provides encouragement to actively market new products and brands towards the mature market. The presence of age-related loyalty offers

some reward for marketing efforts, while the low overall level of loyalty indicates that older consumers can still be induced to include other brands in their portfolio. Practitioners must gain a clear understanding of age-related loyalty in the industry in which they operate to ensure they develop effective strategies to target their customer base. Companies can use this knowledge to form realistic expectations for entering the portfolio of older consumers and growing market share among this segment.

6.0 Limitations and future research

This research addresses calls for further investigation of age-related loyalty patterns, and whether alternative age measures are more accurate at predicting these patterns. It does so by investigating age-related loyalty in three low-involvement categories. Further work should consider applying the polarisation index to other categories, not just low-involvement categories as noted earlier, but also high-involvement categories as the present research found cross-category differences in age-related loyalty. Work should also be extended from physical products and store choice to services, as studies of age-related loyalty for service brands are lacking.

The close relationships between chronological age, cognitive age, and household life cycle raise questions about the underlying mechanism. The use of φ ruled out declining purchase rates through the HLC as an explanation for age-related loyalty. But perhaps HLC has a secondary effect, through reduced demand for variety, hence leading to more brand loyalty? This hypothesis, although appealing, does not account for increasing loyalty in the supermarket category or the lack of loyalty in the juice category. Similarly, while reduced cognitive capability might be thought to account for age related loyalty, this hypothesis is inconsistent with the perception of cognitive age as being lower than chronological age, and

with the finding that social and biological age have smaller effects on age-related loyalty. Perhaps experience, or inertia, is the common factor at play? Clearly, there are opportunities for more research into the precise mechanisms underlying age-related loyalty.

The present study uses a cross-sectional survey design. Age-related differences may in theory be confounded by cohort effects; however, the consistency in results across multiple time period and countries indicates rules out cohort effects as the explanation for the patterns of age-related loyalty observed. Nonetheless, another area for future research is to track how loyalty does change longitudinally as the same group of consumers age. This would require extensive (multi-year) longitudinal data that is not subject to too much panel attrition. Such data is challenging if not impossible to obtain from consumer panels, however, it may be available in specialist areas such as pharmaceutical prescribing or public health cohort studies.

A final avenue for future research is to explore where in the sales funnel age-related changes occur. The current study demonstrates that older consumers are more loyal and have smaller portfolios of brands, and so switch between fewer supermarket and toothpaste brands than younger consumers. However, it is not clear whether older consumers have smaller portfolios of brands because they also have smaller awareness and consideration sets. If age-related changes are occurring at an awareness level, this will indicate underlying reasons why older consumers are more brand loyal in certain categories, and provide implications for practice. Investigating the impact of age on awareness and consideration sets will therefore highlight the relative importance of building mental availability among older consumers.

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