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“How Websites Compete in the Middle East: the Example of Iran”

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# How Websites Compete in the Middle East: the Example of Iran

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## Abstract

Based on the analysis of two sets of data (a cross-sectional online survey of five product categories with an average sample size of 525 and a longitudinal telecommunications panel of more than two million respondents), this study detects a positive relationship between the market size (purchase penetration) of Iranian e-brands (or websites) and the percentage of customers shared with other e-brands. This finding is consistent with the well-established Duplication of Purchase Law; it also holds over time and across different markets (e.g., repertoire v. subscription). Hence, this study makes a twofold contribution to marketing knowledge. First, it expands the collection of empirical evidence concerning the Duplication of Purchase, which thus far is primarily within offline contexts and Western countries. Second, it addresses issues inherent to research on e-loyalty, such as the over emphasis on evaluating loyalty for one e-brand at a time via complex attitudinal measures. Accordingly, this study advances consumer buying behaviour research by clarifying that, similar to offline domains and other geographical areas, e-loyalty in this buoyant Middle Eastern market divides across a small number of e-brands. It is also best appraised through behavioural loyalty and by comparing multiple e-brands competing within the same market. These outcomes translate into a series of practical guidelines for the strategic management of e-brands, improving the practical understanding how e-brands compete and grow.

**Keywords:** *Duplication of Purchase; e-loyalty; behavioural loyalty; online buying; repertoire buying.*

## 1 Introduction

The *Duplication of Purchase Law* is a well-established empirical generalisation that allows marketing practitioners and academics to understand and evaluate brand loyalty and market competition (Ehrenberg, 1988, 2000; Sharp, Wright, Kennedy, & Nguyen, 2017). In particular, this marketing regularity highlights that brands share customers with other brands competing within the same product category in line with market size (e.g., purchase penetration) (Ehrenberg, 1988; Romaniuk & Dawes, 2005; Sharp, 2010; Sharp & Sharp, 1997), clearly illustrating that customers buy across a range of brands (Anesbury, Greenacre, Wilson, & Huang, 2018; Bennett & Ehrenberg, 2001; Ehrenberg & Goodhardt, 1970; Lam & Ozorio, 2013). Established knowledge about these concepts covers many offline buying contexts, including store choice (Keng & Ehrenberg, 1984), pharmaceuticals (Stern, 2002) and beer (Dawes, 2008). It also covers several countries, especially the United States (Goodhardt, Ehrenberg, & Collins, 1975) and Europe (Uncles & Ehrenberg, 1990; Cohen & Tataru, 2011). However, there is a knowledge void concerning online buying behaviour, especially in geographical areas experiencing staggering growth in digital transactions such as the Middle East. These aspects call for a ‘double’ *differentiated replication* of previous research and form the focus of the present study, as per the following rationale.

According to Sharp (2002, p. 27), “replication promotes confidence in the veracity of a discipline’s cumulative knowledge base.” Nonetheless, replications in consumer behaviour research are rare compared to other disciplines (Danaher & Brodie, 2000; Hubbard & Vetter, 1996) and, as Amir and Sharon (1990) remark, there is often limited effort to perform validation studies. Indeed, Uncles and Wright (2004) discuss that marketing scholars often perceive replications as time-consuming, thus miss the opportunity to explore new domains and expand the marketing literature. Internet users worldwide have reached almost five billion (Internet World Stats, 2020b) and more than two billion people are expected to buy products and services online in 2021, spending over 3.5 trillion USD (Statista, 2020a). Several geographical areas in the world underpin these trends, including under-researched contexts such as the Middle East. For example, in 2018, Iran’s e-commerce market experienced a rapid expansion of Internet penetration (up to 80%, see Internet World Stats, 2020a) and it has the highest number of web-users in the Middle East (twice as many as Saudi Arabia, see Statista, 2020b). There are also significant challenges when studying online buying behaviour. For instance, rival brands are only clicks away from each other and consumers can easily compare competing offers with minimal effort (Christodoulides & Michaelidou, 2011; Khan, Zubair, & Malik, 2019; Srinivasan, Anderson, & Ponnayolu, 2002; Swaminathan, Anderson, & Song, 2018). Therefore, empirical research ascertaining how e-brands (or websites) compete is highly relevant, forming a ‘case in point’ for replicating important empirical marketing knowledge such as the Duplication of Purchase Law. To do so, this study uses two sets of buying behaviour data from Iran (a set of survey

data recording claimed, or recalled, purchase behaviour for multiple product categories and a longitudinal panel recording revealed buying behaviour for the telecommunications market), which allow for multiple built-in controls (e.g., examining over-time variation, different types of markets).

In addition to the above, *e-loyalty* research (i.e., research on loyalty towards websites or e-brands, see Srinivasan et al., 2002) is plagued by several issues. For instance, extant studies on e-loyalty often hinge on complex attitudinal measurements, evaluating loyalty for one e-brand at the time (see, Almeida-Santana & Moreno-Gil, 2018; Ramaswami & Arunachalam, 2016), and assuming it to be shaped by multiple factors (Kaya, Behraves, Abubakar, Kaya, & Orús, 2019; Khan et al., 2019; Quan, Chi, Nhun, Ngan, & Phong, 2020; Swaminathan et al., 2018; Zhang & Liu, 2017). This approach presents two problems. First, a general agreement is yet to emerge on which key drivers shape e-loyalty, which prevents the establishment of simple conclusions easily adaptable to ever-evolving digital landscapes. Second, the focus on attitudinal measurements fails to accurately predict consumer buying behaviour (Cheng, 2011; Foxall, 2016; Sharp, Sharp, & Wright, 1999), due to a weak correlation between consumer attitudes and actual purchases made (see, among others, Blery et al., 2009). By extending the Duplication of Purchase Law analysis to the online domain and a Middle-Eastern country, the present study aims to mitigate these problems.

Besides making a significant contribution to two important areas of marketing research (i.e., the body of knowledge on the Duplication of Purchase Law and e-loyalty literature), this research also makes numerous managerial contributions. In brief, it has long been argued that online and traditional (offline) domains are somewhat different in terms of market structures, marketing activities and competitive strategies (Reichheld & Schefer, 2000). It has also been argued that managers need to improve their understanding of e-loyalty to achieve a competitive advantage (Srinivasan et al., 2002; Swaminathan et al., 2018). Accordingly, this study sheds light on possible methods and strategies that can improve the way managers track and handle competition in modern digital contexts, growing the market performance of websites or e-brands. These methods hinge on the well-established conventions resulting from the Duplication of Purchase Law, much the same as in offline domains and irrespective of different geographical contexts,.

## **2 Background and Research Questions**

### **2.1 Duplication of Purchase**

Over fifty years ago, Goodhardt examined television program viewing behaviour, publishing a seminal duplication study in *Nature* (Goodhardt, 1966). Four years later, Ehrenberg and Goodhardt (1970) extended the same analysis to consumer goods, noting that, in a given period, the proportion of customers who buy one brand and also buy other brands is proportional to the number of the second

brand's buyers. This regularity has since been recognised as a robust empirical pattern to be expected in the analysis of buying behaviour and is conventionally labelled as the *Duplication of Purchase Law* (see also Ehrenberg, 1988; Romaniuk & Dawes, 2005; Sharp, 2010; Sharp & Wright, 1999; Uncles, Ehrenberg, & Hammond, 1995). According to this pattern, in a given product category, smaller or less popular brands share many of their customers with larger or more popular brands (Ehrenberg, 1988; Romaniuk & Dawes, 2005; Sharp, 2010; Sharp & Sharp, 1997). In line with the theory of stochastic preferences or the *as-if random* allocation of preferences across substitutable alternatives (Goodhardt, 1966), this pattern corroborates evidence of *repertoire buying* (Goodhardt, Ehrenberg, & Chatfield, 1984; Tanusondjaja, Nenycz-Thiel, & Kennedy, 2016) – i.e., evidence that most consumers buy *multiple brands* within a given product category without rejecting any (Ehrenberg, 1988).

Table 1 presents a brief overview of existing studies, highlighting the product categories and geographical locations (or contexts) considered so far in research using the Duplication of Purchase Law to examine consumer buying behaviour. Examples of previous replications of Goodhardt's seminal work include wine (Romaniuk & Dawes, 2005; Wilson & Winchester, 2019); beer (Dawes, 2008), gambling (Lam & Mizerski, 2009, 2017) and radio listening (Lees & Wright, 2013). Past studies have also abundantly confirmed this pattern's generalisability in Western contexts such as Australia (e.g., Bennett & Ehrenberg, 2001; Dawes, 2008; Lam & Mizerski, 2009; Romaniuk & Dawes, 2005), the United States (e.g., Anesbury, Greenacre, et al., 2018; Lam, 2006; Uncles, Kennedy, Nenycz-Thiel, Singh, & Kwok, 2012) and Europe (e.g., Dawes, 2009; Scriven, Yábar, Clemente, & Bennett, 2015; Tanusondjaja et al., 2016). This collection of empirical evidence makes the Duplication of Purchase a 'law-like' pattern, helpful to examine different domains (Mansfield, 2004) and to solve 'new' problems of theoretical and managerial relevance.

\*\*\* *Insert Table 1 about here* \*\*\*

Nonetheless, as Table 1 suggests, little work exists that understand the implications of this pattern in the online domain and in non-Western contexts such as the Middle East. A partial exception, at least for the analysis of online contexts, is the study by Trinh, Anesbury and Driesener (2017) on online supermarkets. They found that one in five UK online buyers shopped from two or more online supermarkets, clearly indicating duplication of buying across multiple e-stores. Accordingly, the first aim of the present study is to extend and replicate the Duplication of Purchase Law in online digital domains. Doing so will provide new knowledge of the competition for loyalty among various e-brands, clarifying the most effective and beneficial strategic decisions for market success, especially in contexts where e-commerce is experiencing staggering growth, such as the Middle East.

Replication studies have been classified on the basis of how different they are, compared to the original study (Hubbard & Armstrong, 1994; Lindsay & Ehrenberg, 1993). The two most common

replications are *close replications* and *differentiated replications* (Ehrenberg & Bound, 1993; Lindsay & Ehrenberg, 1993; Uncles & Wrigh, 2004). Close replications examine whether the original result will hold in the replication study (Lindsay & Ehrenberg, 1993), for instance, checking whether a new result is at all repeatable (Ehrenberg & Bound, 1993). A differentiated replication is a replication under different conditions, such as repeating the original study in an underdeveloped economy, which radically extends or limits the predictability of findings (Ehrenberg & Bound, 1993). The present study is configured as a ‘double’ differentiated replication, since it extends the Duplication of Purchase Law analysis into a lesser understood research context (online domain) and an underexplored geographical context (Iran, chosen as an example of a Middle Eastern country with a staggering growth of e-commerce). Furthermore, as discussed next, the present research addresses important issues that characterise the literature on e-loyalty.

## 2.2 Issues in e-Loyalty research

*E-loyalty* has been often defined as an intention to revisit a website to repurchase (Anderson & Srinivasan, 2003; Cyr et al., 2005; Islam, Khadem, & Sayem, 2012; Zeithaml, Berry, & Parasuraman, 1996) and not changing to another website (Flavián & Guinalú, 2006). Although many scholars have established the importance of loyalty in e-commerce (Anderson & Srinivasan, 2003; Chang et al., 2009; Cristobal et al., 2007; Kim et al., 2009; Martínez-Argüelles & Batalla-Busquets, 2016; Reichheld & Schefer, 2000; Zeithaml et al., 1996), there is no consensus on its measurement. For example, in terms of the drivers of e-loyalty, some researchers concentrated on one single factor, such as attitudes, behavioural intentions, inertia or switching barriers (Azam, 2015; Kaabachi, Ben Mrad, & Fiedler, 2019; Khan et al., 2019; Parra-Lopez, Martínez-González, & Chinea-Martin, 2018). Other scholars considered two or three factors, establishing links with service quality and customer satisfaction research (Barreda, Nusair, Okumus, & Bilgihan, 2013; Faraoni, Rialti, Zollo, & Pellicelli, 2019; Fuentes-Blasco, Saura, Berenguer-Contrí, & Moliner-Velázquez, 2010; Kaya et al., 2019; Park, Doreen Chung, Gunn, & Rutherford, 2015; Purani, Kumar, & Sahadev, 2019). Other researchers considered four (Chocarro, Cortiñas, & Villanueva, 2015; Fang, Chen, Wen, & Prybutok, 2018; López-Miguens & Vázquez, 2017), five (Christodoulides & Michaelidou, 2011; Fang, Shao, & Wen, 2016) or even more factors (Swaminathan et al., 2018), returning complex attitudinal measures.

The use of different and complex measures (Al-dweeri, Ruiz Moreno, Montes, Obeidat, & Al-dwairi, 2019; Blery et al., 2009; Durmuş, Ulusu, & Erdem, 2013; Kassim & Ismail, 2009; Kim, Jin, & Swinney, 2009) also conflates e-loyalty with other performance indicators, such as e-satisfaction (Al-dweeri et al., 2019; Al-Hawari, 2014; Fang et al., 2018; Kaya et al., 2019), e-trust (Faraoni et al., 2019; Kaabachi et al., 2019; Zheng, Lee, & Cheung, 1991), e-service quality (Belanche Gracia, Casalo Ariño, & Guinalú Blasco, 2015; Durmuş et al., 2013; Khan et al., 2019), perceived value (Fuentes-Blasco et al., 2010; Martínez-Caro, Cegarra-Navarro, García-Pérez, & Fait, 2018; Yao, Tsai,

& Fang, 2015), and other attitudinal measures such as perceived enjoyment, perceived usefulness, personal innovativeness and knowledge sharing (Fang et al., 2016; Martínez-Caro et al., 2018; Yao et al., 2015).

Accordingly, besides an absence of agreement on e-loyalty measurement (see also Aydin & Özer, 2005; Cronin Jr., Brady, & Hult, 2000), a second issue that plagues marketing literature is the excessive emphasis on attitudinal measurements. In this regard, the main problems of theoretical and managerial relevance are as follows. First, attitudinal loyalty does not accurately capture *brand* loyalty (Cheng, 2011; Foxall, 2016; Sharp et al., 1999), especially when loyalty is shared across multiple brands (Arifine, Furrer, & Felix, 2019; Dawes, 2008). Second, attitudinal loyalty shows weak correspondence with actual buying behaviour (Blery et al., 2009) and, as Webb and Sheeran (2006) asserted, it can not accurately predict a change in behaviour. In fact, attitudinal loyalty assesses the intention and previous behaviour (Ajzen & Fishbein, 1980), not the actual purchase behaviour (Bobalca, 2013) and, as Foxall (2016, p. 119) pointed out, “To ‘explain’ why an individual acted in a given way by reference to having a desire or need or being motivated to act in the manner in question actually explains nothing; at best it redescribes the behaviour.”

The same issues discussed so far also appear in research that evaluated e-loyalty in terms of *stickiness*. Zott, Amit, and Donlevy (2000) defined stickiness as the website's ability to obtain the customers' attention and retain. Researchers considered different factors to measure stickiness, such as user perceptions of a website's attributes (Bansal, Irving, & Taylor, 2004; Lin, 2007), positive attitude (Lin, 2007), customer satisfaction with the website (Bansal et al., 2004; Khalifa, Limayem, & Liu, 2002; Kurmiawan, 2000), commitment (Li, Browne, & Wetherbe, 2006), trust (Li et al., 2006; Lin, 2007), and service quality (Huang, Lin, & Fan, 2015). As such, there is no agreement also around the measurement of stickiness. Moreover, prior studies on stickiness primarily focused on evaluating consumer attitudes rather than behaviours (e.g., Huang et al., 2015; Lin, 2017). As Khalifa et al. (2002) suggest, more research is needed considering actual online buying behaviour, such as repeat purchase behaviour across multiple websites (see also Lu, Ye, & Yan, 2018).

By extending and replicating the Duplication of Purchases Law analysis to the online context and in an underexplored geographical area (Iran), this study addresses the problems discussed so far by: i) concentrating on a more objective non-attitudinal evaluation of e-loyalty, via measuring revealed and claimed purchases across different e-brands (websites) competing within the same online product category; ii) drawing upon established conventions on consumer buying behaviour, such as the tendency to buy more than one brand within a given market – an aspect that can be referred to as *multi-brand e-loyalty*; and iii) benchmarking observed trends against the collection of findings that have emerged in empirical marketing studies evaluating the Duplication of Purchase.



Another important benefit of presenting a Duplication of Purchase Law analysis for the online domain and an under-explored geographical area lies in identifying meaningful exceptions or deviations from expected trends. For example, in certain instances, brands might share fewer or more buyers than expected given their market size or popularity level. These exceptions (or deviations) indicate *market partitions* (Ehrenberg, 1988; Wright, Sharp, & Sharp, 1998) or *groupings* (Tanusondjaja et al., 2016). Partitions are brands sharing more customers with similar brands and fewer customers with dissimilar brands than expected; groupings are brands sharing more customers with similar brands and sharing customers with dissimilar brands in line with expectations (Tanusondjaja et al., 2016). Past studies found that partitions and groupings might result from functional differences, location or different end-users. For instance, partitions have been found in radio stations broadcasting different genres (Lees & Wright, 2013), leaded v. unleaded petrol (Ehrenberg & Uncles, 2000); luxury cars (Ehrenberg & Bound, 2000), healthy v. unhealthy foods (Anesbury, Nguyen, & Bogomolova, 2018), and different geographical locations (Mansfield, Romaniuk, & Sharp, 2003; Sharp & Sharp, 1997). Therefore, the analysis of potential deviations offers additional information yielding important implications for brand positioning, brand development (or growth) and customer's brand knowledge (Nenycz-Thiel, Sharp, Dawes, & Romaniuk, 2010), along with signalling the existence of sub-markets, which is informative of competition dynamics (Wright et al., 1998).

In summary, the basic tenet of the Duplication of Purchase Law and likely deviations from it implies that e-brands (or websites) might share more or fewer customers than expected with other e-brands, depending on their market size or popularity. Indeed, despite the general belief that satisfied customers tend to be more loyal (Al-dweeri, Obeidat, Al-dwiry, Alshurideh, & Alhorani, 2017; Khan et al., 2019), high satisfaction typically impacts single-brand loyalty, but it is not an obstacle to being multi-brand loyal (Quoquab, Yasin, & Dardak, 2014). Therefore, understanding and empirically measuring multi-brand e-loyalty is essential to maximisation of returns on consumer-firm relationships for e-brands (or websites) (Arifine et al., 2019). The Duplication of Purchase also suggests that any partition or groupings of e-brands within a product category might come down to functional differences or dissimilarities of end-users. Research that has examined online competition found that product variety (Chang, 2011; Sethi, Kaur, & Wadera, 2018; Yaraş, Özbük, & Ünal, 2017), price (Bucko, Kakalejčík, & Ferencová, 2018; Usman & Kumar, 2020; Yaraş et al., 2017) and availability of a physical store (Yaraş et al., 2017) might impact the consumer intention to purchase online. In a similar vein, studies comparing buying behaviour for different online sub-markets, such as private and public e-banks, attributed any differences to user intentions and satisfaction (Agrawal, Chauhan, & Kukreti, 2017; Hada, 2016; Raveendran, 2016). Yet, these conclusions have not been derived from clear empirical benchmarks on any potential excess or deficit (or lack thereof) in *behavioural* e-loyalty. Accordingly, this research addresses the following research questions:

**RQ1:** *Does consumer purchasing in the Iranian online market follow the Duplication of Purchase Law?*

**RQ2:** *What level of behavioural loyalty (excessive, deficit or regular) do e-brands (or websites) demonstrate when analysing the partition sharing index?*

### 3 Method

#### 3.1 Data description

Following Amir and Sharon (1990) and Sharp et al. (2017), as mentioned earlier, the present research is a ‘double’ differentiated replication study, simultaneously analysing two under-explored domains: online purchases and Iran. The motivation for concentrating on the analysis of online buying behaviour is justified by the need to expand knowledge on the Duplication of Purchase Law and e-loyalty trends in digital domains. The motivation for concentrating on Iran, besides the need to expand empirical marketing research on the Duplication of Purchase to non-Western markets, comes down to the staggering growth in e-commerce that characterises this country in general and vis-à-vis the relevant geographical area. Specifically, compared to the rest of the Middle-East, Iran shows significant differences in terms of GDP, Internet speed and e-commerce growth. For instance, the annual growth rate of revenue is expected to be 7.02% in Iran by 2025, while Australia expects a 4.22% annual growth rate (Statista, 2021a). Similarly, Iran expects almost 11% user penetration growth compared to Australia, with a near 2% growth expectation by 2025 (Statista, 2021b).

To add robustness to the conclusions drawn, the two sets of Iranian data examined in this study allow for a series of ‘built-in’ controls, as follows. The first set of data originates from a *cross-sectional online survey* (collected in the second half of 2020, using a snowballing approach<sup>1</sup> via sharing the survey hyperlink across social media platforms), including five different product categories (home electronics and digital devices, banking, groceries, books, and cosmetics) and a total of 33 e-brands (or websites). Overall, 3,222 responses were collected, out of which 2,669 were employed for the analysis. The responses removed from this dataset for the analysis were either incomplete (e.g., they only answered the general questions or did not answer to any product category questions) or invalid (i.e., they did not buy online, or returned illogical/inconsistent responses). The sample sizes for individual product categories ranged between 262 and 1,114. The survey was conducted in September 2020, and respondents were asked exclusively about their online purchases. In more detail, the survey's first question asked if the respondent had an online purchase in the last six months. Then, based on the product category they were surveyed on, respondents were asked to recall their recent

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<sup>1</sup> The snowball sampling technique (Abbes, Hallem, & Taga, 2020; Baltar & Brunet, 2012; Khan, Fatma, Shamim, Joshi, & Rahman, 2020; Sadler, Lee, Lim, & Fullerton, 2010) allowed finding hard to reach participants (online buyers of multiple product categories).

online purchases, covering timeframes ranging between the last three weeks to six months. For instance, the timeframe for the groceries category was three weeks, while for the home electronic and digital devices category was six months. As such, this first dataset covers examples of repertoire v. subscription markets (Sharp, Wright & Goodhardt 2002). Repertoire markets are repeat purchase markets with few solely loyal buyers and most buyers buy across the repertoire of brands in the category (Dawes, 2008; Sharp & Wright, 1999; Trinh, 2014). Typical examples of repertoire markets include brand choice, store choice, packaged consumer goods, media, fuel and medical prescriptions (Ehrenberg et al., 2004; Keng & Ehrenberg, 1984; Sharp et al., 2002; Sharp & Wright, 1999; Tanusondjaja et al., 2016). In contrast, in subscription markets (e.g., insurance and banking), high levels of single brand loyalty are the norm and brand-switching occurs less frequently. However, according to Dawes (2008), studies show customers in subscription markets also buy from multiple brands (see Mundt, Dawes, & Sharp, 2006; Uncles & Ehrenberg, 1990).

The second set of data originates from a *longitudinal panel* including four time periods (starting in 2013) and more than 13 million records of online purchases across five e-brands by more than two million telecommunications customers. Specifically, the panel data included individual customers records for one of the main mobile operators in Iran, Irancell, which in 2016 had more than 30 million active simcards (Cra, 2017). The panel data included the mobile number, purchase date and time, the amount paid and the name of the websites the customers bought from. These websites are service e-brands that sell different plans to recharge mobile SIM cards. While there were some joint customers across the four-time period, the individual records in each time period were not entirely the same. Nevertheless, this second dataset allowed for two additional ‘built-in’ checks. First, unlike the first dataset, it concentrates on the measurement of revealed behaviour; not recalled or claimed purchases, which are sometimes subject to response bias (Ludwichowska, Romaniuk, & Nenycz-Thiel, 2017). Second, it allows the evaluation of the consistency of Duplication of Purchase across time.

Table 2 presents the demographic profile of respondents from the survey data (demographic information was not available for the panel data), showcasing a suitable alignment with Iran’s Internet users’ population in terms of age and gender, albeit mostly capturing younger consumers.

\*\*\* Insert Table 2 about here \*\*\*

### 3.2 Key measures and empirical tests

In line with past Duplication of Purchase studies, for both data sets, two-entries tables were created and screened, concentrating on the measurement of *brand duplication* – i.e., for each brand, the proportion of brand buyers who also bought other brands within the same category (Anesbury, Greenacre, et al., 2018; Dawes, 2014; Lam & Ozorio, 2013). The calculation of brand duplication

hinges on the measurement of *purchase penetration* for each brand – i.e., the proportion of customers who bought the brand compared to the total market buyers (Ehrenberg, 1988; Goodhardt et al., 1984). Then, within each table, each column’s observed percentages are expected to decrease in line with the overall brand size (Dawes, 2008; Dawes, Romaniuk, & Mansfield, 2009; Romaniuk & Dawes, 2005; Wilson & Winchester, 2019). Specifically, to ascertain any potential deviation from this expected pattern, it is also necessary to input brand duplication and purchase penetration into the calculation of a *duplication coefficient (D)* (Ehrenberg, 1988). The adoption of the duplication coefficient describes if buyers are more or less likely to buy a pair of brands (Tanusondjaja et al., 2016).

There are multiple ways to calculate the duplication coefficient. In line with previous research, in this study, it was calculated by dividing the average duplication by the average penetration of the brands (Dawes et al., 2009; Ehrenberg, 2000; Ehrenberg & Goodhardt, 1970) – see Equation 1.

**Equation 1 - the duplication coefficient**

$$D = \sum b_{XY} / \sum b_X b_Y$$

The above formula was first introduced by Ehrenberg and Goodhardt (1970) and has since been extensively replicated using the simplified formula presented in Equation 2:

**Equation 2 - the duplication of purchase pattern**

$$b_{XY} / b_X = D b_Y$$

whereby:

**b<sub>XY</sub>**: the percentage of buyers of brand Y who also bought brand X for a given time

**b<sub>X</sub>**: the penetration of brand X for a given time

**b<sub>Y</sub>**: the penetration of brand Y for a given time

**D**: the average value of all brands divided by the average penetration of all brands

A higher duplication coefficient typically indicates brand switching (Dawes & Nenycz-Thiel, 2014). The expected duplication for each brand is then calculated by multiplying the duplication coefficient value with the market penetration of that brand. Accordingly, it is possible to benchmark observed and expected sharing of buyers between brands. This comparison involves perusing arithmetical differences between observed and expected figures; for example, by considering the Mean Absolute Deviation values (MADs) – i.e., the differences between the average duplication and the expected duplication in absolute terms (Dawes et al., 2009; Driesener, Banelis, & Rungie, 2017; Hammond, East, & Ehrenberg, 1996), or the Mean Absolute Percentage Error (MAPE) – i.e., the level of the deviations in percentage (Sjostrom, Maria Corsi, Driesener, & Chrysochou, 2014). In this study, the focus was on MADs and MAPEs values, which were perused to address RQ1 (see also the approach by Dawes et al., 2009; and Ehrenberg & Uncles, 2000). The decision to concentrate on MADs and

MAPEs is justified as follows. Driesener et al. (2017) adapted and improved previous research methods linked to the use of stochastic models of buying behaviour such as the Dirichlet (e.g., Scriven & Bound, 2004; Uncles, Wang, & Kwok, 2010). In particular, Driesener et al.'s improvements involve reliance on a suite of 'goodness-of-fit' statistics, which can be used also outside the scope of the Dirichlet model to compare observed and theoretical values of key brand performance statistics such as market penetration and average purchase frequency, a key measure of behavioural brand loyalty. Out of this suite of statistics, MADs and MAPEs prominently feature since, when examined in combination with correlations between observed and theoretical values, they can provide sufficient ground to draw meaningful conclusions on the correspondence between a set of observed and the theoretical measures. Several studies have adopted Driesener et al.'s (2017) approach (e.g., Trinh, Corsi, & Lockshin, 2019; Trinh et al., 2017), although not to explicitly explore the outcomes of Duplication of Purchase analyses. Similarly, in recent years, several studies empirically exploring patterns in buying behaviour used a combination of correlations, MADs and MAPEs to draw their conclusions (e.g., Anesbury, Talbot, Day, Bogomolov, & Bogomolova, 2020; Trinh & Lam, 2016).

To address RQ2, this study used the Partition Sharing Index (PSI). A PSI represents higher or lower than expected levels of sharing for more than one brand, given their market penetration levels (Anesbury, Nguyen, et al., 2018; Sjostrom et al., 2014). Equation 3 presents the PSI formula that this study deployed.

**Equation 3 – Partition Sharing Index**

$$PSI_{ij} = S_{ij} / (D * P_i)$$

whereby according to Sjostrom et al. (2014):

**S<sub>ij</sub>**: the duplication of purchase for brand i with brand j

**D**: the average duplication of all brands divided by the average penetration of all brands

**P<sub>i</sub>**: Penetration of brand i

A PSI of 1.0 shows that two or more websites share customers as expected, in line with their penetration. For example, a PSI of 1.1 represents that the two e-brands share 10% more buyers, while a PSI of 0.9 indicates the two websites share 10% fewer buyers than expected. However, there is a meaningful market partition when groups of websites share buyers more than 20% (Sjostrom et al., 2014). Hence, in line with past studies, the present research assumes that: i) a *market partition* (sub-categories, i.e. e-brands sharing a functional similarity sharing more buyers with each other and fewer buyers with the rest of the category) occurs when the *intra-PSI is ≥1.20* and the *inter PSI is ≤0.80*; and ii) a *grouping of e-brands* (i.e., e-brands sharing a functional similarity sharing more buyers with

each other, but the expected level of buyers with the rest of the category) occurs when the *intra-PSI* is  $\geq 1.20$ , and the *inter PSI* is  $\geq 0.80$  (see also Tanusondjaja et al., 2016).

## 4 Results

### 4.1 Duplication of Purchase Pattern

In relation to the analysis of the survey data, the results were as follows. For example, Table 3 outlines the percentage of online customer duplication for Iranian bank websites for four weeks in 2020. In line with previous studies, the largest e-bank brand, Mellat, had a penetration of 28%, meaning that over one in four category buyers have used their e-banking services in the previous four weeks. Of those customers, 22% have also used the second largest brand Melli; 8% have also used the third largest brand Pasargad; and 4% have also used the second smallest brand Sepah. In turn, on average, 21% of the 11 other e- brands shared 21% of their customers with Mellat. These figures already offer an indication of an underlying Duplication of Purchase. The final rows of Table 3 and Table 4 demonstrate the expected duplication values calculated by multiplying each website's penetration with the duplication coefficient (D value). The D value is 0.69, which is a result of 7.9 (average duplication) divided by 11.5 (average penetration). Therefore, all brands are expected to share 19% of their customers with Mellat (28% multiplied by 0.69), 16% with Melli (16% multiplied by 0.69), and so forth. These results reveal a close fit between the expected duplication values and average observed values. Additionally, the correlation between each e-bank penetration and the average duplication was 0.99; the average MAD was 0.69; and the average MAPE was 10%. Therefore, comprehensively, there was a strong indication that a Duplication of Purchase pattern is present in this market.

This outcome is in line with Sharp et al. (2002), who assert that subscription markets also show multi-brand buying in the absence of substantial restrictions to brand switching. That is, in free choice subscription markets where using 'rival' brands is unrestricted "even though a subscription is required, there may be nothing to prevent multiple subscriptions, as with bank credit cards." (Sharp et al., 2002, p. 15). Similarly, Dawes (2014b) highlighted the existence of the Duplication of Purchase Law in offline banking and confirmed that banks share their customers with rival banks in line with their market share.

\*\*\* *Insert Table 3* **Error! Reference source not found.** *about here* \*\*\*

\*\*\* *Insert Table 4 about here* \*\*\*

\*\*\* *Insert Table 5 about here* \*\*\*

The same analysis described so far was extended to all four product categories (see Table 5). The results confirmed a strong Duplication of Purchase for most markets, except for the home electronics and digital devices category, which revealed a more modest ‘fit’. Specifically, Wright et al. (1998) reported a MAD of up to 3% as a good fit of expected buying behaviour patterns such as the Duplication of Purchase. However, although an average MAD of 2.1 represents a modest fit, it is still reasonable within the range for the fit (Lewis, 1982). Moreover, according to Ehrenberg (1994), a higher correlation (close to +1) between the two variables represents a reasonably good fit. Hence, it was plausible to conclude a clear relationship between the market size of Iranian websites or e-brands (number of buyers) and the proportion of customers shared or multi-brand e-loyalty.

Regarding the panel data, the Duplication of Purchase Law ‘held’ for the telecommunications category across all four years. In more detail, Table 4 shows the Duplication of Purchase pattern in 2016, whereby of the 71% of buyers who bought from website AA; 13% of them also bought from website BB; and 1% also bought from website CC (brand names are anonymised for confidentiality). The same approach has been conducted for three additional years. Moreover, the results across all four years (see Table 5 again) present an average correlation of 0.99 and an average duplication coefficient of 0.45. Also, the average MAD was 1.7, and the average MAPE was 20%.

## 4.2 Deviations

Considering the results for the survey data, as example, Table 6 shows the detailed PSI calculations for Iranian banks, highlighting that the two public banks (Melli and Sepah) share 19% fewer customers with each other than expected (intra-PSI=0.81). In contrast, the ten private banks (Mellat, Tejarat, Saderat, Pasargad, Saman, Parsian, Ayandeh, Eghtesad Novin, Shahr and Day) share 5% more customers than expected given their penetration (intra-PSI=1.05). The dark shades show that the two websites share more customers than expected ( $\geq 1.2$ ), and the light shades indicate the two websites share fewer customers than expected (i.e.,  $\leq 0.8$ ). While there is slight excess sharing of customers for private banks, the inter-PSI (i.e., the sharing between private and public banks) is 0.84 – they share 16% fewer customer with one another than expected. This suggests that there is just one overall banking market within Iran and the ‘public v. private’ delineation is only slightly impacting the standard Duplication of Purchase. In terms of the possible explanation for the overlaps of e-loyalty between some of the e-banks considered, additional reasons that would have required further investigation include the overall user experience and interface quality, including any outstanding technical features enhancing the array of online services available for certain e-banks vs. competitors. For instance, concerning two e-banks with limited sharing of e-customers, Tejarat bank and Pasargad bank, publicly available information about the services these two e-banks offer suggests that Pasargad bank covers 38 of the 50 banking services investigated, while Tejarat covers 24 (Rade, 2019). Similarly, Eghtesad Novin bank offers 33 online services compared to Tejarat, which offers 24 online

banking services. In comparison, when considering e-banks with great overlap of online customers, these typically covered a very similar number of banking services – e.g., Tejarat and Saderat banks offer 24 and 27 online services, respectively.

\*\*\* *Insert Table 6 about here* \*\*\*

\*\*\* *Insert Table 7 about here* \*\*\*

Similar results concerning the deviations from the standard Duplication of Purchase pattern emerged for the other product categories examined. In more detail, Table 7 shows that the books market revealed some deviations most likely underpinned by the variety of the products sold, meaning that the websites with wide products variety shared 347% more customers than expected given their size. Since the inter-PSI (i.e., the sharing between these websites and the rest of the category) was 0.94, this outcome indicates a grouping of e-brands for this product category. Indeed, the remaining e-brands outside of this deviation offered a narrower product range – e.g., 30book.com, Shahreketabonline.com and Gisoom.com only provide e-books and audiobooks; Iranketab only sells selected books in specific genres. Similarly, within the cosmetics category, while there was excess sharing of customers for premium e-brands and for middle-of-the-range and budget e-brands, the intra-PSI were 1.34 and 3.89 respectively, and the inter-PSI was 0.93, suggesting that these are two groupings of e-brands, rather than partitions. The home electronic and digital devices market results revealed that e-brands offering high product variety shared 11% fewer customers than expected (the index was 0.89). In contrast, e-brands offering limited products variety shared 500% more customers than expected. In this instance, there are some unique characteristics in the website with more limited variety. For example, Baneh.com offers 120% refund if the customers claim and prove that the product they purchased is not original. Alldigital.ir provides second-hand products at a lower price, and it does not sell home electronic devices, while Baneh.com provides brands and products that are not available in the Alldigital.ir website. Yet, while there is clear oversharing between these e-brands, they formed a grouping, rather than a partition – a conclusion confirmed by the inter-PSI value (i.e., the sharing between the two sub-categories, which was 2.40). Finally, in the groceries category, two websites that also have physical stores (Snapp.market and Okala.com) shared 8% fewer customers than expected, compared to the two websites that do not have physical stores (Digikala.com and Snappfood.ir), which shared 21% more customers than expected given their size. Here, there is some oversharing between two of the four brands, but since the inter-PSI was 0.97, this is again a grouping of e-brands, rather than a market partition.



The analysis of the longitudinal panel data (see again Table 7) returned a PSI of 1.90 and a grouping for the websites BB and CC across all four years. Based on additional information available within the data (not relevant to the Duplication of Purchase analysis, but adding context to the online marketing strategy of these e-brands), these two websites consistently used Google Ads across all four time periods to attract more buyers – a strategy most likely underpinning *excess* behavioural e-loyalty for these e-brands, in comparison to the other two. Indeed, taking the example of Year 4, when three websites were using Google Ads (BB, CC and EE), the intra-PSI is 1.26 for the three e-brands deploying online advertising, whereas the two other websites (AA and DD) returned a intra-PSI of 0.85 (thus sharing 15% fewer customers than expected). Nonetheless, it is worth highlighting that in light of the intra-PSI score in all four years ( $\geq 1.20$ ), there is just one overall telecommunication category within Iran (no partitions evident).

Overall, Table 7 shows the average inter-PSI value of 1.13 across all product categories. The result aligns with the limited previous studies investigating the PSI, which only explored the consumer goods categories (e.g., Anesbury, Jürkenbeck, et al., 2020; Sjostrom et al., 2014). For instance, Anesbury, Jürkenbeck, et al. (2020) studied the fresh fruits and vegetable purchasing produced by private label, non-branded and proprietary brands. On average, they found a PSI of 1.25 for proprietary brands, 1.49 for private labels and 0.88 for non-branded produce. Nonetheless, to enhance the robustness of the conclusions drawn, we calculated the repertoire sizes for all six categories. The results varied between 1.04 (home electronic and digital devices category) and 1.46 (banking category). With respect to the panel data, repertoire sizes were also around 1 and were consistent across the four years. Although slightly higher repertoire sizes emerged for the product categories considered in the survey data, considering the number of brands examined within each category and the time frames, these results are in line with Banelis, Riebe and Rungie's (2013) study, which investigated repertoires sizes for 122 consumer goods categories across two data sets and different timeframes (one, three and six months). Indeed, survey data might be subject to memory decay, which could limit the accuracy of recalled purchases. Specifically, more time allows consumers to have greater repertoire sizes (Banelis et al., 2013) and, as the number of brands increases, the penetration of the brands and the amount of sharing of customers would also logically increase. These changes might level out the D-Value, which serves into the PSI calculation; thus, possibly justifying, at least in part, the limited evidence of market partitions detected in the present study.

## 5 Discussion

### 5.1 Theoretical implications

Despite the growing interest in online buying, very few studies have empirically examined online behavioural loyalty (Rogers, Daunt, Morgan, & Beynon, 2017), especially in non-Western contexts

such as Middle Eastern countries. Hence, this study extends the body of empirical knowledge dedicated to the Duplication of Purchase analysis established by Professor Gerlad Goodhardt, expanding what we currently know to a new domain (i.e., online consumer buying behaviour) and geographical context (i.e., Iran, a growing Middle Eastern digital market). In more detail, prior studies imply that consumers show single-brand loyalty towards e-brands. The outcome of the present research shows that this is not the case: online customers are actually multi-brand e-loyal and purchase from a range of websites servicing the same product category. The implication of this fact is a great deal of ‘sharing’ of online purchases across rival e-brands, which, like brick and mortar contexts, occurs in a predictable fashion. In this regard, the key novel finding is that e-brands compete in line with the level of purchase penetration within a given online product category, and the benchmarks ascribed by the Duplication of Purchase are widely applicable. Therefore, besides confirming the relevance of the Duplication of Purchase Law (Bennett & Ehrenberg, 2001; Dawes, 2008; Goodhardt, 1966; Keng & Ehrenberg, 1984; Lam & Mizerski, 2009; Romaniuk & Dawes, 2005) to understand online buying and Iranian markets, this study also suggests that marketers can grow e-brands by attracting more buyers, rather than focusing on enhancing customer loyalty (Anesbury, Jürkenbeck, et al., 2020; Faulkner, Truong, & Romaniuk, 2014). This conclusion is corroborated by the absence of outstanding market partitions and the emergence of groupings of e-brands offering a similar level of product variety.

The present research also makes a secondary contribution, remedying some important issues that characterise the e-loyalty literature such as the excessive (and inconclusive) focus on uncovering the drivers of e-loyalty (e.g., Al-dweeri et al., 2019; Al-Hawari, 2014; Belanche Gracia et al., 2015; Fang et al., 2018; Kaya et al., 2019; Khan et al., 2019) and on attitudinal measures (e.g., Durmuş et al., 2013; Khan et al., 2019). This focus is problematic because there is no currently no agreement on the factors affecting e-loyalty and claimed repurchase intention does not always result in actual repurchase (Blery et al., 2009). Moreover most research to date has only examined the implications of online loyalty for a single brand at the time, ignoring empirical research supporting both multi-brand buying and the importance of studying behavioural rather than attitudinal loyalty. In contrast, this study provides clarity and empirical benchmarks on how websites compete in the online market by bringing into the consumer behaviour literature on e-loyalty the body of knowledge on the Duplication of Purchase originating from the work of Professor Goodhardt.

## 5.2 Managerial implications

This research offers brand managers and marketers worthy insights concerning how they can evaluate competition in the online domain. First, based on the finding that buyers are multi-brand loyal, this study suggests that managers of e-brands (or websites) maintain a realistic view on online loyalty, accepting that their customers will most certainly shop from other e-brands as well. Accepting this

simple fact about online buying behaviour and e-loyalty will improve managers' ability to robustly measure and evaluate e-brands' performance, via estimating and tracking the Duplication of Purchase across different product categories and time periods. Specifically, this study highlights implications for setting norms and reasonable expectations for the interpretations e-brands performance – e.g., managers of small-share websites should not be concerned by the fact that their customers also shop from large-share websites. Second, by confirming the existence of the Duplication of Purchase Law in multiple online markets, this study provides valuable insight as to how websites compete. In this regard, this study clarifies that online customers' sharing occurs in line with the e-brand (or website) penetration or market size. This study also highlighted some market deviations in some online categories (presenting higher or fewer sharing between websites than expected). Such deviations will help managers identify with which websites they have heightened/lower competition to achieve better e-commerce results. This knowledge also allows marketers planning marketing strategies based on more realistic competitive benchmarks than merely assessing e-loyalty for their own e-brand.

## **6 Limitations and future research**

As with any research, there are some limitations to this study. First, the panel data offered no information about the customers' demographic details and the survey's respondents mostly belonged to younger demographics. Therefore, future studies might benefit from replicating the same analysis with more diverse samples to further extend the scope of this study's results. Indeed, future and additional replications of this analysis are still warranted, especially examinations of possible differences emerging across dissimilar consumer segments. Second, this study investigates six product categories and two different data types (survey and panel). The combination of these aspects controlled for different conditions, such as the likely confounding effects of dissimilar markets (repertoire v. subscription) and over time variation. However, to add to these findings, future studies could use other product categories or present explicit comparisons of offline and online product categories, another missing information in the two datasets used. In fact, considering the type of markets examined (subscription and repertoire), while bank categories are typically considered a subscription market, the results of this study were much closer to what would be expected in repertoire markets. This outcome calls for further research to better understand the rationale behind online banking. For example, differences (or similarities) between different e-banks, including website characteristics and user experience, and the assortment of online services offered are aspects calling for more explicit analysis. Finally, the outcomes of this study suggest that there is scope for more empirical research examining the application of other 'marketing laws' such as the Double Jeopardy (Anesbury, Greenacre, et al., 2018; Dawes, 2014a; Ehrenberg, Goodhardt, & Barwise, 1990; Greenacre, Tanusondjaja, Dunn, & Page, 2015) and Pareto Share Law (Anesbury, Talbot, et al., 2020; Habel, Rungie, Lockshin, & Spawton, 2003; McCarthy & Winer, 2019) to improve the understanding

of consumer buying behaviour in digital contexts, providing a better understanding how brands grow and compete online.

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## Tables

Table 1: Overview of duplication of purchase studies

Author	Context/Market	Country
Hand (2011)	Arts	UK
Uncles and Ehrenberg (1990a)	Aviation fuel	Europe
Dawes (2008)	Beer	Australia
Colombo, Ehrenberg and Sabalava (2000)	Cars	UK, France
Dawes (2014)	Cigarettes	USA
Dawes (2009)	Clothing	UK
Winchester, Arding and Nencyz-Thiel (2015)	Fair trade coffee and tea	UK
Bennett and Ehrenberg (2001)	Fast food	Australia
Ehrenberg and Goodhardt (1970)	FMCGs	UK
Uncles and Ehrenberg (1990b)	FMCGs	USA
Dawes (2016)	FMCGs	USA
Tanusondjaja, Nencyz-Thiel and Kennedy (2016)	FMCGs	UK, USA
Anesbury, Greenacre, Wilson and Huang (2018)	Fruits and vegetables	USA, India
Lam (2006)	Gambling	USA
Lam and Mizerski (2009)	Gambling	Australia
Lam and Ozorio (2013)	Gambling	USA, Australia and Macao
Lam and Mizerski (2017)	Gambling	Australia
Scriven, Yábar, Clement and Bennett (2015)	Leisure activities	UK
Stern (2002)	Pharmaceuticals	UK
Wilson, Nguyen, Bogomolova, Sharp, and Olds (2019)	Physical activities	Australia and New Zealand
Lees and Wright (2012)	Radio listening	New Zealand
Lynn (2013)	Restaurants	USA
Keng and Ehrenberg (1984)	Store choice	UK
Ehrenberg and Goodhardt (1969)	Television viewing	USA
Goodhardt and Ehrenberg (1969)	Television viewing	UK
Goodhardt, Ehrenberg and collins (1975)	Television viewing	USA
Headen, Klompmaker and Rust (1979)	Television viewing	USA
Barwise and Ehrenberg (1988)	Television programs	USA, UK
Mansfield, Romaniuk and Sharp (2003)	Tourism destination	Japan, USA
Dawes, Romaniuk and Mansfield (2009)	Tourism destination	USA, UK, Japan and Singapore
Romaniuk and Dawes (2005)	Wine	Australia
Cohen and Tataru (2011)	Wine	France
Wilson and Winchester (2019)	Wine	English-speaking European Country

Table 2: Sample gender and age

	Survey data (N=2,669 in total, across all categories)								
	Gender (%)			Age (%)					
	Female	Male	Prefer not to say	18-24	25-34	35-44	45-54	55-64	Prefer not to say
Banking	35	64	1	34	40	18	5	2	1
Books	45	52	3	41	36	17	4	0	2
Cosmetics	58	40	2	39	37	18	4	1	2
Home electronic & digital devices	31	67	2	37	38	17	4	1	2
Groceries	37	60	3	34	38	18	5	0	4
All categories	38	60	2	36	38	18	5	1	2

Table 3: Duplication of purchase for Iranian banks

	Pen (%)	Percentage of users who also used...											
		Mellat	Melli	Pasargad	Saman	Tejarat	Saderat	Parsian	Ayandeh	Eghtesad novin	Shahr	Sepah	Day
Mellat	28		22	8	9	8	11	9	7	3	7	4	0
Melli	23	26		8	7	8	8	6	4	4	5	3	2
Pasargad	16	14	12		8	4	7	8	4	6	2	3	2
Saman	11	21	15	12		9	6	8	5	2	5	1	2
Tejarat	11	21	18	6	10		12	4	5	3	3	3	2
Saderat	11	30	18	11	7	12		4	7	3	3	4	2
Parsian	10	23	14	13	9	4	4		9	6	3	2	2
Ayandeh	8	25	13	10	7	7	10	12		8	4	2	5
Eghtesad novin	7	13	14	13	3	4	4	9	9		6	1	1
Shahr	6	32	18	6	9	6	6	6	5	8		3	2
Sepah	5	24	13	11	2	6	9	4	4	2	4		0
Day	2	4	15	15	11	7	7	7	15	4	4	0	
Average duplication		<b>21</b>	<b>16</b>	<b>10</b>	<b>7</b>	<b>7</b>	<b>8</b>	<b>7</b>	<b>7</b>	<b>4</b>	<b>4</b>	<b>2</b>	<b>2</b>
Expected duplication		<b>19</b>	<b>16</b>	<b>11</b>	<b>8</b>	<b>7</b>	<b>7</b>	<b>7</b>	<b>5</b>	<b>5</b>	<b>4</b>	<b>3</b>	<b>2</b>

Duplication Coefficient =0.69 , MAD =0.69 , MAPE =10% , Correlation =0.99

Table 4: Duplication of purchase for telecom websites – Panel data Y4 (2016)

	Pen (%)	AA	BB	CC	DD	EE
AA	71		13	1	1	0
BB	35	27		2	1	0
CC	3	34	22		1	1
DD	2	23	16	1		0
EE	1	15	10	1	1	
Average duplication		25	15	1	1	0
Expected duplication		27	13	1	1	0

Duplication Coefficient =0.38 , MAD =0.95 , MAPE =16% , Correlation =0.99

Table 5: Overview of duplication of purchase analysis results

	Average Duplication	Average Penetration (%)	Correlation	Duplication Coefficient	MAD	MAPE
Banking	8	12	0.99	0.69	0.69	10
Books	13	15	0.98	0.84	3.07	52
Cosmetics	10	19	0.99	0.53	2.01	43
Home electronic & digital devices	22	25	1.00	0.88	5.91	183
Groceries	20	32	0.99	0.63	0.87	5
Telecommunications (Y1)	14	28	1.00	0.50	1.73	18
Telecommunications (Y2)	12	27	1.00	0.45	2.06	24
Telecommunications (Y3)	12	27	0.99	0.45	1.98	23
Telecommunications (Y4)	9	22	0.99	0.38	0.95	16
Average	13	23	0.99	0.59	2.14	42

Table 6: PSI scores for Iranian banks

	Pen (%)	Sepah	Melli	Mellat	Tejarat	Saderat	Pasargad	Saman	Parsian	Ayandeh	Eghtesad Novin	Shahr	Day
Sepah	5		0.8	1.3	0.7	1.3	1.0	0.2	0.5	0.7	0.4	0.9	0.0
Melli	23	0.8		1.4	1.1	1.1	0.7	0.9	0.9	0.8	0.9	1.1	0.9
Mellat	28	1.3	1.4		1.1	1.6	0.8	1.1	1.2	1.3	0.7	1.7	0.2
Tejarat	11	0.7	1.1	1.1		1.6	0.5	1.3	0.6	1.0	0.5	0.8	1.0
Saderat	11	1.3	1.1	1.6	1.6		1.0	0.9	0.6	1.3	0.5	0.8	1.0
Pasargad	16	1.0	0.7	0.8	0.5	1.0		1.0	1.2	0.8	1.2	0.5	1.3
Saman	11	0.2	0.9	1.1	1.3	0.9	1.0		1.1	0.9	0.3	1.2	1.4
Parsian	10	0.5	0.9	1.2	0.6	0.6	1.2	1.1		1.7	1.3	0.9	1.0
Ayandeh	8	0.7	0.8	1.3	1.0	1.3	0.8	0.9	1.7		1.7	0.9	2.8
Eghtesad novin	7	0.4	0.9	0.7	0.5	0.5	1.2	0.3	1.3	1.7		1.6	0.8
Shahr	6	0.9	1.1	1.7	0.8	0.8	0.5	1.2	0.9	0.9	1.6		0.9
Day	2	0.0	0.9	0.2	1.0	1.0	1.3	1.4	1.0	2.8	0.8	0.9	
		Public Banks		Private Banks									

Table 7: Overview of PSI scores analysis

	Intra-PSI		Inter-PSI
	Public banks	Private banks	
Banking	0.81	1.05	0.84
Books	<b>Wide product variety</b> 4.47	<b>Limited product variety</b> 0.95	0.94
Cosmetics	<b>Premium</b> 1.34	<b>Mid-range and budget</b> 3.89	0.93
Home electronic and digital devices	<b>High product variety</b> 0.89	<b>Limited product variety</b> 6.03	2.40
Groceries	<b>No physical stores</b> 1.21	<b>Has physical stores</b> 0.92	0.97
Telecommunications (Y1)	<b>Using Google Ads</b> 1.90	<b>Not using Google Ads</b> 0.90	1.02
Telecommunications (Y2)	2.21	0.79	0.99
Telecommunications (Y3)	1.95	0.83	1.07
Telecommunications (Y4)	1.26	0.85	1.02
Average	1.78	1.80	1.13