Examining antecedents of consumers' pro-environmental behaviours:

TPB extended with materialism and innovativeness

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Abstract

Major environmental issues facing our planet are considered to be partly rooted in consumer overconsumption that has resulted from high economic growth. Pro-environmental behaviours (PEBs) have been studied extensively in developed Western countries but more research is needed in developing non-Western countries. Additionally, there are increasing calls for research providing broader theoretical and behavioural explanations of consumers' intentions to adopt PEBs. Therefore, the aim of this research was to examine the factors affecting consumers' PEBs in Saudi Arabia. Quantitative data (n=613) were collected using a survey method. The proposed conceptual model and associated hypotheses were tested using structural equation modelling. The results revealed that consumers' intentions to adopt direct- and indirect-PEBs are affected by innovativeness, materialism, perceived consumer effectiveness, and environmental concern, but not by social influence. Evidence was also found of differences between younger and older respondents. These findings can be used to formulate effective marketing strategies to benefit the environment, society, and sustainable companies in the country.

Keywords: *Pro-environmental behaviour, Theory of Planned Behaviour, Materialism, Innovativeness, Age, Saudi Arabia.*

1. Introduction

"*Global climate change is one of the major problems that human beings are facing today. This global problem requires global actions and solutions*" (Ari & Sari, 2017, p.175).

Recent economic growth in developing countries, triggered by technological revolution and globalisation, has led to market-driven growth in consumption patterns and, in turn, to unsustainable consumption. It has been noted that all types of consumption deplete valuable resources (Hüttel, Ziesemer, Peyer, & Balderjahn, 2018) and consumer behaviours - primarily the consumption and disposal of products - affect natural resources (Vermeir & Verbeke, 2006), as what millions of consumers want creates unsustainable demands on these resources and has a significant impact on efforts to protect the environment. However, if a segment of consumers which tends to spend more on environmentally-friendly products is large enough to warrant marketers' attention, an understanding of this segment will become important (Laroche, Bergeron, & Barbaro-Forleo, 2001). Organisations might be encouraged to develop their products to fulfil the needs and wants of environmentally conscious consumers (Pickett-Baker & Ozaki, 2008) and will be more likely to invest their efforts in the development of innovative green technologies and production processes that would lead to greater societal wellbeing (de Medeiros, Duarte Ribeiro, & Cortimiglia, 2014).

Researchers across the world in the fields of management, marketing, and psychology have begun to show significant interest in consumer behaviour toward the environment and environmental issues (Bamberg, 2003; Bamberg & Möser, 2007; Dietz, Stern, & Guagnano, 1998; Fransson & Garling, 1999; Gleim, Smith, Andrews, & Cronin, 2013; Hüttel et al., 2018; Kapoor & Dwivedi, 2020; Lange & Dewitte, 2019; Steg, Bolderdijk, Keizer, & Perlaviciute, 2014; Steg & Vlek, 2009; Van Liere & Dunlap, 1980). Research has focused particularly on

behaviour that has a positive impact on the availability of materials or energy and on behaviour that can positively alter the structure of the ecosystem (de Groot & Steg, 2010; Steg & Vlek, 2009). Efforts have also been made to gain an understanding of the concepts relevant to consumers' pro-environmental behaviours (PEBs) and to further explore the attributes encouraging consumer intention to adopt PEBs (Bamberg, 2003; Carfora, Caso, Sparks, & Conner, 2017; Clark, Mulgrew, Kannis-Dymand, Schaffer, & Hoberg, 2019; Kim & Choi, 2005; Lange & Dewitte, 2019; Laroche et al., 2001; Pickett-Baker & Ozaki, 2008). However, analysis of the existing literature suggests that more theory-based research is needed to enhance current understanding of consumers' intentions to adopt PEBs (de Leeuw, Valois, Ajzen, & Schmidt, 2015) as well as understand concepts relevant to consumers' PEBs in developing countries (de Leeuw et al., 2015; Gleim et al., 2013; Huang, 2016; Hurst, Dittmar, Bond, & Kasser, 2013; Nguyen, Lobo & Nguyen, 2018; Pham, Nguyen, Phan, & Nguyen, 2019; Steg et al., 2014; Strizhakova & Coulter, 2013).

Saudi Arabia is the largest country in the Middle East, forming a junction between Europe, Asia, and Africa. Following recent fast economic growth in the country, expansion of the population, and threats from climate change, the government of Saudi Arabia is now making efforts to balance its economic growth and environmental challenges to achieve sustainable economic development (Al-Tamimi, 2017). To this end, the government has been trying to reduce the country's dependence on the oil sector and diversify its economy by promoting other sectors including finance, trade, government services, and opening new companies (Samargandi, Fidrmuc, & Ghosh, 2014). To obtain more sustainable economic growth, the Saudi government implemented a new vision for the country – the "2030 Vision" – of which the fourth goal is achieving environmental sustainability. The success of the 2030 Vision is widely considered to

rest on the active involvement of relevant stakeholders at all levels, and on researchers in different societal contexts to work for the achievement of the three pillars of sustainability (Alshuwaikhat & Mohammed, 2017).

This study responds to a call by several previous studies (Huang, 2016; Hurst et al., 2013; Kumar, Manrai, & Manrai, 2017; Strizhakova & Coulter, 2013) to achieve an understanding of consumers' PEBs from different cultural perspectives. It examines the factors affecting consumers' adoption of PEBs in the context of Saudi Arabia, thus the findings of this research contribute to existing literature from a non-Western perspective and are practically useful given the context of Saudi Arabia's 2030 Vision. The remainder of the paper is as follows. First, a literature review of research relating to PEBs is undertaken. Then there is a section proposing a conceptual model and research hypotheses for examining factors influencing PEBs in Saudi Arabia. After a section detailing the research methods employed, a further section outlines the findings. The findings are discussed in terms of the theoretical contributions and practical implications before the paper is concluded, outlining limitations and suggesting ideas for further research.

2. Literature review

Three clear clusters of research relating to the environment and consumer behaviour were pinpointed during a review of the literature. The first relates to green purchasing behaviours, defined in previous research as the act of purchasing products that are environmentally beneficial (Nguyen, Lobo, & Greenland, 2016). Numerous studies have focused on green purchasing (Chan, 2001; Gleim et al., 2013; Hsu, Chang, & Yansritakul, 2017; Kim & Choi, 2005; Leonidou, Leonidou, & Kvasova, 2010; Moser, 2015; Pickett-Baker & Ozaki, 2008; Thøgersen, de Barcellos, Perin, & Zhou, 2015; Yazdanpanah & Forouzani, 2015); however, focusing only on

purchasing activities ignores other consumer behaviours that impact on solving environmental issues in other ways, for example joining environmental groups and supporting environmental policies (Huang, 2016). Studies focused on green purchasing behaviours tend to assess the use of one product, such as green skincare products (Hsu et al., 2017). It has also been argued that consumers do not seem to show any consistent preference for environmentally-friendly products in their purchase behaviour (Kilbourne & Pickett, 2008). As a result, other research has focused on sustainable consumption (Jansson, 2011; Jansson, Nordlund, & Westin, 2017; Kumar et al., 2017; Leary, Vann, Mittelstaedt, Murphy, & Sherry, 2014; Noppers, Keizer, Bolderdijk, & Steg, 2014; Ozaki, 2011), and PEBs (de Leeuw et al., 2015; Ertz, Karakas, & Sarigöllü, 2016; Huang, 2016; Polonsky, Kilbourne, & Vocino, 2014; Whitmarsh & O'Neill, 2010), both of which constitute the other two identified clusters of research.

Sustainable consumption is defined as "*behaviour intended to meet the needs of the current generation and benefit the environment without jeopardising the ability of future generations to satisfy their needs*" (Leary et al., 2014, p.1954). Several studies on sustainable consumption have focused on the adoption of eco-innovative products (Jansson, 2011; Noppers et al., 2014; Ozaki, 2011) and others on the purchase of sustainable products (Kumar et al., 2017; Leary et al., 2014). There has been much research on sustainable consumption designed to understand the elements in an individual's psychology that reflect their sensitivity toward environmental issues and make them keen to save energy, avoid waste, keep the environment clean, and purchase ecological products. It also examines what makes consumers satisfied with life and what causes a belief that the individual has contributed to solving environmental issues and helped the environment at both an individual and a societal level (Leonidou et al., 2010).

The third cluster of research relates to consumers' PEBs. Steg et al. (2014, p.29) define PEBs as "*any action that enhances the quality of the environment, either resulting or not resulting from pro-environmental intent*". Several studies have shown interest in a broader set of PEBs which include energy conservation, legislation, public policy issues, and social responsibility (de Leeuw et al., 2015; Ertz et al., 2016; Huang, 2016; Polonsky et al., 2014; Whitmarsh & O'Neill, 2010). PEBs have been suggested to have a positive impact on the availability of materials or energy, and could positively alter the structure and dynamics of ecosystems or the biosphere (de Groot & Steg, 2010; Lee, Kim, Kim, & Choi, 2014; Steg & Vlek, 2009). Therefore, several studies have focused on the importance of, and need to better understand, PEBs and investigating factors and motivations underlying these behaviours (Gleim et al., 2013; Polonsky et al., 2014; Strizhakova & Coulter, 2013).

Far exceeding all other areas of the globe, European countries have been the subject of numerous PEBs studies (Bamberg, 2003; Bockarjova & Steg, 2014; de Leeuw et al., 2015; Gatersleben, Murtagh, & Abrahamse, 2014; Harland, Staats, & Wilke, 1999, 2007; Jansson, 2011; Moser, 2015; Noppers et al., 2014; Onwezen, Antonides, & Bartels, 2013; Ozaki & Sevastyanova, 2011; Pickett-Baker & Ozaki, 2008; Vermeir & Verbeke, 2006; Whitmarsh & O'Neill, 2010), followed by the US (Gleim et al., 2013; Kalamas, Cleveland, & Laroche, 2014; Kilbourne & Pickett, 2008; Kim & Choi, 2005) (see Appendix A). A smaller number of PEBs studies have been conducted in China (Chan, 2001; Polonsky et al., 2014; Thøgersen et al., 2015) and Korea (Cho, Thyroff, Rapert, Park, & Lee, 2013; Lee et al., 2014). Despite several studies reporting on PEBs, research has largely been limited to the location of the researchers, hence further research is needed to deepen understanding of the concepts relevant to consumers' PEBs in other geographical contexts and cultural perspectives (Hurst et al., 2013; Strizhakova & Coulter, 2013). As there is

very little information related to consumer adoption of PEBs in Saudi Arabia (Abdul-Muhmin, 2007), this research focuses on this context.

3. Theoretical model

In response to the call for more theory-based research when exploring dimensions of PEBs (de Leeuw et al., 2015), relevant theories were reviewed in order to develop a theoretically grounded conceptual model for this study. A review of the extant literature revealed that the most commonly utilised theory by studies in this domain is the Theory of Planned Behaviour (TPB) (Ajzen, 1991) (Appendix A). TPB hypothesises that attitudes, perceived behavioural control, and subjective norms affect behavioural intention and, consequently, behaviour (Ajzen, 2001). It has been argued that TPB provides a framework representing relevant factors affecting individuals' behaviours towards a particular issue and allows exploration of the impact of other contextual variables (Ajzen, 1991). This flexibility has enabled researchers to examine the role of other factors on consumers' PEBs, hence why TPB has become a well-utilised model in the PEBs field (e.g. Bamberg, 2003; Bamberg, Ajzen, & Schmidt, 2003; Carfora et al., 2017; Clark et al., 2019; de Leeuw et al., 2015; Hsu et al., 2017; Kumar et al., 2017; Moser, 2015; Nguyen et al., 2016; Whitmarsh & O'Neill, 2010; Yazdanpanah & Forouzani, 2015). In addition, several studies using TPB to understand consumers' PEBs have found it accounted for variances above 60% (de Leeuw et al., 2015; Moser, 2015; Whitmarsh & O'Neill, 2010; Yazdanpanah & Forouzani, 2015). Therefore, it was decided to employ TPB as the theoretical basis for this research. However, as Fransson & Garling (1999) conceptualised environmental concern as an attitude, this study substitutes 'attitude' with 'environmental concern'. Similarly, 'perceived behavioural control' (PBC) is substituted by 'perceived consumer effectiveness' (PCE), representing the ease or difficulty of positively affecting the environment. Previous research has confirmed the

importance of incorporating intention into PEBs models (Bamberg, 2003; Bamberg & Möser, 2007; Chan, 2001; de Leeuw et al., 2015; Fransson & Garling, 1999; Gatersleben et al., 2014; Gleim et al., 2013; Harland et al., 1999; Klöckner, 2013; Kumar et al., 2017; Lee et al., 2014; Minton & Rose, 1997; Nguyen et al., 2016; Onwezen et al., 2013; Polonsky et al., 2014; Vermeir & Verbeke, 2006; Whitmarsh & O'Neill, 2010), so the construct of behavioural intention was at the centre of this study's model.

The model was extended with 'materialism' and 'innovativeness'. To date, few studies have investigated the influence of values with a negative effect, such as materialism, on PEBs. However, it has been noted that consumers with highly materialistic values, such as those in fast-growth economies, might have little concern for the environment and environmental issues (Polonsky et al., 2014). On the other hand, it has been suggested that incorporating innovativeness into PEBs models can help with understanding consumers' early adoption behaviours (Jansson, 2011), which is relevant given the newness of the concept of PEBs in Saudi Arabia (Alam, Almotairi, & Gaadar, 2012).

3.1 Hypotheses development

Environmental concern is "a general attitude toward specific pro-environmental behaviour" (Fransson & Garling, 1999, p.3798), and considered "an affective attribute that can represent a person's worries, compassion, likes and dislikes about the environment" (Lee, 2009, p.88). The effect of environmental concern on behavioural intention has accumulated significant support in the PEBs context (Bamberg, 2003; Felix, Hinsch, Rauschnabel, & Schlegelmilch, 2018) Lee, Kim, Kim, & Choi, 2014; Polonsky et al., 2014), with the majority of studies having found it to be the most significant predictor of behavioural intention (Bamberg, 2003; de Groot & L. Steg, 2008; Felix et al., 2018; Kilbourne & Pickett, 2008; Kollmuss & Agyeman, 2002; Lee et al.,

2014; Polonsky et al., 2014; Vermeir & Verbeke, 2006). The majority of prominent studies have concluded that environmental concern is a main factor in PEBs models, as it could provide valuable information about consumers' intentions to adopt PEBs (Bamberg, 2003; de Groot & Steg, 2008; Lee et al., 2014; Polonsky et al., 2014; Schultz & Zelezny, 1999; Vermeir & Verbeke, 2006), and assist understanding why individuals intend to engage in PEBs (Felix et al., 2018; Kilbourne & Pickett, 2008; Polonsky et al., 2014; Straughan & Roberts, 1999). Therefore, environmental concern is a critical component in PEBs models, and future research should consider it in their models (Polonsky et al., 2014). Taking the above into consideration, the following is hypothesised:

H1. Environmental concern has a positive effect on behavioural intention.

Materialism has been defined as "a set of values, goals or expectancies relating to the acquisition of wealth and material goods" (Hurst et al., 2013, p.257). It is argued that such values might affect a wide range of attitudes, beliefs, norms, intentions, and behaviours (Schultz & Zelezny, 1999; Steg et al., 2014; Stern, 2000). Materialistic values are growing in developing countries as consumers imitate patterns of Western consumption and lifestyles (Kilbourne & Pickett, 2008). It has been found that consumers with highly materialistic values purchase products in search of a sense of identity, happiness, self-image, and social recognition or status (Nepomuceno & Laroche, 2015; Richins, 2004; Tsang, Carpenter, Roberts, Frisch, & Carlisle, 2014). Consumers who gain satisfaction and happiness through acquisition and consumption are more self-centred and less likely to be fulfilled by engaging in environmental activities in comparison to consumers who do not value purchasing goods (Kilbourne & Pickett, 2008). To date, few studies have investigated the influence of values with a negative effect, such as materialism, on PEBs. Previous research investigated the relationship between materialism and PEBs but ignored the

importance of behavioural intentions. Most of these relationships between materialism and PEBs were mediated by variables such as consumers' attitudes (Hurst et al., 2013; Hynes & Wilson, 2016), environmental beliefs (Kilbourne & Pickett, 2008), environmental concern (Polonsky et al., 2014), and environmentally-friendly tendencies (Strizhakova & Coulter, 2013). Therefore, it is important to investigate the direct effect of materialism on behavioural intentions to adopt PEBs. It is also important to investigate this relationship because materialism is frequently suggested as an influential factor affecting consumers to adopt higher consumption patterns (Hurst et al., 2013; Kilbourne & Pickett, 2008; Polonsky et al., 2014), which potentially conflicts with the notion of environmental consumption (Kilbourne & Pickett, 2008). Thus, it is hypothesised that:

H2. Materialism has a negative effect on behavioural intention.

It has been suggested that new ideas, practices or technologies may diffuse through a society because they present cleaner, healthier, safer, more efficient, and more sustainable alternatives. Despite this, the role of innovativeness on the adoption of PEBs has received little examination in the literature. Innovativeness has been described as an "internal drive or motivating strength" (Roehrich, 2004, p.672). This research adopts Roehrich's (2004) conceptualisation, which expresses two central needs for adopting new products: the need for uniqueness and the need for stimulation. It is suggested that marketing of eco-innovations could focus on general innovators, early adopters and opinion leaders in the market rather than only on traditional green consumers (Jansson, 2011; Thøgersen et al., 2010). Consumers who search for and adopt new products have been noted in several studies as socially active opinion leaders who usually adopt new products and spread the word about them (Jansson et al., 2017), behaviours characteristic of both direct- and indirect-PEBs. Moreover, previous studies have found a positive effect of innovativeness on the adoption

of eco-innovative products (Jansson, 2011; Jansson et al., 2017; Osburg, Strack, & Toporowski, 2016; Ozaki & Sevastyanova, 2011). Therefore, it is proposed that:

H3. Consumer innovativeness has a positive effect on behavioural intention.

Social influence refers to "the perceived social pressure to perform or not perform a given behaviour" (Ajzen, 1991, p.188). Social pressures may emanate from those who are important to an individual, including close friends, relatives, colleagues and business partners (Paul, Modi, & Patel, 2016). Fear of social exclusion is viewed as a primary motive for why people tend to fulfil social norms (Bamberg & Möser, 2007). Several studies in the PEBs field have suggested a significant impact of social influence on consumer behavioural intentions to adopt PEBs (Bamberg, 2003; de Leeuw et al., 2015; Gatersleben et al., 2014; Gleim et al., 2013; Hsu et al., 2017; Hynes & Wilson, 2016; Klöckner, 2013; Minton & Rose, 1997; Nguyen et al., 2016; Vermeir & Verbeke, 2006; Whitmarsh & O'Neill, 2010), calling for further examination of the influence of different contextual factors to understand consumers' PEBs (Gleim et al., 2013; Huang, 2016; Kumar et al., 2017; Strizhakova & Coulter, 2013).

In collectivist cultures, behaviours are often driven by social norms (Leonidou et al., 2010), and individuals in such cultures are likely to be motivated by social comparison and imitation of their peers. An individual's demand for organic products, for example, could be influenced by another's demand for the same products (Hynes & Wilson, 2016). Therefore, social influence is considered an especially critical factor in changing purchasing patterns and encouraging PEBs in predominantly collectivist cultures (Hynes & Wilson, 2016; Vermeir & Verbeke, 2006). Saudi behaviours are heavily driven by social norms (Al-Kandari & Gaither, 2011), although some studies have shown surprising results in two other collectivist cultures - India and Iran - revealing a non-significant relationship between social norms and consumers' behavioural intention

(Kumar et al., 2017; Yazdanpanah & Forouzani, 2015). However, the majority of studies considering social influence as a factor in consumers' behavioural intentions to adopt PEBs have found its effect to be significant (Bamberg, 2003; de Leeuw et al., 2015; Hynes & Wilson, 2016; Onwezen et al., 2013; Vermeir & Verbeke, 2006; Whitmarsh & O'Neill, 2010). Therefore, it is hypothesised that:

H4. Social influence has a positive effect on behavioural intention.

PCE is defined "as a domain-specific belief that the efforts of an individual can make a difference in the solution to a problem" (Ellen, Wiener, & Cobbwalgren, 1991, p.103). It has also been defined as an individual-specific belief that "examine[s] the extent to which any one consumer can have an impact on the environment" (Gilg, Barr, & Ford, 2005, p.484). To motivate behavioural change, consumers need to be convinced that their behaviours have an influence on the environment and an impact on solving environmental issues. It is believed that PCE can significantly contribute to predicting individuals' intentions to adopt environmental behaviours (Ellen et al., 1991; Gleim et al., 2013), as consumers with a strong belief that their environmentally-conscious behaviours can have a positive effect on the environment will be more likely to engage in PEBs (Gleim et al., 2013).

It has been argued that if individuals believe that environmental issues must be solved, this belief must influence their behavioural intentions to adopt the actual behaviour. Studies have found that in the consumer context, PCE had a significant effect on behavioural intention (Bockarjova & Steg, 2014; Cho et al., 2013; Gleim et al., 2013; Kim, 2011; Lee et al., 2014; Vermeir & Verbeke, 2006). Individuals' perception of the effectiveness of their efforts to contribute to solving a given problem can help explain their decisions and behaviours (Lee et al., 2014). When PCE was used as an influencing factor in the PEBs context, the construct provided better

understanding of consumers' behavioural intentions (Harland et al., 2007; Vermeir & Verbeke, 2006). Evidence from several studies has confirmed a significant positive effect of PCE on individuals' behavioural intentions to adopt PEBs (Antonetti & Maklan, 2014; Bockarjova & Steg, 2014; Cho et al., 2013; Gleim et al., 2013; Harland et al., 1999; Kim, 2011; Lee et al., 2014; Vermeir & Verbeke, 2006). Therefore, the following can be hypothesised:

H5. PCE has a positive effect on behavioural intention.

Behavioural intention refers to the perceived likelihood of performing the behaviour, rather than doing the behaviour (Ajzen, 1991). For decades, behavioural intention has been used to predict behaviours in many fields of research, including marketing and psychology (Venkatesh, Maruping, & Brown, 2006). Importantly, behavioural intention is one of the most-used factors in consumers' PEBs studies (Bamberg, 2003; Bamberg & Möser, 2007; de Leeuw et al., 2015; Gatersleben et al., 2014; Gleim et al., 2013; Klöckner, 2013; Kumar et al., 2017; Polonsky et al., 2014; Whitmarsh & O'Neill, 2010). Several studies have confirmed the importance of incorporating behavioural intention in PEBs models, as it helps in understanding consumers' PEBs (Bamberg & Möser, 2007; de Leeuw et al., 2015; Gleim et al., 2013; Onwezen et al., 2013; Polonsky et al., 2014). Previous studies have noted that self-reported environmental behaviours are problematic, but when behavioural intentions increase, self-reported behaviours also increase (Polonsky et al., 2014). Additionally, several studies in the literature show a positive correlation between behavioural intention and PEBs (Bamberg & Möser, 2007; de Leeuw et al., 2015; Gleim et al., 2013; Harland et al., 1999; Kumar et al., 2017; Polonsky et al., 2014), and it is confirmed that the inclusion of behavioural intention in PEBs models is important to better evaluate consumers' actual behaviours (de Leeuw et al., 2015).

PEBs can be divided into two dimensions: direct and indirect. Direct-PEBs relate to behaviours that directly affect the environment, including purchasing organic products, reducing consumption, and recycling (de Leeuw et al., 2015; Nguyen, Lobo, & Greenland, 2016; Whitmarsh & O'Neill, 2010). Indirect-PEBs focus on behaviours which have an indirect impact on the environment, such as supporting environmental organisations or participating in environmental groups and protests (Ertz et al., 2016; Polonsky et al., 2014). Not all PEBs studies include both constructs but Polonsky et al. (2014) found that indirect-PEBs have a significant positive effect on consumers' adoption of direct-PEBs. Direct-PEBs have immediate effects on the environment and indirect-PEBs lead to later effects (Stern, 2000) but both play an important role in benefitting the environment, society, and solving the environmental issues (Huang, 2016; Polonsky et al., 2014). There is still a gap in understanding consumers' intentions to adopt different dimensions of PEBs and more theory-based research is needed (de Leeuw et al., 2015).

It is argued that there are different types of PEBs, and each type might be subject to different influences (Ertz et al., 2016; Kilbourne & Pickett, 2008; Polonsky et al., 2014; Stern, 2000). This study adopted two-dimensions of PEBs in line with several studies in the PEBs context (e.g. Huang, 2016; Kilbourne & Pickett, 2008; Polonsky et al., 2014). As Stern (2000) argues, direct-PEBs have immediate effects on the environment, and indirect-PEBs lead to later effects. Several studies have used these recommendations (e.g. Ertz et al., 2016; Huang, 2016; Kilbourne & Pickett, 2008; Polonsky et al., 2014), and confirmed the distinction between direct-PEBs and indirect-PEBs. Evidence gleaned from research has confirmed that participation in PEBs may be influenced by a variety of factors which result in different rates of behavioural engagement and their environmental impacts (Steg et al., 2014; Stern, 2000). Thus, it can be hypothesised that:

H6. Behavioural intention has a positive effect on direct-PEBs.

H7. Behavioural intention has a positive effect on indirect-PEBs.

As direct- and indirect-PEBs are closely related, it can be suggested that the path from indirect to direct behaviours will be positive, as those who participate in environmental activities are more likely to adopt proactive PEBs. Polonsky et al., (2014) proposed this relationship in their study, which was conducted in four Asian countries, and found a significant positive effect of indirect-PEBs on consumers' direct-PEBs. Thus, it can be hypothesised that:

H8. Indirect-PEBs have a positive effect on direct-PEBs.

It is suggested that young consumers represent a powerful engine in the development of environmentally conscious population (Nguyen, Lobo & Nguyen, 2018). It is also suggested that younger generations are more concerned about environmental quality since solutions to certain environmental issues require changes to traditional values, habitual behaviours, and threats to the existing social order (Van Liere & Dunlap, 1980). On the other hand, older generations might not accept changes in their habits or purchasing behaviours as it might affect their values or social order. Moreover, research demonstrates that younger generations are more willing to accept new ideas than older ones (Ottman, Stafford, & Hartman, 2006). It is also noted that the involvement of younger generations in environmental problems can result from continued exposure to information on environmental issues via the media, which facilitates the development of an ecology-minded generation to commit to solving environmental issues as they move into adulthood (Van Liere & Dunlap, 1980). It has been suggested that younger generations are more environmentally concerned (Fransson & Garling, 1999; Nguyen et al., 2018). However, studies have found that older generations are more environmentally concerned than younger generations and that younger generations are more concerned about materialistic values rather than caring about others or saving the environment (Gilg et al., 2005; Liu, Vedlitz, & Shi, 2014; Whitmarsh

& O'Neill, 2010). These diverse findings concerning the role of age suggest an additional need for exploratory research in explaining the role of age related to intentions to adopt PEBs. Research has found that it is essential that consumers' PEBs are studied from a variety of perspectives in order to acquire a holistic insight (Stern, 2000), and it is noted that little is known on factors influencing consumers PEBs in Saudi Arabia (Abdul-Muhmin, 2007). Given the limited research to date, on the influence of age as a moderator in PEBs research this study attempts to explore the differences in antecedents of adoption of direct and indirect-PEBs. It is proposed that:

H9. Age moderates the antecedents of direct- and indirect-PEBs.

4. Research methodology

In the previous section a number of hypotheses were proposed taking into account existing findings; therefore, a positivist and deductive approach was the most appropriate for this study (Bryman & Bell, 2007). Given that existing measurement scales for the constructs identified in section 3 were available, and in order to statistically test the stated hypotheses and evaluate the effect of each research construct on consumers' intentions to adopt direct- and indirect-PEBs, it was decided to implement a survey questionnaire, which has been the predominant data collection method across quantitative PEBs adoption research (e.g Cho et al., 2013; Fransson & Garling, 1999; Hsu et al., 2017; Huang, 2016; Kilbourne & Pickett, 2008; Kim & Choi, 2005; Kumar et al., 2017; Polonsky et al., 2014; Van Liere & Dunlap, 1980; Whitmarsh & O'Neill, 2010; Yazdanpanah & Forouzani, 2015). Although online surveys may exclude those in the target population without internet access, the benefits of geographical reach and reduction of social desirability bias from a self-completion approach (Bhattacherjee, 2012; Zikmund et al., 2013) led to adoption of an online approach.

The questionnaire was developed in English and Arabic, professionally translated using standard back-translation protocol (e.g. Leonidou et al., 2010; Polonsky et al., 2014; Strizhakova & Coulter, 2013). It included measurement items based on a review of previous research (Appendix B) and demographic questions. When deciding to use Likert scales, it is important to consider the number of points to be utilised, making sure that the same number of points are used on all measurement scales in order to successfully conduct structural equation modelling (SEM) (Hair, Anderson, Babin, & Black, 2010). Researchers have noted that using a five-point, rather than a seven-point (or more), scale leads to a lower percentage of missing responses (Weijters et al., 2010) and it has also been found that both five- and seven-point Likert scales produce the same mean scores when rescaled, with levels of skewness unaffected (Dawes, 2008). Therefore, measurement items were measured using a five-point Likert scale. This is also in line with several existing studies (for example, Dwivedi et al., 2013; Kapoor et al., 2014; Kim et al., 2009; Liu et al., 2020; Shareef et al., 2016; 2017; Sharma & Sharma, 2019) that have successfully utilised five-point Likert scale.

The target population for this study is reasonably specific, with the aim of identifying factors affecting consumers' behavioural intentions to adopt direct- and indirect-PEBs in Saudi Arabia. The sample therefore relates to Saudi consumers, so the target population was determined to be those who usually live in Saudi Arabia or consider themselves to be Saudi citizens. Previous research has identified that focusing on diverse levels of education, income, age, and gender groups can offer more insight in terms of understanding who may be more willing to consider PEBs (Chan, 2001; Cho et al., 2013; Dermondy et al., 2015; Gilg et al., 2005; Gleim et al., 2013; Polonsky et al., 2014; Whitmarsh & O'Neill, 2010); however, for ethical reasons, only those over the age of 18 were included in the target population.

Due to the lack of reliable sampling frame, convenience and snowball sampling techniques were utilised to facilitate timely completion of the research. The researchers had access to two higher education institutions in Saudi Arabia. Therefore, a link to the anonymous survey was distributed electronically at these two institutions. The anonymous survey link was also distributed using different online forums and social network sites. Following a similar process as other studies (e.g. Koenig-Lewis et al., 2014; Polonsky et al., 2014; Strizhakova & Coulter, 2013), each participant was asked to send an invitation to the anonymous survey to members of their social groups, including family and friends, to reach a broader range of respondents. A two-month time frame was allocated to collect a minimum of 300 responses for this study.

SEM was preferred to use in this study as it enables testing of hypothesised relationships between multiple variables simultaneously, allowing for both latent and observed variables to be analysed at the same time (Gefen, Straub, & Boudreau, 2000). SEM is also able to take into account measurement errors of the observed variables to be analysed as an integral part of the model (Gefen et al., 2000; Hair et al., 2010). Moreover, the majority of consumers' PEBs studies have used it to analyse their data (Bamberg et al., 2003; Cho et al., 2013; de Leeuw et al., 2015; Gleim et al., 2013; Huang, 2016; Kilbourne & Pickett, 2008; Kim & Choi, 2005; Leonidou et al., 2010; Polonsky et al., 2014; Strizhakova & Coulter, 2013; Yazdanpanah & Forouzani, 2015). Following the recommendation of a two-stage analytical procedure (Anderson & Gerbing, 1988), confirmatory factor analysis was conducted by using AMOS v.22 software package followed by testing of the structural model.

5. Results

Statistics available from the online survey platform revealed that 856 surveys were started and 243 potential respondents were screened out due to not meeting the eligibility criteria. Therefore,

a total of 613 eligible responses were counted in the sample for further analysis. In total 611 fully completed responses remained in the sample after cleaning and screening of the data. Almost 80% of the respondents were female (Table 1). The age group '56 or over' saw the fewest respondents; most were in the '26-35' age group. More than 50% of the respondents held a Bachelor's degree, with a further 18.7% educated to Master's degree level. Nearly half of the respondents declared that they had an income of SR 8000 or more but 105 respondents chose to select the 'prefer not to say' response to this question.

Table 1. Characteristics of Respondents

Variable	Group	Frequency	Percentage
Gender	Male	134	21.9
	Female	477	78.1
Age	18-25	153	25.0
	26-35	214	35.0
	36-45	162	26.5
	46-55	60	9.8
	56 or over	22	3.6
	Prefer not to say	0	0.00
Education	Primary school	1	0.2
	Elementary school	6	1.0
	Secondary school	75	12.3
	Diploma	43	7.0
	Bachelor's degree	318	52.0
	Master's degree	114	18.7
	PhD degree or above	54	8.8
Income	SR 2000 and below	92	15.1
	SR 2000 – 5000	59	9.7
	SR 5000-8000	52	8.5
	SR 8000-12000	112	18.3
	SR 12000- 15000	80	13.1
	SR 15000 and over	111	18.2
	Prefer not to say	105	17.2

To explore the items selected for this study, measured with a Likert scale anchored by 1 'strongly disagree' to 5 'strongly agree', it was observed that all combined constructs measuring environmental concern, perceived consumer effectiveness (PCE) and materialism had mean

values greater than 3.0. Further, intentions and both direct- and indirect-PEBs were measured with a Likert scale anchored by 1 ‘never’ to 5 ‘always’, and the combined construct mean of behavioural intention was also higher than 3.0, whereas the mean values of the combined constructs measuring direct and indirect-PEBs, innovativeness, and social influence were smaller than 3.0. The mean values of the environmental concern items ranged from 3.78 (EC3) to 4.43 (EC2). As a combined construct, environmental concern had a standard deviation of .700 and respondents most strongly agreed with the statement of EC2 “Humans are ruining the environment”.

Respondents tended to ‘strongly agree’ and ‘somewhat agree’ that they are concerned about the condition of the environment, the condition of the natural environment getting worse every year, and natural resource shortages in the future. However, overall, participants tended to agree that the idea of buying things could give them a lot of pleasure, and that they like a lot of luxury in their lives.

5.1 Measurement model

To evaluate the overall model fit, four common measures were used: normed chi-square (CMIN/DF) <3, Adjusted Goodness-of-Fit Index (AGFI) ≥0.80, Comparative Fit Index (CFI) ≥0.95, and Root Mean Square Error of Approximation (RMSEA) ≤0.07 (Gefen et al., 2000; Hair et al., 2010; Hu & Bentler, 1998). Fit indices of the initial measurement model showed that the model did not meet the required criteria for model fit indices for CFI (Table 2). Observed variables with factor loading of less than .50 were removed as recommended by Hair et al. (2010), hence PEBs1, PEBs2, PEBs3, Mat2, and PCE3 were deleted. Following this all model fit measures were satisfied (CMIN/DF, 1.735; AGFI, .938; CFI, .974; RMSEA, .035).

Table 2. Model fit indices

	χ^2	Df	*p*	χ^2/df < 3	AGFI ≥ .80	CFI ≥ .95	PNFI > .50	RMSEA ≤ .07
Initial measurement model	927.947	436	.000	2.128	.894	.926	.765	.043
Final measurement model	312.251	180	.000	1.735	.938	.974	.733	.035
Structural model	381.545	190	.000	2.008	.928	.962	.763	.041

The measurement model was also evaluated by examining convergent validity, discriminant validity, and internal consistency (Table 3). Most constructs exhibited CR values greater than .70, confirming adequate reliability (Bagozzi & Yi, 1989; Hair et al., 2010). Three exceptions were PCE, indirect-PEBs, and innovativeness constructs, with reliability slightly below .70, but this was expected as these constructs were measured with only two items (Bagozzi & Yi, 1989; Hair et al., 2010). Another exception was the direct-PEBs construct, which was also below .70. This construct has faced issues with reliability in previous studies, including a study which used the TPB in the PEBs field (de Leeuw et al., 2015). Nevertheless, in the model of this study all indicators of construct validity showed CR values ranging between .60 and .90, indicating an acceptable level of reliability. Most average variance extracted (AVE) values were supported and above .50, but one construct, direct-PEBs, was lower than this required value. Nevertheless, it was retained, as all other constructs' CR and AVE values were acceptable, and the CR values were greater than the AVE values.

Table 3. Validity measures

Construct	CR	AVE	MSV	MAT	Direct-PEBs	BI	PCE	Indirect-PEBs	SI	INV	EC

MAT	0.811	0.519	0.068	**0.721**							
Direct-PEBs	0.609	0.281	0.591	-0.260	**0.530**						
BI	0.905	0.760	0.368	-0.137	0.607	**0.872**					
PCE	0.693	0.531	0.045	-0.093	0.032	0.212	**0.729**				
Indirect-PEBs	0.672	0.506	0.591	-0.134	0.769	0.534	0.035	**0.712**			
SI	0.873	0.698	0.295	0.010	0.396	0.343	0.009	0.410	**0.836**		
INV	0.680	0.517	0.303	0.042	0.550	0.508	-0.006	0.492	0.543	**0.719**	
EC	0.728	0.580	0.069	0.137	0.089	0.262	0.023	0.149	0.161	0.207	**0.761**

Note: CR = composite reliability; AVE = average variance extracted; MSV = maximum shared squared variance; MAT = materialism; PEBs = pro-environmental behaviours; BI = behavioural intentions; PCE = perceived consumers effectiveness; SI = social influence; INV = innovativeness; EC = environmental concern.

5.2 Structural model

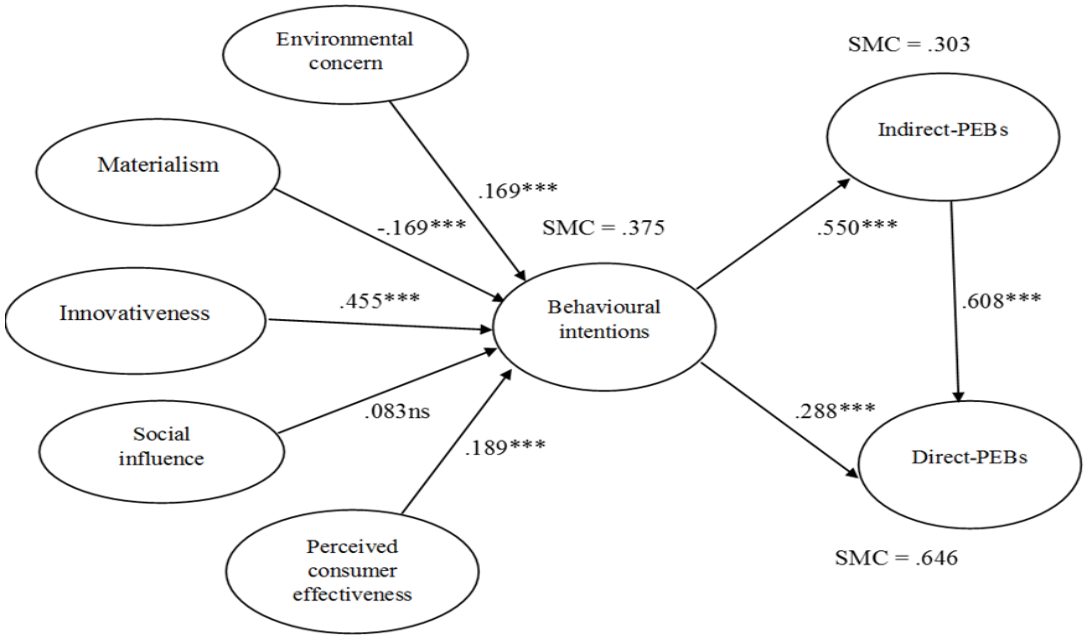
After confirming the measurement model, a structural model was tested to assess causal relationships between latent variables (Gefen et al., 2000; Hair et al., 2010). Each path can be considered statistically significant and supported if the path coefficient is greater than 1.96 and the probability value is less than .05 (Hair et al., 2010). Model fit of the structural model was also good (CMIN/DF, 2.008; AGFI, .928; CFI, .962; RMSEA, .041) (Table 2).

An assessment of path coefficients (Table 4) revealed that environmental concern, materialism, innovativeness, and PCE all significantly affected behavioural intention, thus confirming H1, H2, H3, and H5 respectively. Social influence did not significantly predict behavioural intention, hence H4 was rejected. Behavioural intention significantly predicted both direct-PEBs and indirect-PEBs, supporting H6 and H7. Finally, indirect-PEBs was found to be a significant predictor of direct-PEBs, confirming H8. The results showed that innovativeness was the strongest predictor of behavioural intention. The significant constructs explained 38% of variance

in behavioural intention, 65% of variance in direct-PEBs, and 30% of variance in indirect-PEBs. The final structural model is shown in Figure 1.

Table 4. Results of structural relationships

Structural path	Estimate SRW	Critical ratio	*p*-value
Consumer innovativeness → Behavioural intention	.455	6.603	.000
Materialism → Behavioural intention	-.169	-3.900	.000
Environmental concern → Behavioural intention	.169	3.877	.000
Perceived consumer effectiveness → Behavioural intention	.189	3.669	.000
Social influence → Behavioural intention	.083	1.553	.120
Behavioural intention → Direct-PEBs	.288	4.309	.000
Behavioural intention → Indirect-PEBs	.550	10.165	.000
Indirect-PEBs → Direct-PEBs	.608	6.642	.000



Note: *** = p < .001; ns = not significant; SMC = squared multiple correlation.

Figure 1. Structural model results

In order to examine the moderation effect of age, the data was divided into two groups: those aged 18-35 (n = 367) and those aged 36+ (n = 244). The chi-square difference test was used (Appendix C). Measurement invariance was tested to ensure any between-group differences could be unambiguously interpreted (Cheung & Rensvold, 2002) and was established following the release of constraints on items PCE2, PEBs7 and INV2. The addition of constraints on structural paths did lead to a significant difference (p = .001), thus supporting a moderating effect of age (H9). Therefore, exploration was continued further to determine which paths were contributing to the inequality (Steenkamp & Baumgartner, 1998).

Individual path analysis found the largest difference between the two age groups was in the effect of PCE on behavioural intention and behavioural intention on direct-PEBs. For younger Saudi consumers PCE has a significant effect on behavioural intention (γ = 0.254, p = .000) whereas for older Saudi consumers PCE does not have a significant effect on behavioural intention (γ = .096, p = .335). Behavioural intention has a significant effect on direct-PEBs for both groups, but it has a stronger effect for older Saudi consumers (γ = .427, p = .000) than younger Saudi consumers (γ = .182, p = .028). The difference for the effect of materialism on behavioural intention is bordering significance (p = .053). It is interesting that for younger Saudi consumers materialism does not have a significant effect on behavioural intention (γ = -.088, p = .119) whereas for older Saudi consumers materialism has a strong negative effect on behavioural intention (γ = -.315, p = .000). The difference for the effect of behavioural intention on indirect-PEBs is also nearing significance (p = .066) but there is a strong significant effect for both groups, it is just slightly larger for older Saudi consumers (γ = .616, p = .000) than younger Saudi consumers (γ = .488, p = .000).

6. Discussion

This study employed and extended TPB to examine the factors affecting consumers' intentions to adopt direct- and indirect-PEBs in the context of Saudi Arabia. The results of hypotheses testing have revealed some support for TPB in the context of PEBs in terms of the role of attitudes (environmental concern) and PBC (perceived consumer effectiveness) in affecting intention, as well as supporting the effect of intention on behaviour. However, no support was found for the effect of social influence on intention, contrary to other studies in the area that have utilised TPB (e.g. Bamberg, 2003; Carfora et al., 2017; de Leeuw et al., 2015; Hsu et al., 2017; Nguyen et al., 2016; Whitmarsh & O'Neill, 2010).

The results of SEM revealed that the research model explained 38% of the variance in consumers' behavioural intentions to adopt PEBs, 65% of variance in direct-PEBs, and 30% of variance in indirect-PEBs in the context of Saudi Arabia. The results compare favourably to the original model of TPB, which accounts for 27% and 39% of the variance in intention and behaviour (Armitage & Conner, 2001). Previously, application of an extended model of TPB in the field of consumer PEBs has tended to explain between 30% and 70% of variance in intention; for example, Hsu et al.'s (2017) model explained 43% of variance in behavioural intention, whereas de Leeuw et al.'s (2015) explained 68%, and Yazdanpanah & Forouzani's (2015) explained 65%. Considering PEBs, application of an extended model of TPB has previously tended to explain between 20% and 60% of variance; for example de Leeuw et al.'s (2015) model explained 27% of variance in PEBs, Nguyen et al.'s (2016) explained 38%, and Whitmarsh & O'Neill's (2010) explained 54%. In the previous literature only one study, conducted in Germany and also based on TPB, explained more than 70% of variance in behavioural intention (Bamberg, 2003). However, the model was less successful at predicting behaviour (38% explained variance).

Germany is a developed country, and previous research suggests that in such countries consumers are more willing to perform environmentally-friendly activities than others (Abdul-Muhmin, 2007). Even though Bamberg's study explained the greatest variance in intention, and even in Germany where consumers are said to be more environmentally-minded, Bamberg's explained variance for reported behaviours was not as high as the current study. Thus, it can be concluded that the model of this study performed well, suggesting that using an extended version of TPB is appropriate for examining PEBs in the context of Saudi Arabia.

The fundamental contribution of this research is in exploring the factors affecting direct- and indirect-PEBs in Saudi Arabia through the application of an extended model of TPB in a novel context. The results of this research contribute to the marketing literature, particularly the area of consumer behaviour, and PEBs theory and practice, which are discussed in turn in the following section.

6.1 Theoretical Contributions

The results of this research have answered several academic calls for more up-to-date research on the impact of contextual factors on consumer PEBs (Huang, 2016; Steg et al., 2014; Steg & Vlek, 2009), as well as exploring the attributes and motivations encouraging consumers to adopt PEBs (Ertz et al., 2016; Hurst et al., 2013; Polonsky et al., 2014; Strizhakova & Coulter, 2013). The conceptual model of this study aimed to identify factors affecting consumers' intentions to adopt direct- and indirect-PEBs in the context of Saudi Arabia. The results of this research have confirmed the relevance of both materialism and innovativeness as extensions to the TPB, which offers a further theoretical contribution. A key theoretical contribution of this study lies in finding evidence that innovativeness has a significant direct effect on behavioural intention to adopt direct- and indirect-PEBs in Saudi Arabia. In this study, innovativeness as an influencing factor

had the strongest effect of all the factors included, yet previous research did not take it into account. As PEBs is considered a new concept to Saudi consumers (Alam et al., 2012), it could be suggested that innovativeness can help in understanding early adoption of PEBs. It can also be suggested that the construct of innovativeness should be considered if the concept of PEBs is new for consumers in a particular context, which provides fruitful avenues for future research.

In addition to innovativeness, the significant effect of materialism provides evidence that using materialism as an extension to the TPB is also important in the context of this study. Previous studies in the PEBs area have investigated the influence of materialism on consumers' intentions to adopt PEBs, in this study materialism was looked at as a value, given that several studies have confirmed the influence of values on consumers' intentions to adopt PEBs (Kollmuss & Agyeman, 2002; Nguyen et al., 2016). The results of this research confirmed the negative effect of materialistic values on consumers' intentions to adopt PEBs, an important finding considering the increasing levels of materialism in developing countries (Ger & Belk, 1996; Polonsky et al., 2014). The results of this research provide evidence that targeting values, particularly materialistic values, is important to understand consumers' intentions to adopt PEBs in developing countries with fast economic growth. Materialism is considered a significant factor contributing to higher consumption, which potentially conflicts with the notion of sustainable consumption and PEBs (Hurst et al., 2013; Kilbourne & Pickett, 2008). The results of this research confirmed this conflict between environmental concern and materialism, which is worth exploring in other developing economies in further research. Additionally, in the context of this research, environmental concern was more important than other factors, as increasing levels of concern among consumers would be impactful in terms of changing their environmental behaviours (Bamberg, 2003; Kilbourne & Pickett, 2008; Polonsky et al., 2014). It was also

confirmed that consumers in Saudi Arabia have high levels of concern towards the environment and solving environmental issues, as this construct was the second strongest factor after innovativeness in the model of this study, which might result in more environmental behaviours in the future. This suggests that including environmental concern in future models can provide fruitful results.

A key theoretical contribution of this study lies in finding evidence that PCE affects consumers in Saudi Arabia differently from consumers in other geographical contexts. Several studies in the PEBs context conducted in Western countries found PCE to be an important component in their models, having a strong effect on consumers' intentions to adopt PEBs (Antonetti & Maklan, 2014; Cho et al., 2013; Gleim et al., 2013; Lee et al., 2014). However, the influence of PCE was not as strong in this study as in these previous studies. PCE represents individuals' specific beliefs around the extent to which their efforts can make a difference in the solution to a problem (Ellen et al., 1991), thus in this context it was proposed that consumers would be more likely to adopt PEBs when they feel that their efforts will make a difference in solving environmental issues (Antonetti & Maklan, 2014; Kim & Choi, 2005; Vermeir & Verbeke, 2006). Due to the collectivist culture of Saudi Arabia, consumers may feel their efforts as individuals cannot make a difference to such large-scale problems, so the significant effect of PCE was not strong in this study. As this result is different from the findings of previous studies, this can be a call for investigating influencing factors in the context of this study to understand what could influence consumers to adopt PEBs in Saudi Arabia.

Several studies in the PEBs context have been conducted in Western countries that found the effect of social influence to be significant (Bamberg, 2003; Carfora et al., 2017; de Leeuw et al., 2015; Gleim et al., 2013; Hynes & Wilson, 2016; Whitmarsh & O'Neill, 2010). However, the

results of this research revealed that social influence does not have a significant effect on individuals' behavioural intentions in the context of Saudi Arabia. Due to Saudi Arabia's collectivist culture and previous research suggesting that consumers in such cultures are more likely to be influenced by social influence, this construct was expected to have a strong positive effect (Leonidou et al., 2010). Social influence being non-significant in the context of this study might be related to the recent changes occurring in Saudi Arabia due to rapid development and economic growth, which might affect how Saudi consumers think and how they are influenced. Exploring how the culture is changing alongside fast economic growth could be an interesting avenue for future research. Additionally, this finding may be a result of the low level of information about PEBs among a large segment of consumers in Saudi Arabia, as the concept of PEBs is new there (Alam et al., 2012). Consequently, consumers with little information about PEBs may not be capable of influencing others to adopt these behaviours.

A large proportion of research in the PEBs context has not taken into account the importance of the effect of both direct- and indirect-PEBs on consumers' behavioural intentions. The majority of studies have focused on PEBs in general, particularly one-dimension PEBs. Research has suggested that it is more appropriate to differentiate dimensions of PEBs (Ertz et al., 2016; Huang, 2016; Kilbourne & Pickett, 2008; Polonsky et al., 2014) as both direct- and indirect-PEBs can have a significant influence on protecting natural resources (Huang & Rust, 2011; Polonsky et al., 2014). Reviewing the literature revealed that no previous study has investigated consumers' intentions to adopt direct- and indirect-PEBs in Saudi Arabia. This study took this into account and focused on both types of PEBs, as well as the influence of indirect-PEBs on consumers' direct-PEBs.

Finally, the literature review revealed that few studies have been conducted in developing countries, particularly the Middle East, compared to developed countries. Research within different geographical contexts has largely been limited to the location of the researchers; only one existing PEBs adoption study has been undertaken in Saudi Arabia. As this country is an important market due to its wealth and rapid economic growth, it is vital to explore geographical differences in PEBs and marketing research. PEBs have been studied by far the most extensively in developed Western countries (e.g. Hurst et al., 2013; Kilbourne & Pickett, 2008; Kollmuss & Agyeman, 2002; Strizhakova & Coulter, 2013). Research is needed in countries with different economic, cultural, political, and legal settings (Leonidou et al., 2010), so the examination of factors affecting adoption of PEBs in Saudi Arabia is an important theoretical offering. Therefore, this research offers new insight into the complexity of consumer PEBs.

6.2 Implication for practice

The design and marketing of environmentally-friendly products and services should improve to help increase consumers' intentions to adopt PEBs in Saudi Arabia and support the acceptance of PEBs in the country. As successful business models cannot be directly imported to different cultural contexts, the results of this study provide stakeholders and managers with an understanding of the needs of Saudi consumers and how consumers in Saudi Arabia might be influenced to adopt PEBs so they can formulate more competitive strategies.

The non-significant impact of social influence on purchase intention could be a new insight into a collectivist culture like Saudi Arabia. As the concept of PEBs is new in the context of Saudi Arabia (Alam et al., 2012), the lack of significance in the result of social influence might be due to low level of information about PEBs among consumers in Saudi Arabia. Therefore, marketers might focus on developing their communication activities to enhance knowledge about adopting

PEBs and the consequences of not adopting these behaviours. Retailers may have to reconsider the ways they traditionally communicate and move toward new methods of managing marketing activities to best target the collectivist nature of Saudi consumers. For example, it has been suggested that social media has managed to transform the way internet users communicate and interact with each other, and consumers use social media channels to discover and learn about new products and brands. This process has been found to be enjoyable for consumers so marketers could consider the positive effect of innovativeness, or searching for new environmentally-friendly products over social media channels, to utilise the feeling of pleasure associated with discovering new things. As many consumers in Saudi Arabia utilise social media to evaluate products, their opinion may depend highly on how others evaluate them. Therefore, it may be beneficial to examine how different types of social media can be leveraged for marketing of environmentally-friendly products in future research.

The results of this study found that the strongest significant effect on behavioural intention to adopt PEBs was innovativeness. As novelty-seeking is an internal drive that motivates individuals to discover new products before others do (Roehrich, 2004), PEBs are perceived as new and uncommon, a consumer's tendency to be innovative would affect their intentions to engage in PEBs. Therefore, in order to motivate consumers to adopt behavioural change in Saudi Arabia, retailers and marketers need to ensure that their policies and marketing plans take this factor into account. It has been argued that novelty-seeking consumers are more likely to be interested in discovering new products and related studies suggest that consumers make environmentally-friendly choices more willingly towards new, innovative products (Jansson, 2011; Osburg et al., 2016). Since the concept of PEBs is new in the context of Saudi Arabia (Alam et al., 2012), marketers and planners need to focus on this and try to communicate how

PEBs can be useful for both individuals and society, which may encourage intentions to adopt both direct- and indirect-PEBs. Marketers could focus on opinion leaders in the market rather than only on general consumers, and examination of this could be a fruitful avenue for future research.

Given the significant effect of PCE on PEBs in Saudi Arabia, developers could design campaigns to show individuals that their behaviours have an influence on the environment, and an impact on solving environmental issues. They could provide information in campaigns about how the conservation efforts of one person can make a difference even if they think that other people refuse to contribute. Moreover, policymakers seeking to encourage voluntary PEBs should try to enhance consumer perceptions that their own actions will improve the environment (Ellen, Wiener, & Cobb-Walgren, 1991). Marketers, through their communication activities, could provide information for voluntary participants that if they take actions by participating in environmental groups to mitigate global warming problems, others could be persuaded to change their behaviours to mitigate global warming.

In the context of this study, designers should focus on the characteristics of consumers in Saudi Arabia. The results of this study revealed that consumers in the country care about the environment but also feel happy and successful when purchasing more products, especially if those products are new and innovative. Designers could conceive of new, innovative, cleaner products or services that could provide happiness, self-image and social recognition or status at the same time. This would be likely to attract a larger segment of consumers in the Saudi market and give these companies a competitive advantage in Saudi Arabia.

Policymakers must address the consequences of resource over-consumption at both systemic and individual levels, or severe, long-term environmental problems will occur (Kilbourne & Pickett,

2008), and to improve PEBs among consumers they need to enhance consumer concern (Polonsky et al., 2014). For those who are already environmentally concerned, an emphasis on the success they can achieve by considering PEBs might be effective for promoting ecological purchase and consumption (Bamberg, 2003). Marketers need to focus on consumers' satisfaction rather than the acquisition of physical goods, so consumers can be persuaded to acquire happiness and success without material possessions. Consequently, they could target materialistic consumers with customised socially desirable environmentally-friendly products, and with reclaimed products positioned as exclusive bespoke pieces. Policymakers can also satisfy materialistic values while reusing materials and presenting the image of being green as a new trend. Targeting consumers in this way could provide several benefits for companies in Saudi Arabia. Thus, this study provides important implications for retailers exploring opportunities in Saudi Arabia.

7. Conclusion

To the best of the authors' knowledge, this is the first study to investigate factors affecting consumers' behavioural intentions to adopt direct- and indirect-PEBs, as well as to investigate the influence of indirect-PEBs on direct-PEBs, in the context of Saudi Arabia. Moreover, this is the first study that uses the constructs of materialism and innovativeness to extend the TPB in the PEBs field. In this way, this research adds valuable empirical findings to the current literature through creation of a model to identify factors affecting consumers' intentions to adopt both direct- and indirect-PEBs in a country which has not yet been examined. Saudi Arabia is a developing country with different cultural backgrounds, fast economic growth, and is in the early stages of adopting PEBs among its consumers. Hence the findings of this research provide valuable theoretical and practical contributions.

7.1 Limitations and Further Research

This research is not without limitations but those identified in this section may provide important inspiration for future research. Although it was checked statistically, there may still be an issue with the self-reported behavioural measures. This has been a concern and considered as a limitation in previous studies (de Leeuw et al., 2015; Kumar et al., 2017; Polonsky et al., 2014). This was considered as an issue, as participants may have overestimated the extent of their socially desirable behaviours (de Leeuw et al., 2015), and researchers cannot guarantee the true behaviours of the respondents, due to the sensitive nature of the topic, because respondents may be tempted to modify their responses so as to fit a more 'socially acceptable' mode (Gleim et al., 2013). Therefore, future research should be based on actual purchasing data rather than self-reported data in order to avoid biases that maybe introduced by consumers via their self-reported behaviours (Gleim et al., 2013; Moser, 2015). As it would be difficult to obtain data relating to actual behaviour for the wide variety of behaviours investigated in this study, an attempt was made to minimize such biases by assuring the participants that their responses were anonymous.

The non-significant effect of social influence in the collectivist context of this study can be considered a call for research examining alternative contextual factors that might influence consumers' intentions to adopt PEBs during times of fast cultural and economic change. An interesting example would be an investigation of the role of media use or media applications, as has been highlighted in recent studies (Huang, 2016; Hynes & Wilson, 2016), these studies have found its effect to be significant. Another important contextual construct could be the influence of environmental advertising on consumers' intentions to adopt PEBs, which also received scant attention in previous studies (Ertz et al., 2016).

This study found innovativeness to have the greatest influence on consumers' behavioural intentions to adopt PEBs, so focusing on the influence of innovativeness is vital to understand consumers' intentions to adopt PEBs. Future research could focus on opinion leaders in the market rather than focusing only on general consumers. It is recommended that campaigners should focus on the early adopters segment in their initial campaigns, as these consumers might spread the information to others. Only limited information related to innovativeness is available in the literature in the PEBs context, so future studies could utilize a qualitative approach for a more comprehensive understanding of the effect of this construct on PEBs.

Due to the time and costs involved in longitudinal research, a cross-sectional approach was adopted in this study. Using this approach helped to better understand PEBs, as this context is relatively new in Saudi Arabia, so a cross sectional approach provided rich information about consumers from a large sample of the population. However, anticipating actual consumer PEBs accurately is difficult, as consumers overestimate their self-reported behaviours (Moser, 2015). It is also difficult to measure differences between initial adoption and continued PEBs. Therefore, it is recommended that future research takes a longitudinal approach, which would enable researchers to test for any changes in PEBs over time.

Appendix A. Theories used in existing PEBs research

Theory	Source	Variables considered	Country	Highlights
TPB	de Leeuw et al., 2015	Intention toward PEBs	Luxembourg	Extended model with norms, beliefs, and empathic concern explained 68% of the variance in intention and 27% of PEBs. The moderating role of gender was not significant.
	Carfora et al., 2017	Intention toward PEBs	Italy	Extended the model with the moderation effect of self-identity and past behaviours, and found that intention, attitudes and perceived behavioural control (PBC) significantly explained future PEBs. PBC was the strongest significant predictor, followed by intention. Explained variance figures not provided.
	Bamberg, 2003	Intention toward PEBs	Germany	Extended model with environmental concern and beliefs explained 76% of variance in intentions, and 38% of PEBs.
	Bamberg at al., 2003	Intention toward PEBs	Germany	The original model explained 47% and extended model with past behaviours explained 64% of variance in PEBs, but they conclude that although individuals' behaviours may contain automatic elements, they are still based on reason.
	Whitmarsh & O'Neill, 2010	Intention toward PEBs	UK	Extended TPB with pro-environmental self-identity and past behaviours explained 54% of variance in PEBs.
	Hsu et al., 2017	Behavioural intention	Taiwan	Extended two models, one with the mediating effect of country of origin and the other with the mediating effect of price. Both explained 43% of variance in intention toward green purchasing.
	Nguyen et al., 2016	Intention toward PEBs	Vietnam	Extended model with biospheric values and self-identity and moderating effect of past behaviour explained 38% of the variance in behaviour toward purchasing energy efficient appliances.
	Moser, 2015	PEBs	Germany	Extended model with willingness to pay, personal norms, and focusing on behaviours directly rather than intentions, explained 63.8 % of the variance in PEBs.
	Kumar et al.,	Intention toward	India	Explained variance figures not provided. Attitude toward environmentally sustainable products

	2017	PEBs		mediates the relationship between environmental knowledge and purchase intention. This mediated relationship is moderated by environmental knowledge. Subjective norm is not significantly related to purchase intention.
	Yazdanpanah & Forouzani, 2015	Behavioural intention	Iran	Extended the model with moral norm and self-identity explained 65% of the variation in behavioural intention. Found that the effect of subjective norms was not significant toward intention to purchase organic products.
TPB & NAT	Gatersleben et al., 2014	Intention toward PEBs	UK	Environmental identity fully mediates the relationship between values and intention toward PEBs. Identity and values affected intention toward PEBs more than attitudes, perceived social norms, PBC and personal norms.
	Onwezen et al., 2013	Intention toward PEBs	Germany	Explained variance figures not provided. The findings of 7 models confirmed that anticipated pride and guilt mediate the effects of personal norms on intentions to adopt the behaviour.
	Bamberg & Möser, 2007	Intention toward PEBs	n/a	Meta-analysis of 57 samples. Extended model including attitudes, behavioural control and moral norms (personal norms) explains 52% of variance in intention and 27% in PEBs.
NAT	De Groot & Steg, 2009	Behavioural intention	Europe	Studies focusing on a variety of pro-social intentions and behaviours supported the NAT as a mediator model. Personal norms contributed to the explanation of acceptability of energy-saving policies.
	Hynes & Wilson, 2016	PEBs	UK	Social media is not an effective means of changing values, norms or behaviours around environmentally friendly food.
	Harland et al., 2007	Behavioural intention	Germany	The final extended model with efficacy, ability, and personal norms explained 63% of the variance in behavioural intention.
	Han, 2014	Behavioural intention	US	Extended model with attitudes, social norms and emotions of guilt and pride explained 57% of variance in behavioural intentions.

TPB & VBN	Harland et al., 1999	Intention toward PEBs	Netherlands	Combining constructs of TPB with personal norms and past behaviours explained 37% of variance in intentions and 47% of variance in PEBs.
TPB, NAT & VBN	Klöckner, 2013	Intention toward PEBs	n/a	The model is tested using a meta-analytical structural equation modelling approach based on 56 different datasets with a variety of target behaviours. Intention and habits were the strongest predictors of behaviours. Overall, the model could explain 36% of variation in behaviour, and 55% of variation in intentions.
Schwartz Theory of Basic Values	Schultz & Zelezny, 1999	PEBs	US, Europe, and Latin America	The model included constructs of environmental attitudes including environmental concern and values, finding their effect to be significant.
	Thøgersen, et al., 2015	PEBs	China and Brazil	Extending the model with attitudes, explained 34% (Brazil) and 48% (China) of the variance in consumers' attitudes toward buying organic food. Consumers' attitude toward buying organic food is strongly linked to beliefs about its healthiness, taste and environmental friendliness.
PMT	Bockarjova & Steg, 2014	Behavioural intention	Netherlands	Explained variance figures not provided. The Protection Motivation Theory appeared to be a relevant model to predict PEBs such as electric vehicle adoption.
PMT, and TRA	Kim et al., 2013	Behavioural intention	US and Korea	Attitudes toward the prevention of climate change, perceived severity of climate change, response efficacy, and self-efficacy regarding climate change prevention were significant predictors of individuals' intentions to engage in PEBs.
ABC	Ertz et al., 2016	PEBs	Canada	Explained variance figures not provided. Findings confirmed that using both contextual factors and attitudes is a more fruitful approach to assessing PEBs, as opposed to exclusively using either objective contextual factors or intra-personal factors.
	Huang, 2016	PEBs	Taiwan	Explained 43% of global warming media use, 52% of pro-active behaviours, 95% of promotional behaviours and 86% of accommodation behaviours.
	Leonidou et al., 2010	PEBs	Cyprus	Explained variance figures not provided. The results show that cultural, political and ethical factors are responsible for the adoption of an environmental attitude by consumers when

				performing PEBs.
DOI	Jansson, 2011	PEBs	Sweden	Explained variance figures not provided. Results on Swedish car owners reported that adopters and non-adopters differ on norms, attitudes, and on how innovation attributes are perceived. Consumers' adoption of eco-innovation products is influenced by attitudes, norms and innovative products.
	Ozaki, 2011	PEBs	UK	Found that consumers' level of sympathy to environmental issues has no effect on their decision to adopt green electricity or not, due to lack of strong social norms and personal relevance, inconvenience of switching, uncertainty about the quality of green electricity and lack of accurate information.
Lacks dominant theory	Polonsky et al., 2014	Intention toward PEBs	China, Hong Kong, Taiwan and Singapore.	Explained variance figures not provided. Confirmed the positive effect of dominant social paradigm and the negative effect of materialism on environmental concern. Environmental concern was a moderator between these constructs and intentions towards direct and indirect-PEBs.
	Dermody et al., 2015	PEBs	UK & China	Explained 35% of variance in the UK and 31% in China.
	Jansson et al., 2017	PEBs	Sweden	Personal norms, opinion seeking and opinion leading considered significant factors influencing consumers. Opinion seeking negatively influenced PEBs. Explained variance figures were not provided.
	Kilbourne & Pickett, 2008	PEBs	US	Explained 54% of variance in direct-PEBs. Negative effect was observed from materialism to environmental beliefs. Environmental beliefs influenced environmental concern positively, and environmental concern influenced PEBs positively.
	Gleim et al., 2013	Intention toward PEBs	US	Multi-method study, starting with qualitative study and two quantitative studies to examine the influencing factors of green purchasing behaviours. Found that higher PCE means higher adoption of PEBs.
	Koenig-Lewis et al., 2014	Behavioural intention	Norway	The proposed model of environmental concern and cognitive benefits mediated by emotions explained 61% of variance in behavioural intentions.

	Antonetti & Maklan, 2014	Behavioural intention	US	Two models. The first model used the influence of two emotions, guilt and pride, on PCE to influence behavioural intention. Found that this accounts for 10% of variance. Another moderator, neutralization, was added in the second model, which is the opportunity to buy a product that is labelled Fairtrade. The model explained 32% of variance in behavioural intention.
	McCarty & Shrum, 2001	PEBs	US	Explained variance figures not provided. Found that collectivism, economic status and locus of control are related to beliefs about the importance of recycling.
	Lee et al., 2014	Behavioural intention	South Korea	Explained variance figures not provided. The findings imply that both PCE and environmental concern are very important components for environmental behavioural intention.
	Kim & Choi, 2005	PEBs	US	Explained variance figures not provided. The findings confirmed that both PCE and environmental concern are very important to adopting green purchase behaviours.
	Cho et al., 2013	Behavioural intention	Korea and US	The USA model and the South Korean sample were not significantly different from each other, therefore the dataset was treated as one group of respondents rather than two. The model explained 8% of the variance in PCE, 24% in environmental attitudes and 34% in environmental commitment.
	Chan, 2001	Intention toward PEBs	China	Explained 59% of the variance in green purchasing behaviours.
	Vermeir & Verbeke, 2006	Behavioural intention	Belgium	Key factors affecting consumers' attitudes and behavioural intentions are 'involvement' with sustainability, 'certainty' with respect to sustainability claims and PCE. Experiencing social pressure from peers (social norm) explains intention to buy, despite negative personal attitudes. Explained variance figures not provided.
	Abdul-Muhmin, 2007	Behavioural intention	Saudi Arabia	The key determinant of willingness is perceived psychological consequences, which in turn is significantly determined by past behaviour. The model explained 58.6% of variance in willingness to be environmentally-friendly.

	Ellen et al., 1991	PEBs	US	The findings confirmed the effect of PCE and environmental concern on consumers' environmentally friendly behaviours. Explained variance figures not provided.
	Cleveland et al., 2005	PEBs	Canada	The model explained only 10% of variance in PEBs.
	Laroche et al., 2001	PEBs	US	Consumers who consider environmental issues when making a purchase are more likely to spend more on green products.
	Tanner & Wölfing Kast, 2003	PEBs	Sweden	Contextual factors like 'confidence in eco-label', perceived barriers like 'time and money' and intra-personal factors like attitudes and beliefs explained 41% of variance in consumers' green food purchasing.

Appendix B. Measurement items and sources

Constructs	Code	Items	Factor loading	Cronbach's Alpha	Source(s)
Direct-PEBs	*PEBs1*	*Turn off or unplug electronic devices when not needed.*	.39	.694	Huang, 2016
	PEBs2	*Reduce air conditioning.*	.53		
	PEBs3	*Reduce driving, and walk, cycle or use public transportation.*	.43		
	PEBs4	Eat less meat and more vegetables.	.53		
	PEBs5	Buy local products or locally produced foods.	.52		
	PEBs6	Buy energy efficient appliances.	.53		
	PEBs7	Reduce using plastic bags or use own bag when shopping.	.53		
Indirect-PEBs	INPs1	Persuading others to change behaviour to mitigate global warming.	.76	.670	Huang, 2016
	INPs2	Participating in environmental groups to mitigate global warming problems.	-		
	INPs3	Supporting policies to mitigate global warming.	.66		
Behavioural intention	BI1	I intend to buy environmentally-friendly products in the future.	.79	.901	Bamberg, 2003; Gleim et al., 2013
	BI2	I will try to buy environmentally-friendly products in the future.	.91		
	BI3	I plan to buy environmentally-friendly products in the future.	.91		
Environmental concern	*EC1*	I am concerned about the condition of the environment.	.68	.788	Polonsky et al., 2014
	EC2	Humans are ruining the environment.	.60		
	EC3	I would give up some economic goods for a cleaner environment.	.60		
	EC4	The condition of the natural environment is getting worse every year.	.70		
	EC5	I am concerned about natural resource shortage in the future.	.68		
	EC6	We all need to change our behaviour to protect the natural environment.	-		
Perceived consumer effectiveness	PCE1*	There is not much that I can do about the environment.	.68	.672	Ellen et al., 1991; Kim & Choi, 2005
	PCE2*	There is not much that any one individual can do about the environment.	.78		
	*PCE3**	*The conservation efforts of one person are useless as long as other people refuse to conserve.*	.48		
Materialism	*MAT1*	I admire people who own expensive homes, cars, and clothes.	.59	.821	Polonsky et al., 2014; Richins,

	MAT2	*The things I own say a lot about how well I'm doing in life.*	.33		2004
	MAT3	Buying things gives me a lot of pleasure.	.65		
	MAT4	I like a lot of luxury in my life.	.73		
	MAT5	My life would be better if I owned certain things I don't have.	.80		
	MAT6	I'd be happier if I could afford to buy more things.	.81		
Innovativeness	INV1	I am generally one of the first among my acquaintances to buy new environmentally-friendly products.	.73	.684	Thøgersen et al., 2010
	INV2	Compared with my acquaintances, I buy more new environmentally-friendly products than most.	.72		
	INV3	I know about new environmentally-friendly products before others do.	.50		
Social influence	SI1	People who are important to me think that I should use environmentally-friendly products.	.87	.868	Hsu et al., 2017; Nguyen et al., 2016
	SI2	People who influence my behaviour think that I should use environmentally-friendly products.	.89		
	SI3	People whose opinions that I value prefer that I use environmentally-friendly products.	.73		

Note: * = reverse coded; italics = items dropped; - = Removed due to the extremeness of the kurtosis

Appendix C. Invariance tests

Model	**χ^2**	**Df**	**χ^2/df**	**CFI**	**RMSEA**	**Nested model**	**$\Delta\chi^2$**	**Δdf**	***p*- value**
1 Unconstrained	567.356	380	1.493	.962	.028	-	-	-	-
2 Measurement weights constrained	605.139	394	1.536	.958	.030	2-1	37.783	14	.001
2a PCE2 unconstrained	601.546	393	1.531	.958	.030	2a-1	34.19	13	.001
2b PCE2 and PEBs7 unconstrained	590.493	392	1.506	.960	.029	2b-1	23.137	12	.027
2c PCE2, PEBs7 and INV2 unconstrained	582.896	391	1.491	.961	.028	2c-1	15.54	11	.159
3 Measurement weights (2c) and structural paths constrained	609.458	399	1.527	.958	.029	3-2c	41.584	11	.001
4a EC-BI	585.426	392	1.493	.961	.028	4a-2c	2.53	1	.112
4b MAT-BI	586.639	392	1.497	.961	.029	4b-2c	3.743	1	.053
4c PCE-BI	589.367	392	1.503	.960	.029	4c-2c	6.471	1	.011
4d SI-BI	582.898	392	1.487	.962	.028	4d-2c	0.002	1	.964
4e INV-BI	582.915	392	1.487	.962	.028	4e-2c	0.019	1	.890
4f BI-Indirect PEBs	586.277	392	1.496	.961	.029	4f-2c	3.381	1	.066
4g BI-Direct PEBs	588.483	392	1.501	.960	.029	4g-2c	5.587	1	.018
4h Indirect-Direct PEBs	583.426	392	1.488	.961	.028	4h-2c	0.53	1	.467

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