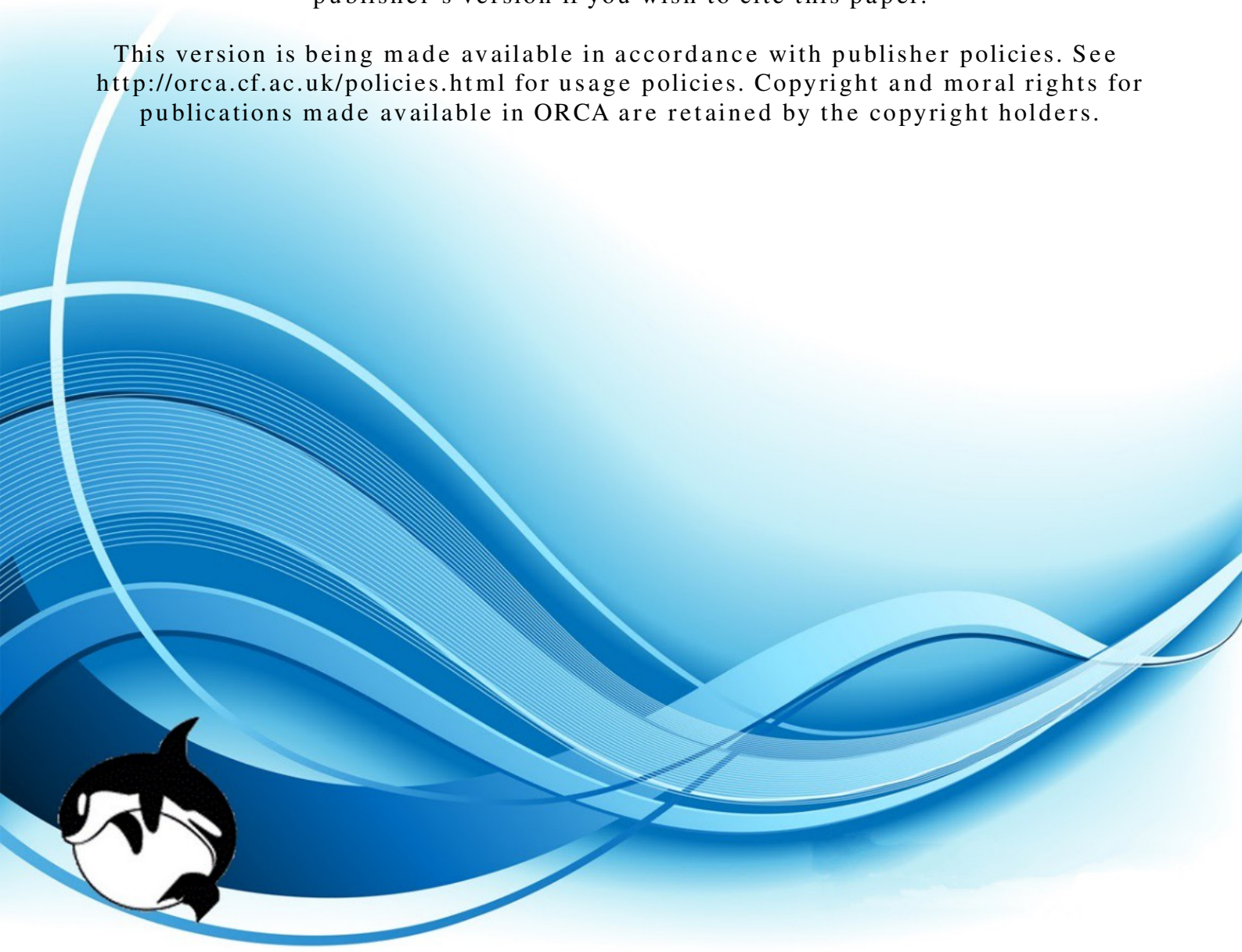

# Consumer behavior analysis and the marketing firm: Measures of performance

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Abstract

Evaluation of firm performance must consider the effects that its products and services have upon consumers. This can be accomplished when measures of consumer behavior inform marketing strategies. Consumer behavior analysis, a field of research that integrates operant behavioral economics and marketing, has developed several measures of consumer buying patterns based on the identification of the types of reinforcement, informational or utilitarian, that are programmed by different products and brands, and of the scope of consumer behavior setting. The present paper describes research that adopted some of these measures and the main results derived from them. Such studies have shown, for instance, that consumers have brand repertoires that include brands offering similar levels of reinforcement, that they tend to change the quantity they buy as a function of package size, price promotions, and utilitarian and informational reinforcement, that consumer individual differences tend to remain relatively stable across time, and that more open settings increase product search duration, decrease the essential value of brands and increase consumers' reports related to dominance of shopping environments and approach responses. Moreover, these measures of consumer behavior can be integrated with measures of firm behavior to evaluate firm performance, on the basis of an operant interpretation of firm behavior. This paper explains some of these integrated measures and describes results that have

shown, for instance, how increases in spending in marketing activities is related to increases in profitability.

## Consumer behavior and firm performance measures

Consumer behavior analysis is an interdisciplinary field of research that investigates consumer choice and the situational factors that influence it (Foxall, 2001, 2002). Building appropriate measures of complex consumer choice can help guide the decision-making behind organizational initiatives. In order to explain such behavior, consumer behavior analysis draws specifically on behavioral analysis, operant behavioral economics, and marketing research to elucidate the ways in which reinforcing and punishing consequences influence purchase and consumption behaviors. The Behavioral Perspective Model (BPM) of consumer choice, depicted in Figure 1, has been the dominant integrative device in consumer behavior analysis. The model, based upon the three-term contingency, interprets consumer behavior as occurring within the consumer situation, which consists of the intersection of the current consumer behavior setting and the consumer's learning history, and as being influenced mainly by the consequences it produces (Foxall, 1990/2004, 2016).

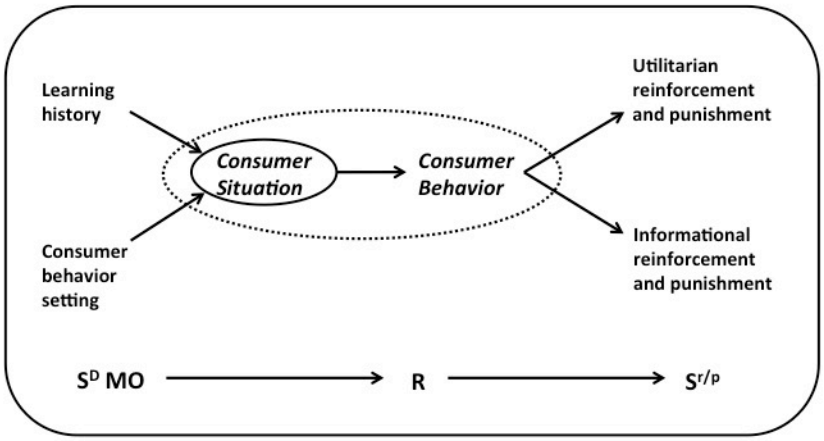

Figure 1. Summative Behavioral Perspective Model, where $S^D$ = discriminative stimulus, MO = motivating operation, R = response, $S^{r/p}$ = reinforcing or punishing stimulus: the elements of the three-term contingency. *Source:* Foxall (2016).

*The Behavioral Perspective Model*

The *consumer behavior setting* comprises the physical and social surroundings which control consumer responses. These surroundings encompass the stimuli that are antecedents of consumer behavior, particularly discriminative stimuli and motivating operations. Consumer behavior settings can differ greatly from one another, for they include retail stores, sports events, entertainment locations, libraries, virtual shopping environments, and such. In each of them there are events, such as brand names, products, service types, price information, which function as discriminative stimuli, in the presence of which certain responses have been previously reinforced in similar circumstances. When shopping in a grocery store, different brands on the shelves might be associated to different levels of reinforcement, as consequences of having been tried by the consumer in previous occasions. Consumer behavior settings also include events that might function as motivating operations, such as having a malfunctioning refrigerator at home or the presence of a rare and prestigious brand for sale in the store.

According to the BPM, consumer behavior settings differ also in the extent to which they induce a particular pattern of response, which depends on the number of response alternatives that are available to the consumer and the relative presence of aversive contingencies. Wandering in an upscale shopping center provides a large variety and number of behavior alternatives. Consumers typically have available dozens of stores which they may visit freely, with or without making any purchases. One may simply stroll in the mall talking with friends, go to a movie theatre or have a meal.

There are few social rules that encourage conformity to certain behavior patterns. In other words, the situation is relatively free of coercive contingencies. By contrast, many retail banks present the consumer with a more formal and structured situation, which provides few behavior alternatives and has programmed coercive contingencies for deviant behavioral patterns. The physical set up encourages standing in line until it is one's turn to walk to the desk; banks observe more restricted opening times than most other shops; and the rules encourage conformity to businesslike behavior. In summary, there is a continuum from situations that permit a number of behavioral possibilities, which have been referred to as relatively open settings, to those that allow only a small number of behavior patterns, which have been described as relatively closed settings. According to the BPM, the degree of openness or closedness is one of the most relevant dimensions of consumer behavior settings.

A behavior setting does not have the same effect on every consumer who enters it. Products and brands on the shelves of a supermarket have very different discriminative functions for a local weekly shopper than they do for a foreigner who, visiting the country for the first time, enters the supermarket. The function of price tags, product attributes and brand logos might not influence the behavior of the foreign consumer as they do for the familiar customer, in the sense of indicating good cost-benefit purchases, good product flavor, prestigious brands, and such like. All events in the consumer setting acquire their behavioral functions due to previous consumer experiences. This is the reason why the BPM stresses that consumer behavior occurs within the *consumer situation*, which constitutes the intersection between the consumer behavior setting and the consumer's *learning history*.

Current antecedents in the consumer setting, such as brand names and product attributes, acquire their discriminative or motivational functions due to past consequences resulting from purchasing and consuming similar products or services. Such consequences have usually opposing functions, when one considers that consumer behavior is simultaneously reinforced and punished. The attainment of products and services, which have reinforcing functions, is in most cases paired with surrendering money or spending time searching for them, which usually function as aversive events. Depending on the relative strengths of such functions (i.e., do the reinforcing properties of the product/service outweigh the aversive properties of the lost time/income or vice-versa), the events in future consumer settings may have evocative or abative functions.

According to the BPM, reinforcing and punishing consequences produced by consumer behavior may have *utilitarian* and *informational* functions. Utilitarian are functional consequences derived from purchasing, owning, and using a product or service, while informational consequences derive from the social consequences of these activities, the social prestige and status that others confer on the owners and consumers of certain economic goods and services. Informational consequences are mediated by others, they are social, in the sense that they result from other people's reactions to the behavior of the consumer and function as performance feedback, indicating how well the consumer is doing. In addition to this distinction between utilitarian and informational consequences, the model proposes that both types of consequences can have reinforcing or punishing effects. Then, for example, any functional car provides door-to-door transportation with a minimum degree of comfort and speed, which is one of the main utilitarian reinforcements derived from owning a car. Utilitarian consequences stem from characteristics of the product in use which tend to be similar

across every brand in the product category. But in addition to door-to-door transportation, many car brands and models generate reactions from others, such as complimentary or appreciative comments, which might function as social reinforcement usually in the form of prestige or social status. These social consequences have been named *informational reinforcement* by the BPM. When owning a car, utilitarian punishment will be produced, for example, whenever the car malfunctions, preventing its use for transportation and incurring repair costs. On the other hand, informational punishment can be exemplified by purchasing a diesel car since the environmental trend would tend to criticize consumers that do not buy clean products.

*Patterns of reinforcement and consumer operant classes*

This theoretical framework provides a functional classification of consumer operant classes based upon the predominant patterns of reinforcement and punishment that shape and maintain consumer choices. Such classification is derived from the fact that the vast majority of goods and services provide both utilitarian and informational consequences in different proportions. When we say that *goods and services provide reinforcement,* this is a way of describing the influence that goods and services exert on the behavior of the large majority of individuals. For example, to assert that owning a luxurious car model, such as a Bentley, provides informational reinforcement (e.g., social prestige and status), is to say that, in most situations, driving a car like this generates social reinforcement, such as flattering comments and praises. One must keep in mind, however, that this may not occur in all situations, for this type of luxury item may not be appreciated by some groups, and this type of comment and praise may not function as reinforcement to some individuals. This way of referring to reinforcement is justified when studying consumer behavior because the main interest usually is focused

on the behavior of groups of individuals. The behavior of a single consumer is rarely of concern to those that develop marketing strategies or analyze the performance of the organization or firm.

From the point of view of the firm, the classification of operant classes may be useful in identifying the most relevant consequences that might influence the behavior of its clients, which allows the firm to program contingencies for their behavior accordingly. Considering the possible combinations of relatively high and low levels of informational and utilitarian reinforcement, four patterns of reinforcement would be identified according to the predominant type and level of consequences for purchasing or consuming goods and services. Visiting a luxurious casino would be an example of behavior exposed to relatively high levels of informational (e.g., high social prestige) and utilitarian (e.g., high level of entertainment) reinforcement, sometimes called *accomplishment*. In contrast, routine grocery shopping would involve relatively low levels of informational (i.e., no one would be admired for doing it) and utilitarian (i.e., the situation is not very entertaining) reinforcement, which has been referred to as *maintenance*. Several combinations of high utilitarian and low informational (e.g., popular entertainment - called *hedonism*) or low utilitarian and high informational (e.g., obtaining mileage points - called *accumulation*) can also be identified in diverse consumer settings. To each of these four patterns we can add the dimension related to the level of openness of the setting. Then, situations of low levels of utilitarian and informational reinforcement may be relatively more open (e.g., grocery shopping that offer many response alternatives) or more closed (e.g., paying income tax). The same occurs in the other extreme in situations associated to high levels of programmed

informational and utilitarian reinforcement, which might be relatively open (e.g., rock concert) or relatively closed (e.g., attending an opera).

Why should behavior analysts find this of interest? There are three predominant reasons. First there is the intrinsic intellectual interest in an intriguing aspect of modern societies and their economic systems. The explanation of the firm – why there are firms, what makes them unique institutions, how they differ from other economic organizations like nonprofits, co-operatives, and partnerships -- is a fascinating, multi-faceted and inter-disciplinary area of study. Second, we should be interested in the firm for practical reasons: many of us work in firms and many of our research participants and clients do too. Understanding and changing human behavior frequently involves understanding the opportunities and constraints firms afford and impose. Finally, because we as behavior analysts possess analytical constructs and methodological techniques which we can make available to students of the firm in other disciplines such as sociology and economics. We also have much to learn in return from these areas that is capable of strengthening our research and consultancy. Organizational behavior analysis, which necessarily embraces the firm and its consumerates, stands to develop further by a solid comprehension of the nature and functions of the firm.

## Measures of Consumer Behavior

This interpretative framework has been applied to the investigation of different types of consumer behavior in a wide variety of settings, generating novel measures of consumer behavior and relevant findings. Considering that the behavior of the firm needs to be sensitive to the behavior of its clients, in this section we illustrate some of the measures that can be used to assess patterns of consumer behavior.

*Consumer buying patterns*

Before describing some of the measures derived from the BPM, it is necessary to explore a stream of consumer research that has specialized in empirical investigation of patterns of consumer's choice, based on records of what consumers actually do, and shows much affinity to consumer behavior analysis (cf. Ehrenberg, 1972/1988; Romaniuk & Sharp, 2016; Sharp, 2010). In this line of research, aggregate patterns of behavior are examined at the brand, store or product level, by adopting measures such as brand market penetration (percentage of potential buyers that have purchased the brand during a given time period), market share (percentage of a product category sales that are accounted for by each brand), product and brand average purchase frequency (how many times during a time period consumers buy a product or brand), and share of category requirement (percentage of all purchases in a given product category accounted for by each brand during a given time period).

Using these measures, which any firm needs to adopt in order to evaluate its market performance, Ehrenberg and colleagues have discovered several systematic patterns of consumer choice. Most of their research was based on data obtained from consumer panels, which consist of groups of consumers that agree to provide information concerning their purchases, including visited store, quantities bought, brands, prices, and such like. These measures of brand performance are obtained from large consumer panel operators (e.g., ACNielsen, IRI, TNSofres) (cf. Sudman, 2011).

This line of research has shown that few consumers of any given brand are exclusive buyers of the brand during a period of one year. That is, only around 10% to 20% of all consumers that buy the brand in a period of a year show 100% loyalty over a sequence of ten to fifteen purchases in the product category. As a corollary to this

finding, researchers also have shown that most consumers are multi-brand purchasers. Over a sequence of shopping occasions, during one year, they choose within a small "repertoire" of available brands, which comprises tried brands that constitute their consideration set. According to Ehrenberg, this multi-brand repertoire is a consequence of the functional similarities of brands within a product category. In each shopping occasion, the choice of a given brand is usually associated to small price differentials or out-of-stock items (cf. Ehrenberg, 1972/1988; Uncles et al., 1995).

When switching the level of analysis to brand performance, Ehrenberg and colleagues have found that brand penetration level and market share are highly correlated, and that frequency of purchase of a given brand increases little with increases in penetration and market share. In other words, although brands differ widely concerning the number of buyers they have and their market share (e.g., ten times larger), over one year, they differ slightly (e.g., twice) relative to the average number of times each consumer buy it over this same period. These researchers have also discovered that brands with larger penetration and market share are associated with higher average purchase frequency than brands with lower penetration and market share. This implies that small brands are "punished twice" for being small: they have fewer buyers who buy them less frequently, than buyers of large brands – a phenomenon known as "double jeopardy" (cf. Ehrenberg et al., 1990). These consumer buying patterns have been replicated across dozens of product categories and services, from soup to gasoline, prescription drugs to aviation fuel, with large and small brands, and light and heavy buyers, in countries as diverse as the United States, United Kingdom, Japan, Germany, and Australia (cf. Ehrenberg et al., 2004).

*Levels of utilitarian and informational reinforcement*

Research based on the BPM has complemented these findings concerning consumer choice patterns. One line of inquiry investigated whether consumers' repertoire of brands is related to the functional consequences associated to the brands they usually buy. In order to do this, the set of alternative brands and product characteristics within each product category can be interpreted as a set of programmed contingencies of reinforcement, which specify what responses (e.g., choosing a given brand for a certain price) are followed by what consequences (e.g., product characteristics). They are treated as programmed contingencies because they were planned by marketing managers but may not function as reinforcement for every consumer. In line with the BPM, these contingencies program utilitarian and informational reinforcement, the magnitude of which requires measurements. Considering that there are no general units to measure utilitarian and informational reinforcement levels, Foxall, Oliveira-Castro and Schrezenmaier (2004) assessed them by adopting a forced ranking system in which three informational and two utilitarian levels were ascribed to each product category. In the case of supermarket food products, increases in utilitarian level can be identified by the addition of (supposedly) desirable attributes. Such attributes usually add value to the product or its consumption, are mentioned on the package or product name, and justify increases in price. Moreover, in most cases, several general brands offer products with and without these attributes. For the product categories investigated, utilitarian levels were identified based on additional attributes (e.g., plain baked beans *versus* baked beans with sausage) and/or differentiated formulation of products (e.g., plain cookies *versus* chocolate chip cookies). Using consumer panel data, each product item was classified as offering level 1 (plain product) or 2 (additional attributes or differentiated formulation) of utilitarian reinforcement.

By contrast, informational reinforcement is strongly associated with brand differentiation in that the most promoted and best-known brands are usually associated with higher levels of prestige, social status, and trustworthiness. Foxall et al. (2004) ranked informational reinforcement level on the basis of the following general criteria: (1) increases in prices across brands for the same product type (e.g., plain baked beans, plain cookies or plain cornflakes) were considered to be indicative of differences in informational levels; (2) the cheapest store brands (e.g., Asda Smart Price©, Tesco Value©, Sainsbury Economy©) were considered to represent the lowest informational level (Level 1); (3) store brands that do not mention good value for money or economy (e.g., Asda, Tesco, Sainsbury) and cheapest specialized brands were usually considered to represent the medium informational level (Level 2); and (4) specialized brands (e.g., Heinz©, McVities©, Kelloggs©, Lurpak©), with higher prices, were considered to represent the highest informational level (Level 3).

Another measure of programmed informational reinforcement was developed by Oliveira-Castro, Foxall and James (2008), which was based on a questionnaire that asked a sample of consumers to evaluate the level of quality (Likert scale 0 to 4) and familiarity (Likert scale 0 to 4) of all brands within each product category. This type of procedure has been interpreted as a probe of social reinforcement contingencies. The behavior of buying brands that are evaluated as being well known and having high quality is more likely to be socially reinforced than that of buying brands that are unknown and/or evaluated as having low quality. This type of measure of informational reinforcement can be used to assess consumer brand-equity (cf. Oliveira-Castro et al., 2008).

Foxall et al. (2004), examining buying patterns with the use of consumer data panel, discovered that consumers buy mostly brands within the same level of informational reinforcement and utilitarian reinforcement. This led to the conclusion that consumers' brand repertoire, reported as consumer heterogeneity by Ehrenberg and colleagues, is formed by brands belonging to the same (or similar) level of utilitarian and informational reinforcement. Therefore, when examining brand choice in routinely purchased goods, measuring the levels of utilitarian and informational reinforcement programmed by different brands may allow the identification of consumers' brand repertoires (i.e., patterns of consumer choice) within different product and service categories.

*Setting scope and learning history*

As mentioned previously, consumer behavior settings differ in scope, ranging from relatively open settings, which provide many choice alternatives to consumers (usually associated to reduced punishing contingencies), to relatively closed ones, where there are limited choice alternatives (and/or significant punishing contingencies). Measures of setting scope have included the quantity of brands within product categories (e.g., Dias & Oliveira-Castro, 2006), the size of the store, such as supermarkets compared to convenience stores (e.g., Yan, Foxall, & Doyle, 2012b; Bui Huynh & Foxall, 2016) and *vignettes* describing different shopping environments (e.g., Foxall & Greenley, 1999; Yani-de-Soriano, Foxall & Newman, 2013). Results showed, for example, that relatively more open settings were associated to increases in product search duration (cf. Dias & Oliveira-Castro, 2006), higher price responsiveness (i.e., elasticity) (cf. Yan, Foxall, & Doyle, 2012b), and increases in verbal responses related to dominance and to approach behavior (cf. Yani-de-Soriano, Foxall & Newman, 2013).

Measures of learning history are not unique to research on consumer behavior and may vary considerably depending on the purpose of each investigation. However, the most typical ones have been based on observed buying patterns (e.g., Cavalcanti, Oliveira-Castro & Foxall,, 2013) and consumers' verbal reports concerning their previous purchases (e.g., Porto & Oliveira-Castro, 2013, 2015).

*Consumer demand elasticity*

Other studies have investigated whether the quantities consumers buy remains relatively constant across shopping occasions. In marketing research, price demand elasticity, which relates changes in consumption as a function of changes in price, has been the most adopted measure of consumer responsiveness to changes in price. One of the simplest forms of demand function, adopted in operant behavioral economics, is a log-log function that relates quantity of consumption to changes in price (cf. Hursh, 1980, 1984; Kagel et al., 1995):

$$Log\ Quantity = a - b(Log\ Price) \quad (1)$$

where *a* and *b* are empirically obtained parameters and represent the intercept and slope of the function, and can be interpreted as measures of intensity and elasticity of demand, respectively. When the absolute value of *b* is smaller than one, demand is inelastic, which means that the percentage decrease in consumption is smaller than the percentage increase in price, and spending increases with increases in price. Demand is described as elastic, when *b* is greater than one, which implies that the percentage decrease in consumption is larger than the percentage increase in price, and spending decreases with increases in price (cf. Hursh, 1980, 1984).

This type of measure was initially developed in the context of consumer demand theory in microeconomics and adopted to explain a multitude of economic behaviors of large groups of consumers. Economic theory provides several predictions concerning the variables that influence demand elasticity, such as the presence or absence of alternative products that function as substitutes for the target product, the essential or superfluous function of the target product, whether changes in price are accompanied by income compensation, among others. Most of these predictions have been corroborated in the context of non-human animals choosing individually a variety of reinforcers in the laboratory and have provided explanations for behavioral patterns that were incongruent with reinforcement theory (e.g., Hursh, 1980, 1984; Kagel et al., 1995).

In an attempt to fill the gap between laboratory findings and behavior in the market, Oliveira-Castro, Foxall and Schrezenmaier (2006) compared individual and group demand price elasticities of consumers buying routinely purchased food items. The authors used panel data that included purchases of nine food product categories during 16 weeks. Calculating elasticity coefficients with all data points from all consumers that bought a given product (overall demand elasticity), results showed that coefficients were negative, as predicted by the theory (i.e., increases in price is associated to decreases in consumption), and that demand for all product categories was inelastic, as indicated by coefficients with absolute values smaller than one. Considering that such overall demand elasticities may result from the combination of intra- and inter-consumer elasticities, the authors examined the occurrence of such patterns. Intra-consumer elasticity would indicate that a consumer buys smaller quantities when paying higher-prices, whereas inter-consumer elasticity would indicate that, on average, consumers that buy smaller quantities tend to pay higher prices. Oliveira-Castro et al.

(2006) calculated inter-consumer elasticities by including in the Equation 1 only one data point for each consumer and intra-consumer elasticities by including in the equation the data points of only one consumer. Results showed that intra- and inter-consumer elasticity coefficients were significant and were similar to overall demand elasticity.

The same reasoning applies to brands. Observed demand price-elasticity, when obtained with purchase data of brands within a product category, may result from intra- and inter-brand price elasticities. Intra-brand elasticity would be characterized by consumers buying smaller quantities of a given brand when its price is higher, whereas inter-brand elasticity would be characterized by consumers buying smaller quantities when they buy a brand with higher average price. The occurrence of such patterns was demonstrated by Oliveira-Castro, Foxall and Schrezenmaier (2005), suggesting some complex relations between the quantity consumers buy of a given product and changes in its price, for it may include combinations of intra- and inter-consumer elasticities with intra- and inter-brand elasticities. For instance, inter-consumer elasticity may result from the fact that consumers who buy larger quantities of a given product also tend to buy more price-promoted brands or tend to buy cheaper brands, that is, brands that have lower regular prices, or tend to buy larger packages that often have lower prices per product weight or volume. The same would apply to intra-consumer elasticity, because the same consumer may buy larger quantities when finding a given brand on price promotion or may tend to buy larger quantities when buying brands with lower regular prices. Moreover, brands that have higher regular prices may be so because they offer higher levels of utilitarian reinforcement or higher levels of informational reinforcement. Do all these buying patterns occur in routine purchasing? What is their

relative importance to explain changes in the quantity consumers buy as a function of changes in price?

Oliveira-Castro, Foxall and James (2008), using a large consumer data panel, decomposed overall demand elasticity by considering intra- and inter-consumer demand elasticities can each be subdivided into intra- and inter-brand elasticities, which can be further subdivided according to package size, promotion price, utilitarian reinforcement level and informational reinforcement level. Results indicated that intra-brand variables accounted for larger variance in purchased quantity than inter-brand variables, and that the variance accounted for by intra-consumer variables depended upon the frequency of purchase across products. Products that have in average larger purchase frequency showed more variance accounted for by intra-consumer variables.

Elasticity coefficients were significant and negative for price variables, that is, the quantity consumers buy decreases with increases in price. Informational coefficients were significant and positive, indicating that increases in informational reinforcement offered by brands increase the quantity consumers buy. Utilitarian coefficients varied across product categories, suggesting that the effects of utilitarian reinforcement depend upon characteristics of the product category. As far as the sizes of the effects of each variable on purchased quantity are concerned, results showed that intra-brand and inter-package coefficients were the largest ones, indicating that changes in the quantity consumers buy are mostly related to changes in brand price due to switching across package sizes. Inter-brand price coefficients were the second largest, showing that consumers tend to buy smaller quantities when buying more expensive (i.e., average regular price) brands.

*Essential value of brands*

An important challenge faced by behavioral scientists, including marketing researchers, is to measure the value that consumers attribute to different commodities. Demand functions have also been used in this context, in the effort to identify the value of different reinforcers, whereas larger demand elasticities would be associated with less valuable reinforcers. Some of the factors that pose problems for the adoption of demand function in measuring reinforcer value are the following results from experimental situations: when prices reach extreme values, demand elasticity increases, becoming more elastic (e.g., Hursh, 1991; Hursh & Winger, 1995); and elasticity coefficients are influenced by the magnitude of reinforcers (Hursh, et al., 1988) and drug dosage (e.g., Winger et al., 1996). These findings indicate that demand elasticity is not constant for each reinforcer. Hursh and Silberberg (2008) have advanced an exponential model to measure demand elasticity that would overcome the difficulties associated with linear models. In their approach, demand elasticity is measured in relation to the point of maximum consumption, where price would be equal to zero. Elasticity is then measured as decreases relative to this point of maximum consumption in terms of percentages, which allows for direct comparison across reinforcers or magnitudes of the same reinforcer. The authors named this elasticity as a measure of the essential value of reinforcers.

The exponential model has been used in various experiments and has shown a good fit to the data and supplied theoretically consistent results for different reinforcers, different schedules of reinforcement, different reinforcement amounts and magnitudes (Hursh & Silberberg, 2008; Christensen et al., 2008; Foster et al., 2009). The approach was also applied to the study of consumer brand choice of food product in grocery shopping, where it indicated that the essential value of brands increased with increases

in the level of informational and utilitarian reinforcement offered by different brands (e.g., Oliveira-Castro et al., 2011; Yan et al., 2012a, 2012b), and with increases in the level of openness of consumer setting (Yan & Foxall, 2016). Moreover, incorporating, in the model, parameters that measure utilitarian and informational reinforcement level increased the amount of variance accounted for by the equation, when compared to the original model that includes only a price parameter.

*Individual differences in consumer buying patterns*

As mentioned so far, previous research has revealed several systematic patterns of consumer choice related to purchase frequency, brand loyalty, brand reinforcement level and responsiveness to price changes, and shown that such measures vary systematically across brands and individual consumers. In the case of brands, it has been demonstrated that several of these measures are correlated to brand size, interpreted on the basis of market share and penetration level. For consumers, results have indicated that their buying behaviors differ with respect to how much and how often they buy, their brand repertoires, the prices they pay, and their level of brand loyalty. However, it would be relevant to know whether these individual differences show stability across time and products, that is, whether, for instance, individuals who show high purchase frequency, when buying within a given product category during a certain period of time, continue to do so in subsequent periods and in other product categories. Consistency of buying patterns across periods and product categories would provide the firm with valuable information to inform its marketing strategies.

This question was addressed by Cavalcanti, Oliveira-Castro and Foxall (2013), who examined the stability of buying patterns across periods. The authors used consumer panel data containing information about 1,600 consumers buying four

different product categories during 52 weeks. They divided this 52-week period into three consecutive periods of 17, 17 and 18 weeks, and analyzed the correlations, across periods and products, among the following behavioral measures: average informational level of purchased brands, average utilitarian level of purchased brands, frequency of purchases, average price paid per product unit (e.g., 100 mg or 100 ml), average number of purchased items, purchased total weight of product, brand loyalty and demand elasticity. Results showed that all correlations for the same measure across time periods were positive and significant, which indicates that individual differences with respect to these measures are consistent and stable across time periods. Correlations across measures, within the same time period, revealed, for instance, that consumers who buy larger quantities (i.e., total weight) of a given product tend to pay lower unit price. In general, given the stability of these behavioral measures, results suggest that individual differences in buying patterns are influenced more by variables related to stable aspects of individuals' lives than by those present in the shopping environment. Some of those more prevalent aspects of consumers' lives are accounted for by the BPM as the consumer behavior setting and the consumer learning history, which include factors such as social class, family size, place of living, weekly working hours, and so forth (cf. Foxall, 1990/2004, 2002).

*Consumer choice and the Matching Law*

Another approach to measure consumer behavior has been inspired by the matching law, which states that, in choice situations, the relative rate of responses allocated to the available alternatives matches the relative rate of reinforcement obtained in such alternatives (cf. Herrnstein, 1961; 1970). The law was mainly derived from experimental research conducted in laboratory settings where non-human subjects

chose between two simultaneously available sources of reinforcement (e.g., food, water), which typically delivered reinforcement according to variable-interval schedules (i.e., reinforcement becomes available after a variable time interval). A generalized form of the matching law was proposed by Baum (1974a), represented by the following equation:

$$\frac{B_1}{B_2} = c\left(\frac{R_1}{R_2}\right)^a \quad (2)$$

where *B* and *R* represent responses and reinforcements, respectively, *c* and *a* are empirically obtained parameters, and the subscripts represent the two available alternatives. Parameter *a* and *c* are interpreted, respectively, as a measure of sensitivity of responses to the distribution of reinforcements and a measure of bias towards one of the alternatives. When *a* and *c* are equal to one, Equation 2 is equivalent to the simpler matching relation proposed by Herrnstein (1961). This generalized equation has been expanded by subsequent research by including other reinforcement dimensions, in addition to reinforcement frequency, such as amount, quality and delay (cf. Fisher & Mazur, 1997). The generalized matching law has been widely adopted in studies of choice, including investigations of non-human subjects in closed settings, as in the laboratory (e.g., Baum, 1979), non-human subjects in open settings, in their natural environment (e.g., Baum, 1974b; Graft et al., 1977), human participants in closed settings, in the laboratory and institutions (e.g., Bradshaw & Szabadi, 1988; Martens & Houk, 1989; Beardsley & McDowell, 1992), and human participants in open settings, in sports events (e.g., Vollmer & Bourret, 2000; Reed et al., 2006).

Matching analyses have also been adopted to examine consumer brand and product choices. The use of this type of analysis to investigate consumer behavior

becomes particularly relevant because the exponent of Equation 2 can provide a measure of reinforcer substitutability, indicating higher levels of substitutability when its value is closer to one (cf. Kagel et al., 1995; Foxall, 1999b). Using this rationale, several studies have used parameter *c* to measure the level of substitutability of brands of routinely purchased food items (e.g., Foxall & James, 2001, 2003; Foxall et al., 2004; Romero et al., 2006; Foxall et al., 2007) and of products (e.g., Foxall et al., 2010; Foxall et al., 2010). In this context of consumer choice, a proposal of integration of the matching law and the BPM has been proposed, whose results indicated that consumers' spending changed systematically with changes in price promotion, quantity bought, utilitarian reinforcement, and informational reinforcement, in decreasing order of importance (Oliveira-Castro et al., 2010).

It is prudent to add a note of caution concerning the use of some of the measures adopted in the studies described in this paper. Most measures of buying behavior were based on consumer panel data, which consist of records of purchases (e.g., product, brand, quantity, price, and store) obtained weekly at the household level. Although such records have been shown to be reliable (cf. Churchill, 1999), it should be noted that they do not necessarily reflect in-store individual purchase behavior, which would be the ideal type of information for most behavioral research. The adopted measures of informational reinforcement level should also be carefully interpreted since they derive from questionnaire application that attempts to probe programmed social contingencies concerning brand purchasing. Despite the difficulties associated to gathering more precise and reliable measures in such social settings, the relation between what individuals say when answering a questionnaire and what they actually do in their social encounters remains an unanswered empirical question.

The investigation of online consumer behavior, which constitutes a more recent research trend, has great potential to provide useful and meaningful measures of consumer responses, due to the similarities that can be found between online purchase task and experimental settings. In this sense, experiments investigating online shopping behavior might display high level of ecological validity (cf. DiFonzo et al., 1998; Hantula, 2005; Sigurdsson et al., 2016). Although the exploration of this line of research is beyond the scope of the present paper, it is worth mentioning that behavior-analytic research on online consumer behavior has grown significantly, with experiments examining the effects of several contingency parameters on choice and other consumer responses (DiClemente & Hantula, 2003, Fagerstrom, 2010, Fagerstrom et al., 2011, 2017; Fagerstrom & Ghinea, 2011; Hantula & Bryant, 2005; Menon et al., 2016; Sigurdsson et al., 2013, 2020).

**The marketing Firm**

All the regularities in consumer behavior described so far can, in principle, be used to inform the firm's strategies to fulfill consumers' demand, which ultimately is what may ensure the firm's survival. In order to do so, however, the firm needs to adjust its response to these patterns efficiently and constantly. To interpret and understand such interactions, the Marketing Firm Theory (MFT) was proposed by Foxall (1999a). In this sense, the firm is the hub of a metacontingency which embraces also the firm’s suppliers and its consumerate.

Any entity whose behavior can be predicted on the basis of the consequences that have previously followed its operant responses plus the environmental stimuli that prefigure the nature of the consequences that will ensue from its present behavior can be termed an *operant system* or a *contextual system* (Foxall, 1999a, 2016). This designation

clearly applies to the consumer. However, the marketing firm can also be understood as such a system and its corporate behaviors described in terms of the reinforcing and punishing outcomes they incur.

The dominant theme of the firm's external relationships is defined by the demands which its consumerate makes of it. The overall aim of the marketing firm is to create a consumerate. The "consumerate" encompasses the customer base of the marketing firm, be it composed of an aggregation of individual final consumers or a number of corporate customers. Drucker (1977, 2007) speaks of the objective of the firm as "to create a customer." A customer is someone who purchases a product or service in sufficient quantity to enable the firm to fulfill its revenue and profit objectives; and a consumerate is that aggregation of the customer base that enables the firm, through repeat purchasing, to accomplish these goals. More formally, a customer is an individual or organization with which the firm interacts through marketing transactions [objective exchange, whole marketing mix deployment, pecuniary markets]. Only firms (marketing firms) therefore have customers and by extension consumerates.

The effectiveness and efficiency of business activities depend on matching company's offerings with consumer demand. They are revealed by the relationships between the behaviors and consequences of commercial exchange that actually occur in the market. Just as at the individual level it can be determined that a contextualized response has led to a consequence, and this consequence influences subsequent responses in a behavioral chain (Baum, 2017), at the firm level, the same relationship is made present through two complementary paths in which cost-benefits are weighed up. One of these is the direct path (contextualized organizational response → organizational

consequence) and the other path is indirect (contextualized organizational response → context for consumers to purchase → consumer response → organizational consequence).

The direct path implies transaction costs (Coase, 1937; Williamson, 1985), since the organizational response (e.g. hiring workers) has the potential to generate costs or expenses that have a negative impact on the accounting-financial result (it can cause an immediate loss or weaken the profit-making benefit). In this sense, the organizational response leads to utilitarian punishments, which reduce the rates at which it emits the same response in the future. In extreme cases, it may even declare bankruptcy. Typically, to avoid bankruptcy, the firm tries to reduce costs or expenses to obtain profit.

The indirect path is the transaction mediated by the consumerate and its consequences. It is the path of the organizational response geared toward the consumers, and *via* which they, by responding commercially to the firm, acquire products and services. In this sense, they offer a pecuniary exchange (reinforcing the company with payment for these products and services – Foxall, 1999a). This indirect path is more laborious but necessary for the company's permanence in the market. By increasing transactions, greater pecuniary benefits (revenue) are generated than the costs generated by the organizational response, providing greater profit for the firm (Foxall, 2020).

### *The performance of a Marketing Firm*

For a firm that carries out marketing activities geared toward consumers, the performance occurs in an extra-firm relationship. In it, the company interacts through commercial exchanges with the consumerate (total final consumers) and/or symmetrical

exchanges (a firm that sells with a firm that buys). Thus, company performance relates to how effective or efficient the firm has been in obtaining gains derived from the commercial exchanges (Porto & Foxall, 2020), where this performance may be a comparison of the company with itself over time (intra-firm relationship) or in relation to other companies that offer the same benefits to consumers (inter-firm relationship).

Company performance indices from a behavioral perspective are syntheses of performance expressed in numbers that represent the organizational response and its consequences. They are commonly adopted by company managers or evaluators for decisions on which activities should be intensified or reduced (Pauwels et al., 2009). These indices can be qualitative (e.g. presence or absence), but they are more typically quantitative when the interest lies in what level of result the action adopted has generated. They are useful in demonstrating that a response has led to a consequence or that a consequence has led to a subsequent response. As many company behaviors are recurrent, some firms use a panel of performance indicators called a dashboard (Eckerson, 2010) to monitor performance in an intra-firm relationship (the firm with itself over time) or in an inter-firm relationship (the firm versus others in the same time unit).

There are a number of possible ways of building these indices, some relating exclusively to responses or to consequences, and others mixed. In general terms, they are comparative proportions (numerators and denominators) between responses and consequences, as shown in Table 1.

| Name | Measure | Scale | Application |
|---|---|---|---|
| Organizational or consumerate behavior measures | Any quantity that shows occurrence, frequency, strength, duration time, or time | Proportion of rate of focal response over competitor response or over total responses. Typically values | Used in various organizational and marketing studies. |

| | | | |
|---|---|---|---|
| | for first emission of a response (whether of the company or of the consumer). | between 0 and 1. Metrics with scales that exceed 1 can exist, such as those used in matching studies. | |
| Organizational or consumerate result measures | Any quantity of a company consequence that shows occurrence, frequency, magnitude, duration time, or time for first receipt or loss (whether of the company or of the consumer). | Proportion or rate of focal reinforcement/punishment over competitor reinforcement/punishment or over total reinforcements/punishments. Typically values between 0 and 1. Metrics with scales that exceed 1 can exist, such as those used in matching studies. | Used in behavioral studies. Typical in matching studies. |
| Elasticity (response-consequence relationship) | It is the percentage variation in Y given the percentage variation in X. It is a function composed of a variable that represents response and another variable that represents consequence, but where both are previously transformed into a natural logarithm (nlog). | A relationship between an nlog variable with another nlog variable generates values (positive or negative). Values (estimate) equal to 1 (absolute) is unitary elasticity. Values lower than 1 (absolute) are inelastic and values higher than 1 (absolute) are elastic. | Economic, marketing, and consumer behavior studies. |
| Coefficient of determination ($R^2$) | Adjustment measure of a generalized statistical function. One or more firm or consumerate behaviors (X) can lead to a consequence (Y). | Varies between 0 and 1, where 0 is the absence of prediction and 1 is total prediction regarding Y. | Various quantitative social and economic science studies, with interests in predictions and explanations. |

Table 1. Performance metrics from the behavioral perspective.

The occurrence of a behavior is generally measured on a dichotomous scale (if the response was emitted or not) and the frequency of the behavior is a count of the quantity of occurrences over a period. The strength is generally the volume or how much effort is expended on the activity on each response emission occasion (e.g. a

company's marketing investment or the amount saved by a consumer for the purchase). The duration time of a response is the count in a time interval of how much the response is emitted and the time for the first response is a count of the time interval between the start of a behavioral chain and the first time that the company or consumer emits the response.

Similar measures are used for consequences, with adaptations for an environmental event of gain or loss (e.g. occurrence of profit, frequency of profit, amount of profit, etc.). Consequences for the consumer may include using the product acquired, frequency of use, magnitude of use, etc. The combination between a response and its consequence can be used by transforming each part into a logarithm and then using the concept of elasticities as an estimate or coefficient of a relationship (estimate above 1 is an elastic relationship and estimate below 1 is an inelastic relationship). This has enabled stability or instability effects to be observed of the effectiveness of responses in the gains or losses in economic relationships.

Temporality of the units of measure of the performance indicators is common in studies in marketing and economics (Pauwels et al., 2009). The time period in which the organizational response was emitted is identified, and this can be the current time (represented by the letter t) or a lagged previous time (represented by t-1, t-2, t-...x). They are used in longitudinal studies for forecasting purposes or for identifying short- and long-term cumulative effects.

In organizational practices, there are numerous response and consequence relationships, and it is sometimes hard to identify which ones should be used to form a performance indicator. An understanding of the set of organizational responses, whether interlocked or not, and their consequences can make it possible to determine which ones are most important to use. A previous functional analysis can be useful for identifying

them. Thus, when there are two or more organizational responses that lead to the same consequence, these responses can be complementary or competitive. If they are complementary, when executed together, they have a greater influence on the consequence. If they are competitive responses and only one is executed, it generates a small effect on the consequence. If, on the other hand, they are competitive responses and both are executed, they can weaken or discontinue the positive effect on the consequence. It would be similar to Equation 1, with the addition of another independent variable with the term in logarithm and both of them in an additive model, as they represent the supply offerings (organizational responses).

In contrast, a response can lead to two or more consequences. If the consequences are complementary, the same response propagates or generalizes the effects. If the consequences are competitive and only one of them is important, the response generates a limited generalized effect. If the consequences are competitive and both are important, the response generates ambiguous or conflicting effects. They are represented in following Equations 3 and 4.

$$Log\ C_{1i} = a_i + b(Log\ B_{ia}) \quad (3)$$

$$Log\ C_{2i} = a_i + b(Log\ B_{ia}) \quad (4)$$

where $Log\ B_{ia}$ is the behavior a of firm i, $a_i$ is the intercept, $b$ is the multiplicative estimate effect (slope) of the response over $Log\ C_{1i}$ or $Log\ C_{2i}$, $Log\ C_{1i}$ is the reinforcing or punishing consequence 1 of firm i, $Log\ C_{i2}$ is the reinforcing or punishing consequence 2 of firm i.

An illustration of Equation 3 is displayed in Figure 2. In Graph A for firm i and in Graph B for firm j, the greater the magnitude of the marketing behavior, the greater the magnitude of the profitability (reinforcing consequence). However, in Graph A it is an elastic relation (Log profitability$_i$ = 4.14 + 1.37 * Log marketing behavior$_i$), while in Graph B it is an inelastic relation (Log Profitability$_i$ = 2.55 + 0.50 * Log marketing behavior$_i$).

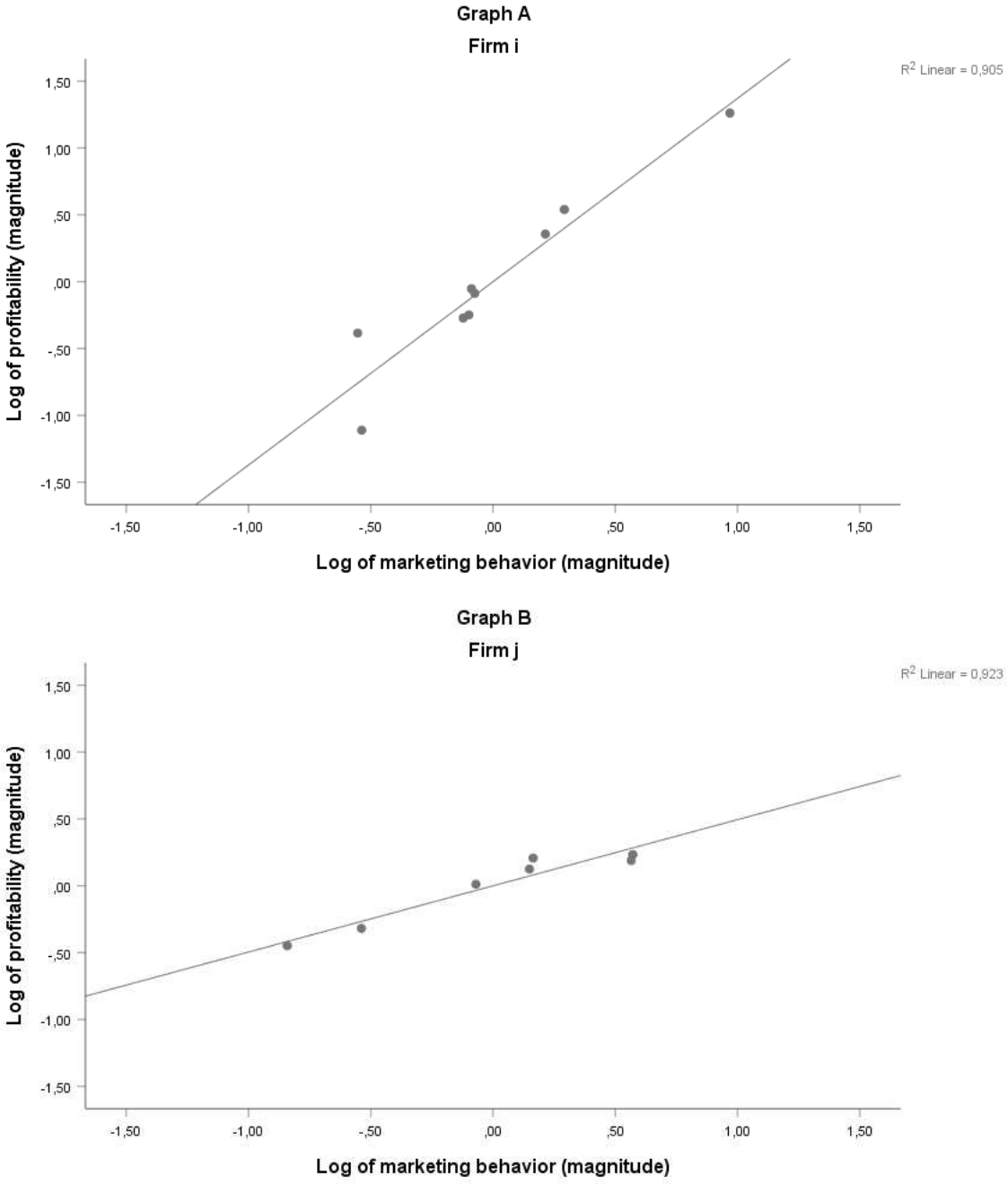


Figure 2. Graphs that illustrate the use of Equation 3 applied to firm i (Graph A) and to firm j (Graph B).

In choice situations, one can apply variations of the generalized matching equation (Baum, 1974a; Caron, 2019; Davison & McCarthy, 2016; Poling et al., 2011; Villarreal et al., 2019), represented in Equation 2. The focal and alternative choice in a

future time (t+1) are added as a variable to be explained along with the dimensions of the focal reinforcers over the alternatives in the current time (t). Equation 5 illustrates this example.

$$Log\left(\frac{B_{1,i,t+1}}{B_{2,i,t+1}}\right) = a_i + bLog\left(\frac{MR_{1,i,t}}{MR_{2,i,t}}\right) + bLog\left(\frac{FR_{1,i,t}}{FR_{2,i,t}}\right) + bLog\left(\frac{DR_{1,i,t}}{DR_{2,i,t}}\right) \quad (5)$$

where $Log\ (B_{1,i,t+1}/B_{2,i,t+1})$ is the behavior 1 of firm i in a subsequent time divided by the alternative behavior 2 of firm i in a subsequent time, $Log\ (MR_{1,i,t}/\ MR_{2,i,t},)$ is the magnitude dimension of the reinforcement 1 of firm i in the current time divided by the magnitude dimension of the reinforcement 2 of firm i in the current time, $Log\ (FR_{1,i,t}/\ FR_{2,i,t},)$ is the frequency dimension of the reinforcement 1 of firm i in the current time divided by the frequency dimension of the reinforcement 2 of firm i in the current time, $Log\ (DR_{1,i,t}/\ DR_{2,i,t},)$ is the delay dimension of the reinforcement 1 of firm i in the current time divided by the delay dimension of the reinforcement 2 of firm i in the current time, $a_i$ is the intercept of firm i (or the bias), and *b* is the multiplicative estimate effect of each reinforcement (slope).

With the use of Equations 1 to 5 there is a range of applications for revealing effects on organizational practices, especially marketing practices that generate reinforcing or punishing effects for the firm. Porto and Foxall (2019) used Equation 5 to reveal the changes in percentage points of the dimensions and of the types of reinforcers over the changes in percentage points of the marketing investments in a subsequent time (a choice of managerial effort geared toward the consumerate). Results have revealed that the reinforcer delay dimension was the most important influencer and, in general, an undermatching relation (inelasticity) is found – a high level of reinforcers is needed

to generate small increments in subsequent marketing investments in relation to other company administrative investments.

Applications of the Marketing Firm Theory have been used to reveal firms' utilitarian financial gains or losses (Porto & Foxall, 2019; Porto & Foxall, 2020). However, there is much room for developing these measures and it is an open field for functional studies and managerial applications. Measures should be developed that capture firms' informational reinforcements or punishers and it ought to be revealed what type of influence these informational consequences generate in subsequent organizational behaviors, especially those that relate to the consumerate.

In addition, research that compares simultaneous gains or losses between the firm and consumer in the same commercial exchange is still scarce. Future studies still need to demonstrate which specific marketing behaviors are most elastic in generating consequences for the company and for consumers. The applications of this knowledge could serve as inputs for evaluating the firm's performance as a whole over the course of its existence.

## Conclusion

The final aim of the marketing firm is to generate profit. Profit derives from its having a base of customers who buy repeatedly its products and services, which must be efficiently provided. Firm success is, therefore, essentially dependent upon its strategic responses to changes in consumer behavior. Consumer behavior analysis provides an operant framework to interpret and predict consumer behavior, that has been extensively adopted to investigate a wide range of phenomena, such as consumer choice in different settings, consumer verbal responses, product search and online shopping, with the use

of several measures of behavior, including, for example, matching analysis, demand elasticity, and essential value of brands. Information derived from this type of research can be integrated to an analysis of the behavior of the firm, interpreted as an operant system, in which responses of the firm produce consequences (usually derived from consumer behavior) that may alter its behavior in future occasions. According to this approach, the behavior of the firm produces changes in the setting for consumers, by presenting products and services, which may induce approach or avoidance responses from consumers. Such consumer responses, in turn, function as reinforcer (or punishers) for the firm behavior. Company performance measures, from a behavioral perspective, constitute syntheses of performance expressed in numbers that represent the organizational response and its consequences. They should be employed in the evaluation of the efficiency of the firm's responses to changes in the behavior of its consumerate.

## References

Baum, W. M. (1974a). On two types of deviation from the matching law: Bias and undermatching. *Journal of the Experimental Analysis of Behavior, 22*(1), 231-242. https://doi.org/10.1901/jeab.1974.22-231

Baum, W. M. (1974b). Choice in free-ranging wild pigeons. *Science, 185,* 78-79. https://doi.org/10.1126/science.185.4145.78

Baum, W. M. (1979). Matching, undermatching, and overmatching in studies of choice. *Journal of the Experimental Analysis of Behavior*, *32*(2), 45—53. https://doi.org/10.1901/jeab.1979.32-269

Baum, W. M. (2017). *Understanding behaviorism: behavior, culture, and evolution*. John Wiley & Sons.

Beardsley, S. D. & McDowell, J. J. (1992). Application of Herrnstein's hyperbola to time allocation of naturalistic human behavior maintained by naturalistic social reinforcement. *Journal of the Experimental Analysis of Behavior*, *57(2)*, 177—185. https://doi.org/10.1901/jeab.1992.57-177

Bradshaw, C. M. & Szabadi, E. (1988). Quantitative analysis of human operant behavior. In G. Davey and C. Cullen (eds.), *Human operant conditioning and behavior modification* (pp. 225-259). Wiley.

Bui Huynh, & Foxall, G. R. (2016). Consumer store choice: A matching analysis. In G. R. Foxall (ed.) *Routledge Companion to Consumer Behavior Analysis* (pp. 96-120). Routledge Taylor & Francis Group.

Caron, P. O. (2019). Multilevel analysis of matching behavior. *Journal of the Experimental Analysis of Behavior*, *111*(2), 183-191. https://doi.org/10.1002/jeab.510

Cavalcanti, P. R., Oliveira-Castro, J. M. & Foxall, G. R. (2013). Individual differences in consumer buying patterns: A behavioral economic analysis. *The Psychological Record, 62*, 259—276. https://doi.org/10.11133/j.tpr.2013.63.2.003

Christensen, C.J., Silberberg, A., Hursh, S.R., Huntsberry, M.E., & Riley, A.L. (2008). Essential value of cocaine and food in rats: Tests of the exponential model of demand. *Psychopharmacology, 198*, 221–229. https://doi.org/10.1007/s00213-008-1120-0

Churchill, G. A., Jr. (1999). *Marketing research: Methodological foundations* (7th Ed).The Dryden Press.

Coase, R. H. (1937). The nature of the firm. *Economica, 4*(16), 386–405. https://doi.org/10.1111/j.1468-0335.1937.tb00002.x

Davison, M., & McCarthy, D. (2016). *The matching law: a research review.* Routledge.

Dias, M. B., & Oliveira-Castro, J. M.. (2006). Comportamento de procura por produtos: efeitos da quantidade de marcas. *Revista Psicologia Organizações e Trabalho*, *6*(1), 195-232. http://pepsic.bvsalud.org/scielo.php?script=sci_arttext&pid=S1984-66572006000100008&lng=pt&tlng=pt

DiClemente, D. F., & Hantula, D. A. (2003). Optimal foraging online: Increasing sensitivity to delay. *Psychology & Marketing, 20*(9), 785–809. https://doi.org/10.1002/mar.10097

DiFonzo, N., Hantula, D. A., & Bordia, P. (1998). Microworlds for experimental research: Having your (control and collection) cake, and realism too. *Behavior Research, Methods, Instruments & Computers, 30*(2), 278–286. https://doi.org/10.3758/BF03200656

Drucker, P. F. (1977). *Management*. Harper.

Drucker, P. F. (2007). *The practice of management*. Routledge.

Eckerson, W. W. (2010). *Performance dashboards: measuring, monitoring, and managing your business*. John Wiley & Sons.

Ehrenberg, A. S. C. (1972/1988). *Repeat Buying*. Griffin.

Ehrenberg, A. S. C., Goodhardt, G. J. & Barwise, P. (1990). Double jeopardy revisited. *Journal of Marketing*, *54*(3), 82—91. https://doi.org/10.1177/002224299005400307

Ehrenberg, A. S. C., Uncles, M. D., & Goodhardt, G. J. (2004). Understanding brand performance measures: Using Dirichlet benchmarks. *Journal of Business Research, 57*(12), 1307—1325. https://doi.org/10.1016/j.jbusres.2002.11.001

Fagerstrøm, A. (2010). The motivating effect of antecedent stimuli on the web shop: A conjoint analysis of the impact of antecedent stimuli at the point of online purchase. *Journal of Organizational Behavior Management, 30*, 199–220. https://doi.org/10.1080/01608061003756562

Fagerstrøm, A., Arntzen, E., & Foxall, G. R. (2011) A study of preferences in a simulated online shopping experiment. *The Service Industry Journal, 31*(15), 2603–2615. https://doi.org/10.1080/02642069.2011.531121

Fagerstrøm, A., & Ghinea, G. (2011). On the motivating impact of price and online recommendations at the point of online purchase. *International Journal of Information Management, 31*, 103–110. https://doi.org/10.1016/j.ijinfomgt.2010.10.013

Fagerstrøm, A., Pawar, S., Sigurdsson, V., Foxall, G.R., & Yani-de-Soriano, M. (2017). That personal profile image might jeopardize your rental opportunity! On the relative impact of the seller's facial expressions upon buying behavior on Airbnb. *Computers in Human Behavior, 72*, 121-131. https://doi.org/10.1016/j.chb.2017.02.029

Fisher, W. W. & Mazur, J. E. (1997). Basic and applied research on choice responding. *Journal of Applied Behavior Analysis, 30*(3), 387—410. https://doi.org/10.1901/jaba.1997.30-387

Foster, T.M., Sumpter, C.E., Temple, W., Flevill, A., & Poling, A. (2009). Demand equations for qualitatively different foods under fixed-ratio schedules: A

comparison of three data conversions. *Journal of the Experimental Analysis of Behavior, 92*(3), 305–326. https://doi.org/10.1901/jeab.2009.92-305

Foxall, G. R. (1990/2004). *Consumer Psychology in Behavioral Perspective.* Routledge. (Republished in 2004 by Beard Books).

Foxall, G. R. (1999a). The marketing firm. *Journal of Economic Psychology*, *20*(2), 207-234. https://doi.org/10.1016/S0167-4870(99)00005-7

Foxall, G. R. (1999b). The substitutability of brands. *Managerial and Decision Economics, 20*, 241—257. https://doi.org/10.1002/(SICI)1099-1468(199908)20:5<241::AID-MDE936>3.0.CO;2-U

Foxall, G. R. (2001). Foundations of consumer behaviour analysis. *Marketing Theory*, *1*(2), 165—199. https://doi.org/10.1177/147059310100100202

Foxall, G. R. (2002). *Consumer Behaviour Analysis: Critical Perspectives in Business and Management*. Routledge.

Foxall, G. R. (2016). *Perspectives on Consumer Choice: From Behavior to Action, From Action to Agency.* Palgrave Macmillan.

Foxall, G. R. (2020). The theory of the marketing firm. *Managerial and Decision Economics*, *41*(2), 164-184. https://doi.org/10.1002/mde.3047

Foxall, G. R., & Greenley, G. E. (1999). Consumers' emotional responses to service Environments. *Journal of Business Research, 46*(2), 149–158.

Foxall, G. R. & James, V. K. (2001). The behavioral basis of consumer brand choice: A preliminary analysis. *European Journal of Behavior Analysis*, *2*(2), 209—220. https://doi.org/10.1080/15021149.2001.11434195

Foxall, G. R. & James, V. (2003). The behavioral ecology of brand choice: How and what do consumers maximize? *Psychology and Marketing*, *20*(9), 811—836. https://doi.org/10.1002/mar.10098

Foxall, G. R., James, V. K., Chang, J. & Oliveira-Castro, J. M. (2010). Substitutability and complementarity: Matching analyses of brands and products. *Journal of Organizational Behavior Management*, *30*(2), 145—160. https://doi.org/10.1080/01608061003756414

Foxall, G. R., James, V. K., Oliveira-Castro, J. M., & Ribier, S. (2010). Product substitutability and the matching law. *The Psychological Record*, *60*, 185—216. https://doi.org/10.1007/BF03395703

Foxall, G. R., Oliveira-Castro, J. M., James, V. K. & Schrezenmaier, T. C. (2007). *The behavioral economics of brand choice.* Palgrave Macmillan.

Foxall, G. R., Oliveira-Castro, J. M. & Schrezenmaier, T. C. (2004). The behavioral economics of consumer brand choice: Patterns of reinforcement and utility maximization. *Behavioural Processes*, *66*(3), 235—260. https://doi.org/10.1016/j.beproc.2004.03.007

Graft, D. A., Lea, S. E. G. & Whitworth, T. L. (1977). The matching law in and within groups of rats. *Journal of the Experimental Analysis of Behavior*, *27*(1), 183—194. https://doi.org/10.1901/jeab.1977.27-183

Hantula, D. A. (2005). Guest editorial: Experiments in e-commerce. *Psychology & Marketing, 22*(2), 103–107. https://doi.org/10.1002/mar.20049

Hantula, D. A., & Bryant, K. (2005). Delay discounting determines delivery fees in an e-commerce simulation: A behavioral economic perspective. *Psychology & Marketing, 22(2),* 153–161. https://doi.org/10.1002/mar.20052

Herrnstein, R. J. (1961). Relative and absolute strength of response as a function of frequency of reinforcement. *Journal of the Experimental Analysis of Behavior*, *4(3)*, 267—272. https://doi.org/ 10.1901/jeab.1961.4-267

Herrnstein, R. J. (1970). On the law of effect. *Journal of the Experimental Analysis of Behavior*, *13(2)*, 243-266. https://doi.org/10.1901/jeab.1970.13-243

Hursh, S. R. (1980). Economic concepts for the analysis of behavior. *Journal of the Experimental Analysis of Behavior, 34*(2)*,* 219–238. https://doi.org/ 10.1901/jeab.1980.34-219

Hursh, S. R. (1984). Behavioral economics. *Journal of the Experimental Analysis of Behavior, 42*(3)*,* 435–452. https://doi.org/ 10.1901/jeab.1984.42-435

Hursh, S. R. (1991). Behavioral economics of drug self-administration and drug abuse policy. *Journal of the Experimental Analysis of Behavior, 56*(2)*,* 377–393. https://doi.org/10.1901/jeab.1991.56-377

Hursh, S. R., Raslear, T. G., Shurtleff, D., Bauman, R., & Simmons, L. (1988). A cost-benefit analysis of demand for food. *Journal of the Experimental Analysis of Behavior, 50(3),* 419–440. https://doi.org/10.1901/jeab.1988.50-419

Hursh, S. R. & Silberberg, A. (2008). Economic demand and essential value. *Psychological Review, 115*(1), 186–198. https://doi.org/ 10.1037/0033-295X.115.1.186

Hursh, S. R., & Winger, G. (1995). Normalized demand for drugs and other reinforcers. *Journal of the Experimental Analysis of Behavior, 64*(3)*,* 373–384. https://doi.org/ 10.1901/jeab.1995.64-373

Kagel, J. H., Battalio, R. C. & Green, L. (1995). *Economic Choice Theory: An Experimental Analysis of Animal Behavior.* Cambridge University Press.

Martens, B. K. & Houk, J. L. (1989). The application of Herrnstein's law of effect to disruptive and on-task behavior of a retarded adolescent girl. *Journal of the Experimental Analysis of Behavior, 51*(1)*,* 17–27. https://doi.org/ 10.1901/jeab.1989.51-17

Menon, R. G. V., Sigurdsson, V., Larsen, N. M., & Foxall, G. R. (2016). Consumer attention to price in social commerce: Eye tracking patterns in retail clothing. *Journal of Business Research, 69*, 5008-5013. https://doi.org/10.1016/j.jbusres.2016.04.072

Oliveira-Castro, J. M., Foxall, G. R., & James, V. K. (2008). Individual differences in price responsiveness within and across food brands. *Service Industries Journal*, *28*(6), 733—753. https://doi.org/ 10.1080/02642060801988605

Oliveira-Castro J. M., Foxall, G. R., James, V. K., Pohl, R. H. B. F., Dias, M. B. & Chang, S. W. (2008). Consumer-based brand equity and brand performance. *Service Industries Journal, 28*(4), 445-461. https://doi.org/10.1080/02642060801917554

Oliveira-Castro J. M., Foxall, G. R, & Wells, V. K. (2010). Consumer brand choice: Money allocation as a function of brand reinforcing attributes. *Journal of Organizational Behavior Management, 30*(2), 161 - 175. https://doi.org/ 10.1080/01608061003756455

Oliveira-Castro, J. M., Foxall, G. R., Yan, J., & Wells, V. K. (2011). A behavioral-economic analysis of the essential value of brands. *Behavioural Processes, 87*(1), 106–114. https://doi.org/10.1016/j.beproc.2011.01.007

Oliveira-Castro, J. M., Foxall, G. R., & Schrezenmaier, T. C. (2005). Patterns of consumer response to retail price differentials. *Service Industries Journal, 25*(3), 1-27. https://doi.org/10.1080/02642060500050392

Oliveira-Castro, J. M., Foxall, G. R., & Schrezenmaier, T. C. (2006). Consumer brand choice: Individual and group analyses of demand elasticity. *Journal of the Experimental Analysis of Behavior, 85*, 147-166. https://doi.org/10.1901/jeab.2006.51-04

Pauwels, K., Ambler, T., Clark, B. H., LaPointe, P., Reibstein, D., Skiera, B., Wierenga, B., & Wiesel, T. (2009). Dashboards as a service: Why, what, how, and what research is needed? *Journal of Service Research*, *12*(2), 175-189. https://doi.org/10.1177/1094670509344213

Poling A., Edwards T., Weeden M., & Foster T. M. (2011). The matching law. *The Psychological Record, 61*(2), 313–322. https://doi.org/10.1007/BF03395762

Porto, R. B., & Foxall, G. R. (2019). The marketing firm as a metacontingency: Revealing the mutual relationships between marketing and finance. *Journal of Organizational Behavior Management*, *39*(3-4), 115-144. https://doi.org/10.1080/01608061.2019.1666774

Porto, R. B., & Foxall, G. R. (2020). Marketing firm performance: When does marketing lead to financial gains? *Managerial and Decision Economics*, *41*(2), 191-202. https://doi.org/10.1002/mde.3046

Porto, R. B., & Oliveira-Castro, J. M. (2013). Say-do correspondence in brand choice: interaction effects of past and current contingencies. *The Psychological Record, 63*(2), 345-362. Doi: 10.11133 / j.tpr.2013.63.2.009

Porto, R. B., & Oliveira-Castro, J. M. (2015). Consumer purchase and brand performance. In G. R. Foxall (Ed.), T*he Routledge companion to consumer behavior analysis*, (pp. 175-201). New York: Taylor and Francis Group.

Reed, D. D., Critchfield, T. S. & Martens, B. K. (2006). The generalized matching law in elite sport competition: Football play calling as operant choice. *Journal of Applied Behavior Analysis, 39*(3), 281-297. https://doi.org/10.1901/jaba.2006.146-05

Romaniuk, J. & Sharp, B. (2016). *How Brands Grow. Part 2.* Oxford University Press.

Romero, S., Foxall, G. R., Schrezenmaier, T. C., Oliveira-Castro, J. M. & James, V. K. (2006). Deviations from matching in consumer choice. *European Journal of Behavior Analysis*, *7*(1), 15-40. https://doi.org/10.1080/15021149.2006.11434261

Sharp, B. (2010). *How Brands Grow.* Oxford University Press.

Sigurdsson, V., Menon, R. G., Sigurdarson, J. P., Kristjansson, J. S., & Foxall, G. (2013). A test of the behavioral perspective model in the context of an e-mail marketing experiment. *The Psychological Record, 63*, 295–308. https://doi.org/10.11133/j.tpr.2013.63.2.005

Sigurdsson, V., Larsen, N. M., Alemu, M. H., Gallogly1, J. K., Menon, R. G. V., & Fagerstrøm, A. (2020). Assisting sustainable food consumption: The effects of quality signals stemming from consumers and stores in online and physical grocery retailing. *Journal of Business Research, 112*, 458-471. https://doi.org/10.1016/j.jbusres.2019.11.029

Sigurdsson, S., Larsen, N. M., & Menon. R. G. V. (2016). Behavior analysis of online consumer behavior. In G. R. Foxall (ed.) *Routledge Companion to Consumer Behavior Analysis* (pp. 51-64). Routledge Taylor & Francis Group.

Sudman, S. (2011). *Consumer panels*. Marketing Classics Press.

Uncles, M., Ehrenberg, A.S.C. & Hammond, K. (1995). Patterns of buyer behavior: Regularities, models, and extensions. *Marketing Science*, *14*(3), G71–G78. https://doi.org/10.1287/mksc.14.3.g71

Villarreal, M., Velázquez, C., Baroja, J. L., Segura, A., Bouzas, A., & Lee, M. D. (2019). Bayesian methods applied to the generalized matching law. *Journal of the Experimental Analysis of Behavior*, *111*(2), 252-273. https://doi.org/10.1002/jeab.506

Vollmer, T. R. & Bourret, J. (2000). An application of the matching law to evaluate the allocation of two- and three-point shots by college basketball players. *Journal of Applied Behavior Analysis, 33*(2), 137-150. https://doi.org/10.1901/jaba.2000.33-137

Winger, G., Woods, J. H., & Hursh, S. R. (1996). Behavior maintained by alfentanil or nalbuphine in rhesus monkeys: Fixed-ratio and time-out changes to establish demand curves and relative reinforcing effectiveness. *Experimental and Clinical Psychopharmacology, 4*(2), 131–140. https://doi.org/10.1037/1064-1297.4.2.131

Williamson, O. E. (1985). *The economic institutions of capitalism.* Free Press.

Yan, J. & Foxall, G. R. (2016). Essential value in the Behavioral Perspective Model. In G. R. Foxall (ed.) *Routledge Companion to Consumer Behavior Analysis* (pp. 138-149). Routledge Taylor & Francis Group.

Yan, J., Foxall, G. R. & Doyle, J. R. (2012a). Patterns of reinforcement and the essential value of brands. I: Incorporation of utilitarian and informational reinforcement into the estimation of demand. *The Psychological Record, 62*, 361-376. https://doi.org/10.1007/BF03395808

Yan, J., Foxall, G. R. & Doyle, J. R. (2012b). Patterns of reinforcement and the essential value of brands. II: Evaluation of a model of consumer choice. *The Psychological Record, 62*, 377-394. https://doi.org/10.1007/BF03395809

Yani-de-Soriano, M., Foxall, G. R. and Newman, A. (2013). The impact of the interaction of utilitarian and informational reinforcement and behaviour setting scope on consumer response, *Psychology and Marketing, 30*(2), 148—159. DOI: 10.1002/mar.20594