Understanding the influence of individual behaviour and social networks in sustainability transitions

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Copyright statement

Abstract

A behaviour change towards sustainable food purchasing behaviour is crucially necessary for the survival of the planet. This thesis applied a mixed method approach, combining results from a cross-sectional online survey (N=474), a lab experiment (N=134) and an agent-based model (ABM) to explore how a change towards sustainable food purchasing may be achieved in society. The methodological approach of this thesis is quantitative confirmatory and exploratory. The online survey, based on main environmental psychology theories (Theory of Planned Behaviour, Norm Activation Model and habit theories) and social network theory, explored which factors significantly influence sustainable food purchasing behaviour. Findings show that social network factors influence sustainable food purchasing behaviour via psychological factors; habit, perceived behavioural control, descriptive and personal norms. Additionally, segmentation of different sustainable behaviour groups (high, medium and low) let to the development of segment specific intervention strategies. The lab experiment, measuring actual sustainable food consumption behaviour, validated and extend these findings by showing that social network members significantly influence sustainable food consumption behaviour compared to strangers. I further applied the empirical findings and theoretical knowledge to build an ABM to understand (1) the spread of sustainable food purchasing behaviour, and, (2) how three social network factors (i.e. network size, percentage of sustainable shoppers and percentage of food discussion partners in the social network) influence this spread of sustainable consumer behaviour via psychological factors shown to be relevant to influence sustainable purchasing behaviour (i.e. intention, habit, personal and descriptive norm). Findings provide evidence that there is (1) a threshold effect during the spread of sustainable food purchasing behaviour in social networks as the spread of sustainable food shopping behaviour is fastest at the beginning phase of the experiments, slowing down towards the middle and end phase. The speed of the spread of behaviour is significantly influenced by the size of the social network and the percentage of initial sustainable shoppers in the personal network (2). This research provides a first glimpse of what behaviour change towards sustainable food shopping may look like with the influence of social networks. Intervention and policy recommendations are discussed.

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Declaration

I confirm that the work presented in this thesis is my own with the exception of the agent-based model which was developed with the help of Professor Adrian Newton, my supervisor at Bournemouth University.

List of presentations and publications

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Publications

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Schubert, I., de Groot, J.I.M., Newton, A.C. & Lubbers, M.J. (in preparation). Sustainable shoppers' social network profiles. *Journal of Consumer Psychology.*

Chapter 1: Background: historical overview of environmental policies

Chapter Overview

This chapter will highlight major milestones of past and present environmental policy developments to provide a brief overview of the achievements of the policies implemented this far and set the background for this PhD research project. The historical overview will start with a short summary of the history of the environmental protection policies from its beginnings until the end of the last century (Section 2.1.). Section 2.2. will provide a brief overview of the policy and strategy efforts and achievements since the beginning of the 21st century to the present followed by a conclusion and presentation of the overall aim of this PhD thesis (Section 2.3.). Finally, Section 2.4. explains why I focus on sustainable consumer behaviour, specifically on sustainable food purchasing behaviour. The chapter will finish with a brief outline of the remaining chapters of this thesis document in Section 2.5.

1.1. Introduction

Climate Change is upon us (UNEP, 2012). The accelerated heating up of the planet (and cooling down in the seas) has brought with it dramatic irreparable changes to the world's ecosystems with lakes and estuary collapses due to eutrophication and the melting of glaciers and the Arctic ice sheet (UNEP, 2012). The complex ecosystem changes have grave consequences for human well-being resulting in socio-economic and health problems. Temperature changes have led to an increase in environmental catastrophes like flooding and droughts which have affected natural assets such as food supplies, safety and loss of homes in all areas of the world. The continued loss of biodiversity additionally increases the chances of an increase in further ecosystem collapses (UNEP, 2012).

Additionally more waste than ever is being produced, partly due to increased urbanisation and a rapidly growing population, and the amount is growing. Waste

problems are expected to exceed the capacities of countries in the near future. The seriousness of the degradation of the environment and the gravity of the situation is now recognized at all levels, local environmental groups, at the national and international government level. Human consumption patterns have been indicated to be one of the main reasons for the environmental degradation (UNEP, 2012). Specifically this thesis will focus on food consumption, which is responsible for 20-30 % of anthropogenic greenhouse gas (GHG) emission and up to 70% of human water consumption (Smith et al., 2014). The next sections will provide a historic overview of the numerous policies and strategies that have been developed over the last 40 years to reduce the impact humans have on the environment.

1.1.1. Early environmental policy developments and achievements (1972-1999)

The Stockholm conference on the Human Environment in 1972 was the first to officially put environmental problems on the international agenda. This agreement was not reached very easily and was a major achievement as developed and developing nations wanted to focus on different issues (Dresner, 2008). Developed nations wanted to focus on the effect humans have on nature and its protection by controlling pollution and depletion of resources. Developing countries, on the other hand, almost boycotted the conference as they believed that environmental concerns were a rich country's issues and deflected from the main concerns, the eradication of poverty and economic and social development. To integrate these different viewpoints the notion of sustainable development was put forward in the Stockholm Declaration. It set out that under-development in developing countries was the main reason for environmental problems and that when tackling development it was vital to safeguard the environment. Industrialisation and technological development were indicated to be the main reasons for the environmental problems in developed countries (United Nations,1972). The Declaration consisted of 26 principles, the first set of international soft laws, i.e. not legally binding guidelines, for environmental concerns. This was supported by an action plan of 109 recommendations and five issue-specific resolutions. Principles and resolutions outlined included, for example the principle of compensation (i.e. when trans-boundary impact incidents occur through other nations) and the right to live in an environment of quality (Quental et al., 2011).

To assist nations in the implementation of the principles as proposed in the Stockholm conference, the United Nations Environment Programme (UNEP) was formed along with a fund to support nations to develop and protect people's quality of life without destroying the environment for future generations (Quental et al., 2011). Possibly more important was the realisation that nations had to work together to tackle environmental issues and that a healthy environment was vital for the long-term success of all nations (Dresner, 2008).

A decade later, the notion of sustainable development was further developed in the World Conservation Strategy (WCS) (IUCN, 1980). Sustainable development was here defined as 'the integration of conservation and development to ensure that modifications to the planet do indeed secure the survival and well-being of all people' (IUCN, 1980, section 1.2, p.6). The WCS highlighted the need for conservation in development by drawing attention to the problems the world is facing. It contained suggestions for changes and expressed the need for a quantifiable way to measure change. The framework and practical suggestions were aimed at achieving its three primary objectives: 1. Maintain essential ecological processes and life-support systems, 2. Preserve genetic diversity, 3. Ensure the sustainable utilization of species and ecosystems (IUCN, 1980, p.7). However, the impact of the WCS was limited, reflecting its development by northern environmentalists and lacking political and economic strategies to support environmental preservation (Dresner, 2008).

The political backing for sustainable development was strengthened through the Brundtland Commission's report "Our Common Future" (World Commission on Environment and Development, 1987). The Brundtland report linked environment and economy by drawing on environmental economics to show that a healthy economy needed a healthy environment. It discussed the growing inequality between rich and poor and made suggestions on how to implement sustainable development into national policies (Quental et al., 2011). The report put forward seven strategic requirements for sustainable development: reviving growth and changing the quality of growth, meeting needs for jobs, food, energy, water and sanitation; conserving and improving natural resources; ensuring sustainable levels of population; combining economics and environmental decision making and applying technology to better manage risks. Sustainable development was defined as "development which meets the needs of the present without compromising the ability of future generations to meet their own needs." (World Commission on Environment and Development 1987, p.43).

A significant milestone in environment protection policy development was the Earth Summit (United Nations Conference on Environment and Development [UNCED]) in Rio de Janeiro in 1992 (United Nations, 1992). The Earth Summit's message - that major changes in people's attitudes and behaviours were crucial to bringing about the changes needed - was broadcasted by almost 10,000 journalists and received by millions around the globe. It demonstrated the intricacy of challenges the world faced with poverty on one side and excessive consumption on the other, putting strains on the environment. Governments realised that environmental impacts had to be considered when making economic decisions. Important achievements were the development of Agenda 21 and the signing of treaties on biodiversity, climate change, desertification and high-seas fishing by more than 170 countries. Additionally a United Nations Commission on Sustainable Development was set up to oversee and give guidance in implementing the treatise. Agenda 21, a global action plan detailing sustainable development priorities for the 21st century, highlighted for example the importance of the bottom-up approach stressing the role of citizens, communities and non-governmental organizations (NGOs) in growing towards a sustainable development. However, a big disappointment was America's refusal to sign the biodiversity convention and refusal to sign targets to keep carbon dioxide levels stable (or reduce them as suggested by the Intergovernmental Panel on Climate Change) (Dresner, 2008).

Although some would argue that the achievements of the Earth Summit (1992) were disappointing, owing to weakened conventions and no achievement of a forest convention (e.g. Dresner, 2008), it left a significant legacy in terms of the countless policies and strategies for sustainable development drawn up in numerous countries and the work with national and international businesses to achieve eco-efficiency (United Nations, 2002). Legally binding obligations to reduce greenhouse gas emission were not reached at the Earth Summit in 1992, however, they were finally accomplished with the Kyoto Protocol of Climate Change in 1997. Most industrialised countries and some central European countries in transition agreed to sign a contract which obliged them to reduce greenhouse gas emissions by 6-8% below their 1990 levels. The time limit for this reduction was set to 2008-2012 (Dresner, 2008).

1.1.2. Environmental policy achievements in the 21st century

The 21st century started off with a key intergovernmental event, the Millennium Summit in 2000, held in the Hague. The main outcome of this summit was the Millennium Declaration. This outlined the Millennium Development Goals; eight global targets broken into sub-targets to be achieved by 2015. The eight main goals included: decreasing extreme poverty, achieving universal primary education, promoting gender equality and empowering women, reducing child mortality, improving maternal health, halting the spread of HIV/AIDS and other diseases, guaranteeing environmental sustainability and developing a global partnership for sustainable development. The World Summit on Sustainable Development (Johannesburg, 2002) reinforced the Millennium Development Goals (MDGs) without adding new or more stringent commitments (Quental et al., 2011).

Significant progress has been made towards achieving the MDGs in the last 12 years (UNDP, 2010), including progress in the reduction of HIV/AIDS and other diseases and getting universal primary education for children (United Nations, 2012b). Maternal health improvements and child mortality, however, have still not improved significantly to reach target levels by 2015 (United Nations, 2012b). Although poverty has been reduced in every developing nation the eradication of extreme poverty and hunger has not been achieved (United Nations, 2012b) .

Some countries, like Brazil, have made significant changes and either have already achieved their MDG's or are very likely to achieve them (UNDP, 2012a). Other countries have shown less significant improvements and some are even off target, such as Benin (UNDP, 2012b). A major factor hindering some countries in achieving the MDGs is the extended financial crisis, which started in 2008 (Chibba, 2011). Chibba (2011) points out that this slowing down in progress is due to reduced access to finances and foreign investments for developing countries as well as higher unemployment rates and lower levels of foreign financial aid. Recent natural disasters are also partly to blame for the slowing down in the achievement of the MDGs (United Nations, 2012b).

A renewed commitment to sustainable development and its future promotion was made by the governments attending the Rio+20 Conference (United Nations, 2012a). This renewed commitment was detailed in the primary outcome document of the conference "The future we want". Additionally, new green economy policies were adopted and the development of sustainable development goals, building on the MDGs, was set in motion. Attendees of the conference started work on developing a strategy for sustainable development financing and made a promise to strengthen the United

Nations Environmental Program. Lastly, a 10 year framework of programmes on sustainable consumption and production patterns was adopted. Although the concept of sustainable consumption was first developed in 'Agenda 21' (, (United Nations,1992) and was first defined at the Oslo Symposium in 1994 as being '…the use of goods and related products which respond to basic needs and bring a better quality of life, while minimising the use of natural resources and toxic materials as well as the emissions of waste and pollutants over the life cycle, so as not to jeopardise the needs of future generations (Norwegian Ministry of Environment, 1994, p. 9). The focus on frameworks to increase sustainable consumption and production in Rio +20 showed a new focus on approaches to sustainable development with an increased effort and awareness for the need to change individual consumption behaviour. Additionally, Rio+20 resulted in more than 700 voluntary commitments and new partnerships to advance sustainable development (United Nations, 2012c).

Rio+20 further saw the adoption of the green economy policies which are based on the green economy report (UNEP, 2011). The report details that 'greening' economies do not reduce economic growth but can be catalysts for growth, for example by producing new jobs and new strategies to eliminate poverty. The concept of a "green economy" aims to integrate ideas from ecology, economics and sustainable development. By placing a value on natural resources and ecological services the full cost of a product or service, including the effect it has on the environment, can be calculated (UNEP, 2011). The aim of this is to show the real cost of a product in order to protect the environment from complete depletion of resources. It is suggested that the green economy concept is not simply a replacement for sustainable development but is a necessary step in order to achieve it (UNEP, 2011). The economic model that has been in place so far, based on increasing consumption, has not been able to resolve the extreme problems this world is facing; poverty, environmental destruction and depletion of natural resources. In fact, it is thought that these problems may have even been brought on by it or at the very least made worse. The green economy report aims to motivate policy makers by showing successful examples to encourage new investment and enabling conditions for a transition to a greener economy again with a focus on sustainable consumption (UNEP, 2011).

1.1.3. Conclusion and research aim

This historical overview of the development of environment protection policies and strategies for sustainable development shows the effort governments have put into solving environmental problems. While these policy dialogues have led to substantial actions, progress towards sustainable development has only partially been achieved. This can be seen in the continued environmental degradation as pointed out by the GEO 5 report (UNEP, 2012). A reason for the lack of progress in sustainable development seems to be the missing focus of policies on changing human behaviour and consumption patterns which are at the root of the environmental problems. An increasing awareness of the lack of focus on changing human consumption patterns and behaviours has led to policies now increasingly addressing individual consumption patterns to aim for the crucial shift towards a sustainable society (see Rio+20 frameworks). What is unclear from the policy side is how this shift in consumer behaviour towards sustainable consumption may be achieved through individual behaviour change. Understanding how this shift or transition in society maybe achieved with a focus on individual sustainable consumer behaviour change will be the main focus of this PhD thesis. Therefore, the aim of this PhD thesis is to find policy relevant interventions that focus on changing individual consumer behaviour to stimulate a behaviour change towards sustainable consumption within society. In particular, this thesis will focus on one aspect of consumer behaviour; sustainable food purchasing.

1.1.4. Sustainable consumer behaviour: Focus on sustainable food shopping

Sustainable food purchasing has been identified as a key behaviour for sustainable development in many government action frameworks, such as the U.K.'s sustainable lifestyles framework (Defra, 2011), which target a number of underlying sustainability issues. There is no legal definition of what is sustainable food, however there are aspects of sustainable food, such as organic and fairtrade that are clearly defined. Since defining what constitutes a sustainable diet is not straight forward (FCRN, 2014), sustainable food in the context of this research will be defined as food that is ecological and fair trade. Within this category falls food which is; organic, fairtrade, locally produced, fish and seafood from sustainable sources, food with reduced or no packaging and meat and animal products that protect the welfare of animals and wild species (e.g. free range or Freedom Food). Although it could be argued that there is still a discussion about how ecological some of the food categories are included in this

working definition of sustainable food for this thesis. For example, there are still discussions about whether locally produced food is more sustainable than food produced elsewhere because it is not only food miles but the whole growing process that should be taken into account (Weber & Matthews, 2008). However, this discussion goes well beyond the scope of this thesis and therefore I have made the decision to include locally produced food into the category of sustainable food to show a more complete picture of food that might be on offer with varying degrees of being ecological and fair trade.

1.2. Thesis overview

This section will provide a brief overview of the remaining chapters of this thesis. Chapter 2 summarises key theories and findings from the psychological behaviour change literature focussing on sustainable consumer behaviour. In particular, the chapter will focus on food purchasing, highlighting current theoretical gaps. To overcome current theoretical shortcomings I include social network theory to understand how social networks influence sustainable food purchasing behaviour. Chapter 2 then continues to briefly summarize developments in sustainable transition theories and research techniques, in particular agent-based modelling a social simulation technique. The chapter concludes with a presentation of the theoretical framework and methodology of this thesis.

Chapter 3 reports an online survey developed to research the direct relationship social network factors have with sustainable food shopping behaviour and via already established psychological predictor variables of sustainable food shopping behaviour. This is followed by a chapter detailing further analyses of the online survey exploring the relationships between social network characteristics and psychological predictors of sustainable food purchasing behaviour for high, medium and low sustainable shopper segment to develop tailored social marketing and intervention strategies (Chapter 4). An additional empirical chapter (Chapter 5) reports an experiment to understand the relationship between social networks and sustainable food consumer behaviour further.

Chapter 6 reports the development of an agent-based model (ABM) exploring the influence of social network factors and psychological factors on sustainable consumer behaviour to test policy relevant interventions. Chapter 7 presents the general

discussion where findings of the thesis will be critically evaluated, conclusions drawn and future research suggestions are made.

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Chapter 2: Theoretical framework

Chapter overview

This chapter will start with a brief summary of the most prominent behaviour change theories in environmental psychology and point out current theoretical and research gaps, in particular regarding sustainable food shopping behaviour (Sections 2.1.-2.4.). The theories explained; the Theory of Planned Behaviour (Section 2.1.), the Norm Activation Model (Section 2.2.) and theories of habit (Section 2.3.), form the basis of the theoretical framework of this thesis and reasons for combining the theories are explained in section 2.4. To address the theoretical gap of these theories- the lack of factors explaining the influence of social networks in sustainable behaviour change- I include social network theory (Section 3) into my theoretical framework. The chapter then focuses on how individual behaviour change in sustainable food purchasing may lead to a behaviour change in sustainable food purchasing in society by exploring transition theories (Section 2.4.1.) and research techniques, in particular looking at Agent-Based Modelling (Section 2.4.2.), in relation to sustainability transitions. The chapter concludes with a summary of the theories and research presented (Section 2.5.), the theoretical framework (Section 2.6.), research questions and hypotheses of this thesis (Section 2.7.) and a methodology section (2.8.).

2.1. Psychological theories of sustainable consumer behaviour

There are two main schools of thought on sustainable behaviour formation focussing on different combinations of predictors. One such group are Expectancy Value Theories (EVTs) and the other group includes normative theories. Both include

different assumptions in relation to how people decide to act sustainable. The next sections will introduce the EVTs (2.1.), followed by a section explaining normative theories (2.2.).

2.1.1. Expectancy Value Theories in sustainable consumer behaviour: The Theory of Planned Behaviour

EVTs explain behaviour as a process in which behaviour is influenced through attitudes (an expression of liking or disliking towards something or somebody). These attitudes are formed by weighing up beliefs about the costs and benefits of behaviour (or behavioural object) (i.e. expectancy) and the extent to which an individual values these specific costs and benefits (i.e. value). For example, if I hear that plastic is floating around in the oceans and can be found in animals even in remote places my attitude towards highly packaged food (in plastic) and consequently my own consumer behaviour might be affected by this information. I might actively reduce the amount of plastic by buying products in reduced or no packaging if I believe that animals dying due to the plastic humans produce and throw away is unacceptable. One of the most well known and validated extended EVT is the Theory of Planned Behaviour (TPB) (Ajzen, 1991).

The TPB (Ajzen, 2006) assumes behaviour influenced by intentions to act in a certain way and ability to perform the behaviour (i.e. perceived behavioural control). Intentions are influenced by attitudes, subjective norms (i.e. injunctive norms) and perceived behavioural control. Attitudes are evaluations of the behaviour to be performed and considerations of the likely outcome when performing this behaviour. Subjective norms or injunctive norms are normative beliefs about the expectations of important others. If my neighbours talk about the importance of recycling facilities in the neighbourhood I might perceive that recycling is seen as important and expected. More recently Ajzen (2006) has suggested the inclusion of descriptive norms. Descriptive norms refer to perception of how others behave in certain situations. For example, I might see my all of my neighbours taking out large amount of recycling on a regular basis from which I assume that recycling is an important behaviour for the neighbourhood I live in. Thus, descriptive norms describe beliefs about group - or social norms. Perceived

behavioural control is based on beliefs about factors that may hinder or facilitate the performance of this behaviour. In terms of sustainable behaviour this means that the stronger the attitudes towards sustainable behaviour coupled with positive injunctive and descriptive norms and strong perceived behavioural control (to act in a sustainable manner), the stronger the intention to act sustainably and thus the sustainable behaviour.

The TPB (Ajzen, 1991) has been successfully applied in a variety of studies examining and altering sustainable behaviours and behavioural intentions, such as organic food purchasing (e.g. Vermeir & Verbeke, 2006, 2008; Aertsens et al., 2009; Thøgersen, 2010), reducing meat consumption (e.g. de Barcellos et al., 2011), buying local produce (e.g. Mirosa and Lawson, 2012), buying fair trade (e.g. Arnot et al., 2006; Doran, 2009), and buying sustainable fish (e.g. Verbeke et al., 2007). These studies lend support to the TPB by showing that positive attitudes towards purchasing sustainable food together with strong subjective norms and perceived behavioural control regarding the sustainable behaviour explain high intention to purchase sustainable food and an increased likelihood that this behaviour will be performed.

2.1.2. Normative theories in sustainable consumer behaviour: The Norm Activation Model

Although the TPB is quite successful at predicting sustainable food purchasing behaviours, research has shown that the inclusion of factors from normative theories add to the predictive capacity of the model (e.g. Bamberg & Möser, 2007; Klöckner, 2013). Normative theories assume that people perform sustainable behaviours because they feel morally obliged. Therefore, unlike EVTs who suggest that humans make decisions by weighing up the choices and choosing the best possible options based on their own personal values, normative theories propose that humans base their decision on moral codes of specific behaviour. The Norm Activation Model (NAM, Schwartz, 1977; Schwartz & Howard, 1981), originally developed to explain prosocial behaviour, is one of the most widely used normative theories to explain sustainable consumer behaviour. The NAM suggests that people behave sustainably owing to personal norms being triggered. Personal norms are different from injunctive and descriptive norms, in the TPB, in that they focus on feelings of personal or internal obligation and not just felt external social pressure to act. Personal norm, according to Schwarz (1977), is activated by four central situational variables.

1. Problem Awareness, defined by the extent a person is aware of the adverse consequences (i.e., problems) of not acting pro-socially or against something valued.

2. Ascription of responsibility, referring to extent of the person's feelings of responsibility for the potential negative consequences of not acting pro-socially.

3. Outcome efficacy, this refers to a person's believe that he or she can make a valuable contribution to the solution of the problem.

4. Self-efficacy, like perceived behavioural control in the TPB, the person needs to feel able to perform the desired actions.

The NAM has been successful in predicting sustainable food purchasing behaviours (Thøgersen, 1999; Thøgersen & Ölander, 2006; Klöckner & Ohms, 2009) showing that personal norms play an important role in explaining sustainable behaviour. However, combining factors from the TPB and NAM increases the amount of sustainable behaviour explained as factors can explain both decisions based on subjective outcome maximisation (i.e. best choices, in TPB) and moral based decision-making (personal norms, NAM) (Klöckner, 2013).

2.1.3. Habits and sustainable consumer behaviour

Both the NAM and TPB explain decision making as a conscious process of waying up values and norms, however research has shown that between 35-53 % of our daily behaviours can be classified as habitual using very little conscious deliberation capacities (i.e. being mainly subconscious) (Wood, Quinn & Kashy, 2002). Habits are automatically triggred by cues which can be external (e.g. social) and internal (e.g. goals) (Neal, Wood, Labrecque & Lally, 2012). Habits have been defined as actions that are frequently performed (almost daily) in the same behavioural and situational context, indicating stability across situations, and with little conscious deliberation (Wood et al,. 2002). Indeed, food shopping behaviour in the developed world has been argued to be a low level cognitive activity characterised by subconscious repetitive behaviour (Fischer & De Vries, 2008; Thøgersen et al., 2012). This argument has been supported by a number of studies which found habits to be important predictors of sustainable food purchasing behaviours (e.g. Biel et al., 2005; Padel & Foster, 2005). In general habits have been seen as barriers to sustainable behaviour change (Klöckner & Verplanken, 2012) due to the automaticity of the behaviour and low cognitive deliberation. In fact when habits are strong there appears to be no influence

of intention on behaviour, again supporting the argument of low cognitive deliberation in habitual behaviour and indicating the difficulties this poses for behaviour change interventions (Klöckner & Matthies, 2004). It seems logical then that habit is an important factor in changing food purchasing behaviour and should be included in the theoretical framework of this thesis.

2.1.4. Combining EVTs, normative theories and habits in sustainable consumer behaviour

Two recent meta-analyses (Bamberg & Möser, 2007; Klöckner, 2013), examining predictor variables of sustainable behaviour (i.e. factors from the TPB, NAM and habit), including sustainable food purchasing behaviour, show the value in combining factors from all three theories. Both meta-analyses found the strongest predictor of behaviour to be intention, explaining between 27% and 38 % of variance in sustainable behaviour. Additionally habit and perceived behavioural control (a factor of the TPB) were found to be direct significant predictors of sustainable behaviour by the more recent one of the two meta-analysis (Klöckner, 2013). 52-55% of intention, on the other hand, was explained by a combination of attitude, PBC, personal norms in both meta-analyses and additionally subjective norms (i.e. injunctive and descriptive norms) again in the more recent of the two (Klöckner, 2013). One reason for the slight variation in significant predictor variables for behaviour and intention in the two meta-analyses could be that Klöckner (2013) included more predictor variables and newer studies with different behaviour thus shifting the importance of predictor variables slightly. However, it is clear from the evidence that psychological factors from the TPB, NAM and habits are important for explaining sustainable consumption behaviour including sustainable food purchasing behaviour.

To sum up, research has found a number of significant predictors of individual sustainable food purchasing behaviour. The most significant ones have been intention, habit, perceived behavioural control, personal-, injunctive- and descriptive norms and attitude. The direction of the relationship and strength of each predictor depends on the type of sustainable behaviour including sustainable food purchasing (Klöckner, 2013).

2.2. Social networks in sustainable consumption behaviour change

As I identified in the policy section, individual behaviour change is the basis for a change in sustainable food purchasing behaviour. However, individuals are part of families, communities and other parts of society which influence each other. This social influence (i.e. when one's emotions, opinions, or behaviours are affected by others, Axsen & Kurani, 2012) is lacking in detail (i.e. it is only included in social norms, i.e. descriptive and injunctive norms) in the theories mentioned so far. Indeed research investigating the spread of information in social networks has found that the extent to which information spreads through social networks is influenced by the number and strength of social ties (i.e. relationships) (Granovetter, 1973) and the type of information (Weening & Midden, 1991). However, information spread does not nessesarily lead to the spread of behaviour (Bartiaux, 2008) and therefore further research is needed to investigate the spread of behaviour (specifically sustainable consumer behaviour) in social networks.

Social network theory and research (Wasserman, 1994; Carrington et al., 2005) focuses on understanding patterns of social relationships between individuals.

The social network approach provides a framework in which the influence of social networks on sustainable food purchasing behaviour may be researched in a more detailed way. A social network is defined as a social structure comprised of a set of social actors (e.g. individuals) and ties between these actors. Each individual is mapped with their relationship to other individuals through ties providing an overview of the social network. The size of the network studied depends on the theoretical question of the researcher (and practical implications) and can vary from micro - (e.g. dyads and ego-networks) via meso- (e.g. organisations and scale-free networks) to macro level (e.g. complex networks) (Marsden, 2005). The social network approach offers techniques for analysing the structure of the social networks as well as theories explaining the patterns observed. Social network analysis can be used to detect local and global patterns, identify influential entities, and examine network dynamics.

The social network approach has its conceptual origins in three schools of thought; sociology, anthropology and role theory (Tichy, Tushman & Fombrun, 1979). Network

researchers often apply group sociology or social psychology theories to explain the social relationships and processes (Keim, 2011).

Studies investigating the effect of social influence on sustainable consumer behaviour have suggested several mechanisms ranging from personality factors (e.g. the tendency to accept information from others) (e.g. Bearden, Netemeyer & Teel, 1998; Kuenzel & Musters, 2007) to translation perspectives, focussing on processes through which behaviour is socially defined and interpreted by individuals and through social interaction (e.g. Geels, 2010) (see Axsen & Kurani (2012) for more information on mechanisms of social influence).

Here I focus on a mechanism that is relevant for explaining the interplay between social network characteristics and psychological predictors of sustainable food purchasing behaviour; conformity. Conformity, seen as interpersonal influence occurring through an individual's perceptions of what others are doing or expecting, is often explained through norms (e.g. Social Identity Theory, Tajfel & Turner, 1979; 2004) and social learning (e.g. Social Learning Theory, Bandura, 1977).

Social identity theory (Tajfel & Turner, 1979, 2004) and its extension, self-categorization theory (Turner, Hogg, Oakes, Reicher & Wetherell, 1987) suggest that behaviour is influenced through group norms, which are defined as descriptive norms of relevant social network groups. These group norms are made salient on the basis of self-categorization to distinguish oneself and the in-group (i.e. their social network) from the out-group.

Social Learning Theory (Bandura, 1977), on the other hand, suggests that behaviour is learned through observing and imitating others who perform the behaviour. For this to happen four processes are necessary, attention (i.e. the person needs to observe the behaviour), retention (i.e. the person needs to be able to remember the behaviour), reproduction (i.e. the person needs to be able to replicate the behaviour) and motivation (i.e. the person needs to have a good reason to replicate the behaviour). I suggest that sustainable food purchasing is a behaviour which can be observed, retained and reproduced easily by people due to the repetitiveness and visibility of the behaviour. Motivation could come from having important others perform the behaviour on a regular basis. Therefore, social learning maybe one possible mechanism through which social networks can influence sustainable food purchasing behaviour.

Since the main aim of the theories is to find intervention strategies that will stimulate the spread of sustainable consumer behaviour in society not just the individual the next section will explore relevant transition theories.

2.3. Spread of sustainable consumer behaviour in society

To explore how sustainable consumer behaviour may spread through society this research will have to include theories that focus on more than individual behaviour change and social network influence. The next sections will focus on transition theories in particular in relation to sustainable consumer behaviour (section 2.4.1.). Furthermore I will discuss the advantages of applying simulation models, in particular agent-based models, in research focusing on the spread of sustainable consumer behaviour in society (section 2.4.2.).

2.3.1. Theories focussing on the spread of behaviour in society: Tipping points and change processes

Research which focuses specifically on the spread of sustainable behaviour in society, sometimes referred to as sustainability transitions, is still in its infancy and lack reliable theoretical models and a universally accepted definition of the transition phenomenon (Holtz, 2011). Holtz (2011) argues, however, that there are some core characteristics of the change processes that happen in transitions. The three core characteristics he highlights are; 1. Multiple interconnected change processes happening in a number of domains. 2. Change happens slowly and incrementally as rapid change is hampered due to the interconnectedness of different domains. 3. If change is happening in one domain the interconnectedness will induce changes in other domains of the system thus the changes reinforce themselves.

Other researchers describe similar aspects of the transition process (e.g. Rotmans et al., 2001). Rotmans et al. (2001) suggest that for a societal transition to happen

changes need to happen in a set of connected areas. These areas are technology, economy, institutions, behaviour, culture, ecology and belief systems. Rotmans et al. (2001), like Holtz (2011), depicted the change process in transitions as a slow iterative process, where the connected structural changes within society reinforce each other. However, they also describe an acceleration of the transition process which they call the breakthrough phase, in which visible structural changes happen. The acceleration phase is more in line with Gladwell's tipping point theory (2002).

Gladwell (2002) portrays transitions as more dramatic and dynamic calling them 'tipping points', which show rapid shifts in behaviour or thinking patterns. Gladwell points out that these tipping points happen in all areas of society such as the spread of disease, crime rates or teenage pregnancies. Tipping points can be reached if a critical number of people attain a certain status, be it being diseased, adopting an innovation, or falling/climbing crime rates. Once this critical tipping point is reached drastic changes in form of increases or decreases in numbers of e.g. supporters, people affected or ill can be seen.

Research into the adoption of Facebook applications found that once an application had crossed a threshold this application was propelled to exceptional levels of popularity (Onnela & Reed-Tsochas, 2010). This evidence seems to suggest that a tipping point could exist in relation to behaviour change. However, the speed at which such spread of behaviour may happen and the number of interconnected areas in which change happens may vary depending on the complexity of the behaviour. There has been no research to explore the spread of behaviour in society in the domain of sustainable consumer behaviour. The main reason for this could be the complexity of studying such behaviour change processes in society towards sustainable consumer behaviour. Being a sustainable consumer, encompasses not only environmental considerations but also social ones, as discussed in chapter 1. When evaluating the sustainability of a product ideally one should consider the whole process from product creation via usage to disposal (Norwegian Ministry of the Environment, 1994).

2.3.2. Researching the spread of sustainable consumer behaviour in society with simulation models: Agent-based models

Researching ways to spread sustainable consumer behaviour in society is complex. One not only needs to take into account the complexity of the behaviour or process itself but also the multitude of processes arising from large populations of heterogeneous people, ever evolving networks and situations (Jager & Mosler, 2007). Due to these complexities and the large number of factors at play, researchers are looking more and more towards simulation models. With the help of simulation models researchers are able to look at the effects of numerous combinations of micro-level factors (e.g. factors that influence behaviour change on an individual level) and group level factors (e.g. social network factors) on macro-level phenomena like consumerism. It would be impossible to examine such complex combinations of factors and their interactions in real life or controlled experiments (Delre, Jager, Bijmolt, & Janssen, 2010). Simulation models have been successfully used in statistical physics to study the spread of epidemics and viruses (e.g. Newman, 2002; Dodds & Watts, 2005), marketing studies (e.g. Solomon et al., 2000; Hohnisch et al., 2006) and social sciences (e.g. Jager & Janssen, 2003; Delre et al., 2007), demonstrating the wide application of this technique to understand complex processes like the spread of sustainable consumer behaviour.

There are a number of different types of simulation models (for an overview of simulation models of behaviour change look at Holtz, 2011). However, unlike agent-based models (ABMs) most of them either do not capture the heterogeneity of agents (i.e. individuals), the complexity of social processes or have bigger social units than agents (Kiesling et al., 2012). ABMs, unlike other simulation models, are thus able to accommodate the diversity of psychological factors coupled with the heterogeneity of agent and social network factors (suggested by the theoretical framework of this thesis), to simulate the complex process of behaviour change in society in sustainable consumer behaviour.

ABMs include rule-based human ‘agents’ which interact dynamically and can create real-world-like complexities through designed algorithms (Bonabeau, 2002). They enable simulation of behavioural processes within actors as well as between them and their environment (Jager & Mosler, 2007). Most agent-based models are made up of the following aspects: (1) numerous agents at various levels; (2) decision-making heuristics (rules of thumb); (3) learning rules or adaptive processes; (4) an interaction structure; and (5) a non-agent environment (Garcia & Jager, 2011). ABMs are thus very suited towards researching the spread of sustainable consumer behaviour in society and will be applied in this thesis.

2.4. Summary

The overall aim of this research is to explore how a change towards sustainable consumer behaviour may be achieved on a societal scale. Due to the complexity of researching such behaviour change in sustainable consumer behaviour I have decided to choose one aspect of sustainable consumer behaviour, sustainable food purchasing (discussed in Chapter 1 in more detail). The first part of this chapter focussed on identifying factors that should be included in the theoretical framework of this thesis. Firstly, I summarised the main psychological theories of sustainable behaviour change (i.e. the TPB, NAM and habit theories) and pointed out the main theoretical shortcoming (i.e. the theories lack details of the influence of social networks in sustainable behaviour change) (Section 2.2.). Secondly, to address this shortcoming I include social network theory (Section 2.3.) in addition to factors from the main theories (i.e. TPB, NAM and habit) in my theoretical framework (Section 2.6.).

The second part of this chapter explored theories of spread of behaviour in society change (2.3.1.) and research techniques (2.3.2.) to find ways in which individual sustainable food purchasing behaviour change may lead to a societal change in behaviour in relation to sustainable food purchasing. Section 2.3.1. included a brief summary of theories focussing on sustainability transitions highlighting the complexity and difficulties of studying such behaviour change in society due to a lack of universally agreed definition of what constitutes a transition and divergent opinions about the speed and details of the change processes during a societal behaviour change or transition. Due to the complexity of researching ways that can bring about a behaviour change in sustainable consumer behaviour in society I have decided to apply a simulation modelling technique called agent-based modelling, the advantages of which I discussed in this chapter (Section 2.3.2.).

This thesis will add to the scientific literature in two ways. Firstly, through the novel approach of combining social network theory and psychological factors of sustainable behaviour change to understand sustainable food purchasing behaviour. Secondly, by furthering scientific knowledge on how a behaviour change in sustainable food purchasing may be achieved in society through policy interventions (background literature and details of which will be discussed in the ABM chapter as they are based on findings from the empirical chapters 3 (online survey) and 4 (segmentation study).

2.5. Theoretical Framework

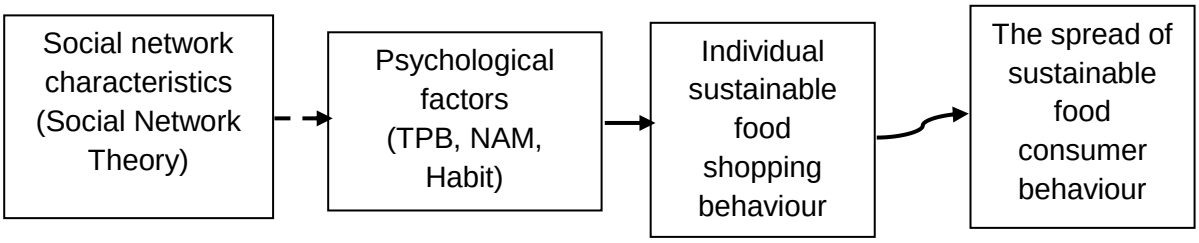

Figure 2.1. Theoretical framework showing established relationships (solid lines), theorized relationships to be explored with a survey and experiments (dashed line) and relationships to be explored through social simulation (wavy line).

Figure 2.1. depicts the theoretical framework of this thesis. The framework combines the most significant factors from the main environmental psychology theories of sustainable behaviour change the TPB, NAM and habit theories, identified through two meta-analyses (Bamberg & Möser, 2007; Klöckner, 2013) with social network factors (details discussed in Chapter 3). The main aim of this thesis is to further the theoretical understanding of how behaviour change in sustainable food shopping behaviour may be achieved on a societal level. To answer this I will study the influence of social networks through the study of social network characteristics on sustainable food purchasing behaviour via the psychological predictor variables. This relationship is shown in Figure 2.1 as a dashed line leading from social network characteristics to psychological factors and a solid line from psychological factors to individual sustainable food shopping behaviour. The solid line between psychological factors and sustainable food purchasing behaviour indicate previously established relationships (e.g. as shown in the recent meta-analysis of Klöckner, 2013), and will not be explicitly examined in present thesis. The first aim of this thesis is to establish relationships between social network characteristics, psychological factors and sustainable food purchasing behaviour. Therefore the dashed line shows the hypothesized relationships I am going to focus on in thesis Chapters 3, 4, 5. The second aim will investigate the influence of social network characteristics via psychological factors on the speed of the spread of sustainable consumer behaviour. Therefore the wavy line shows the

relationship that the manipulation of the social network characteristics in the agent-based model which will be tested in Chapter 6.

2.6. Research Questions and Hypotheses

2.6.1. Research aim and researh questions

The main research aim of this thesis is: *to investigate relationships between social network characteristics, psychological predictors and sustainable consumer behaviour.* Based on the main aim and the research framework (Figure 2.1.), developed from the theories, the main research question of the thesis was: *How important are social network characteristics for explaining and changing sustainable consumer behaviour?* This question included three sub questions:

(a) Do social network characteristics explain sustainable consumer behaviour directly, or, indirectly, via important psychological predictors (Chapter 3 and 5)?

(b) Can social network characteristics and psychological predictors usefully explain different sustainable food consumer segments in society (Chapter 4)?

(c) How could the use of social network characteristics help to spread sustainable consumer behaviour through social networks (Chapter 6)?

2.6.2. Research Hypotheses

In each empirical chapter in this thesis (i.e. Chapter 3, 4, 5, 6) I have developed and evaluated a number of specific research hypotheses which are particular to each chapter and to the progression of the theoretical understanding of how a behaviour change in sustainable food shopping behaviour may be achieved within society.

2.7. Methodology

The overall aim of this research is to examine how behaviour change in sustainable consumer behaviour, in particular sustainable food shopping behaviour, may be achieved on a societal level. To accomplish this I will apply several types of research methods to maximize the scope and validity of this research.

My overall methodological approach is based on a positivist's research approach. This approach is grounded in the verification of research based on measurable outcome and thus applies quantitative research methods instead of qualitative research methods (Cohen & Crabtree, 2006). The reason for choosing a positivist's rather than a constructivist approach, which focuses on inducing theory and meaning from qualitative research is twofold. Firstly, I believe that knowledge can be gained from positive verification of measurable data. Secondly, this knowledge can be build upon by using methods that are objective, valid, reliable and replicable by others.

For this research I am building on knowledge about sustainable behaviour change and the spread of behaviour gained by others and advancing this knowledge through a variety of quantitative research methods. The process for this research is divided into three main phases. The first phase of this research is to use quantitative research methods to examine the influence of social networks on sustainable food purchasing behaviour while taking into account previously identified psychological predictors of sustainable food purchasing behaviour (i.e. TPB, NAM and habit). To achieve this I will, firstly, collect empirical data through an online survey (Chapter 3 and 4). The survey data will be cross-sectional and therefore no causality can be drawn from the data. Reasons for choosing cross-sectional survey design will be discussed in chapter 3. In the second phase I will run an experiment designed to test the influence of social network factors on sustainable food consumer behaviour (Chapter 5) in order to test the causality of the significant factors from the online survey. In the third phase, I will develop an agent-based model (ABM) to test policy relevant interventions designed to stimulate the spread of sustainable purchasing behaviour (Chapter 6). The ABM is a simulation model which will be built in Netlogo. The ABM will be based on theories from the scientific literature discussed in this introduction (i.e. TPB, NAM, habit and social network theory) combined with empirical evidence of significant predictors of sustainable food purchasing behaviour found during the first research phase of this thesis, the online survey.

A detailed description of the method, including research design, sample, measures, materials and analyses, will be discussed separately in each chapter so the reader can link method and findings to draw their own conclusions.

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Chapter 3: The sustainable food revolution: The influence of social network characteristics on sustainable food purchasing and its psychological predictors.

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Chapter abstract

How to change people's consumption patterns to be more sustainable is one of the major issues society is tackling at the moment. Present research merges social network characteristics with psychological variables from popular models (Theory of Planned Behaviour, Norm Activation Model and habits) used to explain sustainable consumer behaviour. The survey study (N=507) explored how ego network characteristics in addition to psychological variables explain self-report sustainable food purchasing behaviour. Results showed that five social network characteristics (i.e. degree, sustainability degree, food discussion degrees, purchasing influence degree, relationship length) significantly explain sustainable food purchasing behaviour. However, these relationships are all mediated through psychological variables. Results indicate that behaviour change interventions may focus on bottom-up approaches with small social networks enabling discussions within one's network on food purchasing decisions that will ultimately encourage the uptake of sustainable food purchasing behaviour through habits, perceived behavioural control, descriptive and personal norms.

3.1. Introduction

Human consumption is one of the main drivers of environmental degradation (UNEP 2012). International policies are focussing on achieving a sustainable consumer society through changing individual consumption patterns, deemed necessary for the survival of human beings and the planet (Defra, 2013; UNEP, 2012). Food consumption is a key facet of sustainable consumption accounting for 20-30 % of anthropogenic

greenhouse gas (GHG) emission and up to 70% of human water consumption (Smith et al., 2014). Although the majority of European consumers report they are willing to purchase sustainable food products only 12 % of these consumers actually do so (European Commission, 2014). These results show that there is still a gap to motivate people to become sustainable food shoppers. The main aim of this research is to extend research on drivers of individual sustainable food purchasing. More specifically, present study will explore how one's social network can affect psychological motivators and sustainable food purchasing behaviour. Since defining what constitutes a sustainable diet is not straight forward (FCRN, 2014), sustainable food in the context of this research will be defined as food that is ecological and fair trade.

3.1.1. Predictors of sustainable food purchasing behaviour: Theory of planned behaviour and moral considerations

A large body of literature has researched factors explaining various aspects of sustainable food purchasing intention and behaviour, such as organic food purchasing (e.g. Vermeir & Verbeke, 2006, 2008; Aertsens et al., 2009; Thøgersen, 2010), reducing meat consumption (e.g. de Barcellos et al., 2011), buying local produce (e.g. Mirosa & Lawson, 2012), buying fair trade (e.g. Arnot et al., 2006; Doran, 2009), and buying sustainable fish (e.g. Verbeke et al., 2007). The theoretical framework for most of these studies was the Theory of Planned Behaviour (TPB, Ajzen, 1991). The TPB (Ajzen, 1991; 2006) assumes behaviour influenced by intentions to act in a certain way and ability to perform the behaviour (i.e. perceived behavioural control). Intentions are influenced by attitudes, subjective norms (i.e. injunctive norms) and perceived behavioural control. Attitudes are evaluations of the behaviour to be performed and considerations of the likely outcome when performing this behaviour. Subjective norms or injunctive norms are normative beliefs about the expectations of important others in relation to performing the behaviour. More recently Ajzen (2006) has suggested the inclusion of descriptive norms. Descriptive norms refer to perception of how others behave in certain situations, that is, they describe beliefs about 'normal' group behaviours. Perceived behavioural control is based on beliefs about factors that may hinder or facilitate the performance of the behaviour. In terms of sustainable behaviour this means that the stronger the attitudes towards sustainable behaviour coupled with positive injunctive and descriptive norms and strong perceived behavioural control (to

act in a sustainable manner), the stronger the intention to act sustainably. A strong behavioural intention results in more sustainable behaviour.

In studies investigating sustainable consumer behaviour, the TPB (Ajzen, 1991) is often applied in combination with concepts included in normative models (e.g. Thøgersen & Olander, 2006; Arvola et al., 2008; Klöckner & Ohms, 2009). Normative models assume that sustainable consumption choices include aspects of moral considerations. One of the key predictors of sustainable consumer behaviour within these models are 'personal norms'. Personal norms are feelings of personal and moral obligation to behave in a sustainable way (White et al., 2009).

The TPB and normative models imply that people either weigh the costs and benefits of performing a sustainable behaviour on either 'utility-maximising' (TPB) or 'normative' decision making rules (De Groot, Schubert, & Thøgersen, 2016). However, researchers have found that strong hindering effects to the uptake of sustainable food purchasing behaviour are our habitual choices (e.g. Magnusson, Arvola, Hursti, Åberg, & Sjödén, 2001; Padel & Foster, 2005; Aertsens et al., 2009). They argue that in the western world food purchasing is often a low level cognitive activity characterised by subconscious repetitive behaviour (Fischer & De Vries, 2008; Thøgersen, Jorgensen, & Sandager, 2012), which utility and normative models fail to grasp. These studies suggest that to fully explain sustainable food purchasing behaviour, habits should also be included in any behavioural model.

A recent meta-analysis (Klöckner, 2013) comparing the predictive power of factors from the TPB, NAM and habits in explaining sustainable behaviour, including sustainable food purchasing behaviour, found that intentions were the strongest predictor of behaviour explaining 38 % of variance, followed by habits (explaining 24%) and perceived behavioural control (PBC; explaining 11%). Overall, the three variables explained 36% of sustainable behaviour suggesting some overlap between intentions, habits and PBC. The strongest predictor of sustainable behaviour, intention was explained by a combination of attitude and PBC, personal norms and social norms (i.e. injunctive and descriptive norms), in order of importance. Evidence from the meta-analysis shows that psychological factors from the TPB, NAM and habits are popular and important in studies investigating sustainable food purchasing behaviour (see Klöckner, 2013). Therefore, this study will include the main predictors of sustainable food purchasing behaviour as suggested by these popular psychological theoretical perspectives/theories (i.e. intentions, habits, PBC, attitude, personal, injunctive and descriptive norms).

Apart from the psychological factors as described above, there is ample evidence showing that the social environment influences consumer behaviour as well (e.g. Goodrich & Mangleburg, 2010; Lee, 2016; Tu & Fishbach, 2015; Shergill, Sekhon & Zhao, 2013). Social influence can be defined as change in an individual's attitude or behaviour that results from the interaction with other individuals or social groups (Rashotte, 2007, p.4426). Indeed, Abrahamse and Steg (2013), investigating the effectiveness of social influence approaches in sustainable consumer behaviour (i.e. encouraging resource conservation) in a meta-analysis, found that social influence approaches (e.g. block leader, normative messages) were more successful in changing sustainable consumer behaviour than other approaches (e.g. information and goal-setting) and compared to control groups. It seems surprising then that social influence is often not explicitly investigated in relation to the uptake of sustainable consumer behaviour and has never been measured in conjunction with the complete set of the main psychological predictors of sustainable consumer behaviour as often included in such research (e.g., TPB factors, personal norms, habits). This research will aim to close this gap in current research by investigating how social influence characteristics affect the often investigated psychological variables (i.e. intentions, habits, PBC, attitude, personal, injunctive and descriptive norms) and sustainable food purchasing behaviour.

3.1.2. Social network analysis

Social network analysis (Wasserman, 1994; Carrington, Scott & Wasserman, 2005) could offer support in researching this novel avenue in sustainable food purchasing research by providing a method that explicitly measures social influence characteristics in the form of social network characteristics. Social network research focuses on understanding patterns of social relationships between individuals (Wasserman, 1994). It distinguishes between two main types of networks, socio-centred or whole networks, and ego-centric or personal networks. Socio-centred networks concern the set of relationships between the members of a social collective with pre-defined boundaries such as colleagues in an organisation. Ego-centric networks, on the other hand, are relationships between one individual (ego) and others (alters). This study will focus on ego networks, the reference group that surrounds people, which have been found to be important in relation to sustainable purchasing behaviour (Axen & Kurani, 2012; Salazar & Oerlemans, 2015; Salazar, Oerlemans & van Stroe-Biezen, 2013). By

studying ego networks I am able to study the combined influence of different types of relationships or subgroups (e.g. family members, friends and colleagues) on human behaviours, as research has found that social influence works differently in different groups (Abrahamse, Steg, Vlek & Rothengatter, 2005; Kuenzel & Musters, 2007). Therefore, by studying the combined effect of different types of subgroups on behaviour, compared to a single type, I am able to investigate how social network characteristics affect sustainable consumer behaviour and its psychological predictors across relationship types. This approach gives an overview of the more generalizable characteristics applicable across social network groups for intervention strategies.

Studies investigating the effect of social influence on sustainable consumer behaviour have suggested several mechanisms ranging from personality factors (e.g. the tendency to accept information from others) (e.g. Bearden, Netemeyer & Teel, 1998; Kuenzel & Musters, 2007) to translation perspectives, focussing on processes through which behaviour is socially defined and interpreted by individuals and through social interaction (e.g. Geels, 2010) (see Axsen & Kurani (2012) for more information on mechanisms of social influence).

Here I focus on a specific mechanism that is relevant for explaining the interplay between social network characteristics and psychological predictors of sustainable food purchasing behaviour; conformity. Conformity, seen as interpersonal influence occurring through an individual's perceptions of what others are doing, is often explained through norms as suggested in the social identity theory (Tajfel & Turner, 1979; 2004).

Social identity theory (Tajfel & Turner, 1979, 2004) and its extension, self-categorization theory (Turner, Hogg, Oakes, Reicher & Wetherell, 1987) suggest that behaviour is influenced through group norms, which are defined as descriptive norms of relevant social network groups. These group norms are made salient on the basis of self-categorization to distinguish oneself and the in-group (i.e. their social network) from the out-group. Research into the influence of social networks on sustainable agricultural practises suggests that social network characteristics influence behaviour via descriptive norms rather than directly (Fielding, Terry, Masser & Hogg, 2008). Furthermore, research investigating the effect of social groups on health found that the relationship between group identification and physical activity was mediated by perceived behavioural control (Grant, Hogg & Crano, 2015).

Present study investigates the relationship of nine social network characteristics that have been previously indicated to be influential in changing perceptions (i.e. norms and perceived behavioural control) towards the desired behaviour. The study will add to the literature by investigating the relationship of those nine social network characteristics with each other and with psychological predictors of sustainable behaviour in relation to sustainable food purchasing behaviour, which has never been explored. These characteristics are network size (degree) and subgroup size (i.e. sustainable shoppers, food consumption members, food discussion and purchasing influencers), emotional closeness, social context diversity, density, relationship length. Previous findings of the influence of those nine social network characteristics on perceptions of desired behaviour are explained below.

Social network characteristics: previous findings and hypotheses

Fielding, Terry, Masser and Hogg (2008) found that if people closely identify with their in-group, they mirror their social networks' descriptive norm. In addition, research found that increased network size lead to a decrease in the spread of behaviour (Lamberson, 2010; Siegel, 2009). I theorise that the reason why there is a decrease in the diffusion of behaviour in larger networks is the fact that descriptive norms become less clear due to the presence of several rather than just one descriptive norms of buying sustainable food owing to more diversity in shopping behaviour. Consequently, small networks are more likely to produce strong descriptive norms in relation to sustainable food purchasing (i.e. in favour or against). Therefore I hypothesise that 'The smaller the size of the social network (i.e. degree), the stronger the descriptive norms in relation to sustainable food purchasing. (H1)'.

The number of sustainable shoppers within an ego network (sustainability degree) is likely to influence descriptive norms in a positive manner. Social network research into the adoption of health related behaviour found people were more likely to adopt the behaviour if others in their social network had already adopted the behaviour (Centola, 2010). Therefore, I hypothesize that 'The higher the number of sustainable shoppers in one's social network, the stronger the descriptive norms in relation to sustainable food purchasing. (H2)'.

Furthermore, I suggest that discussing food with social network members in general and during shared food consumption may also lead to an exposure of the underlying norms in favour or against sustainable food purchasing. I suggest that, in line with social identity theory (Tajfel & Turner, 1979, 2004) and self-categorization theory

(Turner, Hogg et al., 1987), the more opportunities a person has to discuss food matters with social network members, the more likely it is that they are to be exposed to the descriptive norms of their social network members (i.e. how others behave) which is likely to lead to an internalisation of these norms. Therefore I hypothesize that 'The higher the number of food discussion members the higher the descriptive norms in relation to sustainable food purchasing. (H3)' and 'The higher the number of food consumption members (i.e. people that a person consumes food with or cooks with) the higher the descriptive norms in relation to sustainable food purchasing.' (H4).

Research into the adoption of plug-in hybrid electric vehicles (PHEV) found that people were unable to predict before the study which social network member would be potentially influential in relation to such an adoption decisions in their study (Axsen & Kurani, 2011). However, they found that emotional closeness seemed to be a significant social network characteristic affecting perceptions towards PHEVs of participants and therefore they suggested a more general selection criteria of network members based on emotional closeness instead of a particular group membership (i.e. family or neighbours). In this study I have not only in-cooperated this information in the way I collected ego-network data but I was also going to explore whether emotional closeness in the network affects descriptive norms towards sustainable food purchasing. Research shows that positive and negative emotions towards the group or social network influence group identification (Kessler & Hollbach, 2005). Specifically positive emotions towards the group strengthen the identification with the group/social network and negative emotions have the opposite effect. As explained above group identification leads to the take up of descriptive norms present in the social network (Fielding et al., 2008), therefore I suggest that emotional closeness (an emotional expression of how close one feels to the social network) may play a role in the adoption of descriptive norms. Our fifths hypothesis therefore reads 'Increased emotional closeness of the social network affects descriptive norms' (H5).

Furthermore, diversity of one's social network has been found to increase the desired behaviour in political participation (Song & Eveland, 2015) and spreading of messages in Word of Mouth marketing (Groeger & Buttle, 2014). The social influence may be effective because people are more likely to hear the same message from several different people within the network (Kadushin, 2011) which will result in a more salient descriptive norm. Therefore I suggest that social network diversity affects the uptake of group norms (i.e. descriptive norms). Therefore the hypothesis reads 'The higher the

social diversity (i.e. social context diversity) the stronger the descriptive norms in relation to sustainable food purchasing behaviour.' (H7).

In a similar vein, a link has been found between the density of a network (i.e. how closely linked members are, how cohesive the network is) and people performing a certain behaviour, in this case delinquent behaviour in peers (Haynie, 2001). A person was more likely to behave in a delinquent way if they had a dense (i.e. more cohesive and closely connected) peer network that was also performing delinquent behaviours. If the dense network was not delinquent itself this relationship reversed and showed a decreasing relationship of delinquent behaviour (Haynie, 2001). I hypothesise that group norms are the underlying mechanism for seeing this relationship between density and behaviour as suggested in the social identity theory (Tajfel & Turner, 1979, 2004) and self-categorization theory (Turner, Hogg et al., 1987). Like with social context diversity, we suggest that there is a relationship between the density of the network and the uptake of group norms (i.e. descriptive norms) in relation to sustainable food purchasing behaviour and put forward the following hypothesis, 'The higher network density the stronger the descriptive norms in relation to sustainable food purchasing behaviour.'(H7).

Research into life events has found that having a baby or small children increases sustainable food purchasing (Schäfer, Herde, & Kropp, 2010). I suggest that purchasing food for others will influence personal norms in relation to sustainable food purchasing as rather than the in-group norms but personal norms become salient as one negotiates what one feels comfortable in buying and what not. Therefore the number of people influencing food purchasing decisions directly will be taken as an indicator that a person has caring responsibilities and that this will directly affect personal norms. Therefore I hypothesize that 'There will be a relationship between the number of people directly influencing purchasing decisions and personal norms in relation to sustainable food purchasing behaviour' (H8).

Research into physical activity and group membership also found that people who strongly identified themselves with a group that already performed the desired behaviour (i.e. performing sport) possessed a stronger feeling of perceived behavioural control (i.e. they felt more able to perform the behaviour) (Grant et al., 2015). These findings are in line with what Bandura (1977, 2006) called vicarious learning. Vicarious learning refers to seeing other people successfully perform a behaviour which can lead to increased feelings of perceived behavioural control in the observer if they identify with the group (i.e. social network members). I therefore hypothesize that seeing other

sustainable shoppers in the group perform this behaviour (i.e. having a large number of sustainable shoppers in the network) is related to increased PBC, hence 'The higher the number of sustainable shoppers within a person's network, the stronger the PBC. (H9)'.

Research focussing on breaking unsustainable consumer habits have found that people are more likely to break habits during life course changes, such as moving house and starting a family, as their routines are disrupted (e.g. Schäfer, Jaeger-Erben & Bamberg, 2012; Verplanken & Roy, 2016). When people go through such changes they are more likely to meet new people, make new friends and will be confronted with new behaviours and perceptions that have to be integrated into existing in-group norms and distinguished from out-group norms (White & Dahl, 2006). This I hypothesize can lead to a strengthening or breaking down of the own habits in relation to sustainable consumer behaviour. Therefore, the final hypothesis reads 'Network relationship length affects sustainable food purchasing habits' (H10).

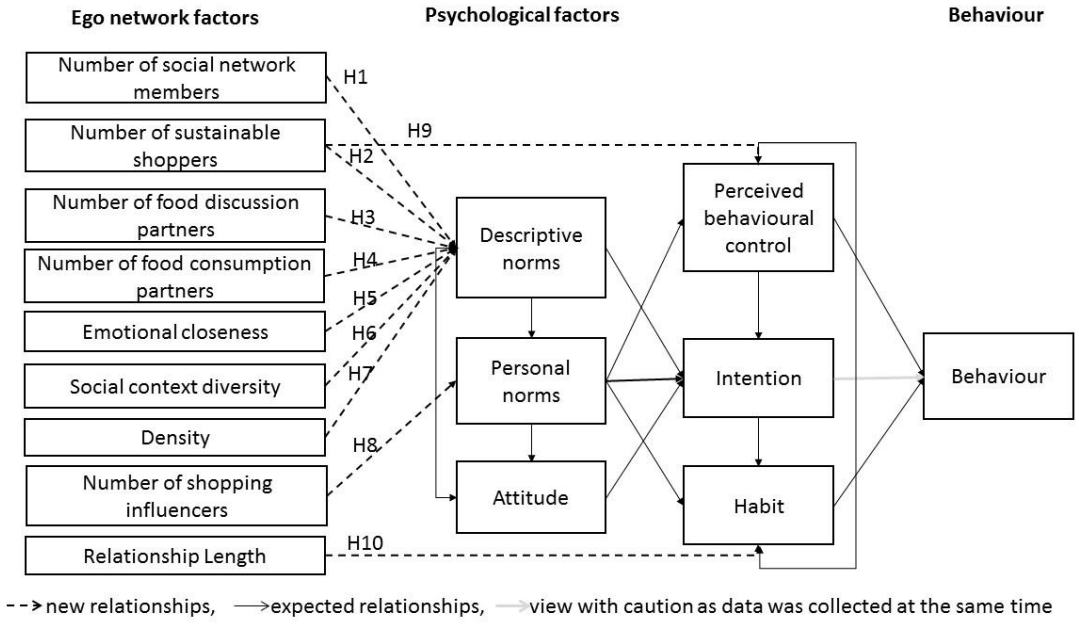

Figure 3.1. New relationships and expected relationships between ego network characteristics, psychological factors and sustainable food purchasing behaviour included in this study.
Note: relationship between intention and self-report sustainable food purchasing behaviour needs to be viewed with caution as this data was collected at the same time.

Figure 3.1. depicts the exploration and testing of the different relationships in the present study. Therefore the main aim of the study is to test how the social network factors explain sustainable food purchasing behaviour via the established psychological predictors of sustainable consumer behaviour. The sub-aim of the study was to further validate the results by comparing the relationships between the psychological predictors of behaviour with those found in the meta-analysis by Klöckner (2013).

3.2. Method

3.2.1. Participants

507 participants were recruited from a loyalty programme called Maximiles (http://www.maximiles.co.uk/) which rewards participants with vouchers for shops and points to spend online for filling in surveys. Due to the relatively high response burden of the research this was decided as the only viable option to gain a large enough set of data. Maximiles was chosen for their strong ethical customer guidelines and because they offer sustainable purchasing options for participants to spend their earned points on. These options include being able to donate points earned (i.e. money) to charities or buy memberships such as to the Royal Society for the Protection of Birds (RSPB).

The survey took approximately 20-30 min to complete with a mean of 23.96 min (SD = 32.5, ranging 3.73 minutes - 356.6 minutes, Mode (there are several modes, lowest is shown) = 12.35, Median = 16.7). Participants were able to stop working on the questionnaire at any time and return to it at a later point which explains the higher end of the completion time of 356.6 minutes. Four participants that took less than five minutes to complete the survey were excluded from the analyses leaving a sample of 503 participants.

The dependent variable in this study is the behaviour related to sustainable food purchasing. Due to missing data 460 participants were in the analysis..

42.6% of the participant sample was male and 57.4% female with a mean age of 48.6 years (SD = 13.9, ranging from 19-78 years, Mode = 53, Median = 50) and with a wide range of political views and ethnic backgrounds (full breakdown in Appendix I).61.2 % of participants reported having children; this figure includes grown up children. 36.3% of the sample reported having a degree, equivalent or higher, 9.9% other higher education levels below degree level, 19.2% A levels or equivalent, 23% GCSE/O-level or equivalent, 3.1% NVQ level 1 and below, 2.1% other qualifications and 6.1% no qualifications. Employment levels reported were as follows: 33.8% participants reported being full-time employed, 5.3% self-employed, 14.1% part-time employed, 7.6% full-time housewife/househusband, 3.4% in full-time education, 24.3% retired, 7% unemployed, 2.7% felt they did not fit into those categories and 1.9% preferred not to answer the question.

3.2.2. Questionnaire design

Research into scale length has found that questions with more categories are more reliable and more valid (Alwin, 1997). Therefore, all questionnaire items were measured on a 7-point Likert scale rather than a 5-point Likert scale. All questionnaire items for each TPB construct (i.e. behaviour, intention, habit, perceived behavioural control, injunctive- and descriptive norm and attitude) were developed in a two-step process. The first step involved consulting conceptual and methodological considerations for the development of these items as discussed by the TPB developer (Ajzen 2002; 2006). Additionally the most recent and thematically similar research studies were consulted for the wording of constructs in the sustainable consumption literature. Additional literature sources are mentioned with the explanation of each construct. For the habit and personal norm items, again the most recent and thematically similar research literature was consulted and sources are cited below.

Likert scales implemented in this research have at least three questionnaire items (questions per psychological scale measured) with seven point answers scales which appear to be spaced out equally insuring more variation and thus interval like data. The wording of the answer scales which appears alongside the numbers makes the scales appear interval rather than categorical by minimising differences between categories; e.g. strongly disagree, disagree, disagree somewhat, neither agree nor disagree, agree somewhat, agree, agree strongly.

For the purpose of the study a brief definition of ‘sustainable food purchasing’ and ‘sustainable food products’ in line with the behaviour items of the survey was developed. The definition was given before and during the survey when questions referred to sustainable food purchasing or sustainable food products (Appendix II).

The survey was uploaded into Qualtrics, an online survey development tool. The survey consisted of three parts. Social network characteristics were collected in part one and will be described in detail in section 3.2.3. Part two measured the dependent variable (behaviour) followed by the psychological constructs which were presented in a computer randomized order. The dependent variable will be described in section

3.2.4. and details of the psychological constructs can be found in section 3.2.5. Part three measured demographic information.

Demographic information was collected in order to assess the representativeness of the participant sample in comparison with the general UK population. Additionally some demographic information was included in the analyses to rule out confounding demographic factors. Demographic information collected included age, gender, educational level, ethnicity, political affiliation, employment status, household income, number of children and ages of children.

3.2.3. Survey

Firstly, Maximiles' customers were informed about the nature and length of the survey including that the survey was intended for adults who shop for food most of the time in their household. Additionally it was explained that the researchers were interested in seeing how similar the person completing the questionnaire was compared to their social network and that participants would be asked to provide some information about their social networks. The survey data was collected via Qualtrics (http://www.qualtrics.com/).

Secondly, informed written consent was taken from participants before the start of the survey. Participants under the age of 18 were filtered out for data protection reasons.

3.2.4. Dependent variable

The dependent variable measured in this survey was self-reported sustainable food purchasing behaviour. This was measured specifically in relation to six sustainable food purchasing behaviours. These were food products which fell into one or more of the following categories; organic, fair-trade, local produce, with little or no packing, Fish and/or Seafood from sustainable sources (e.g. with the Marine Stewardship Council (MSC) sign, animal products that are free range or freedom food. Details of how the dependent variable was measured can be found in Table 3.1. Each set of questionnaire items for behaviour was computer randomized. Behaviour construct

scores were created by taking the mean of all questionnaire items included in the analyses. Excluded items are highlighted and reasons for exclusion of items are given in section 3.3. and subsections.

3.2.5. Psychological constructs

The survey measured psychological predictors based on the theoretical framework of the study. These were intention, habit, perceived behavioural control, personal - , injunctive - and descriptive norms and attitude. Details of how each psychological predictor variable was measured can be found in Table 3.1. All psychological predictor scores were created by taking the mean score of all questionnaire items included in the analyses (see section 3.3. and subsections for exclusion details).

Table 3.1. Psychological constructs, definition, questionnaire items, answer scale and source

Psychological construct	Definition	Questionnaire items	Answer scale	Source
Dependent Variables				
Behaviour	Construct captures self-reported sustainable food purchasing behaviour in relation to six sustainable food purchasing behaviours. (Fair-trade, organic, reduced packaging, local, from sustainable fish and seafood sources and labelled 'free range' or 'freedom food'.)	*B.1.1.* I buy fair-trade products. *B.1.2.* I buy products for which the producer gets a fair price. *B.2.1.* I buy organic food. *B.2.2.* I buy food that is grown without the use of herbicides, pesticides, or chemicals. B.3.1. I buy products in refillable packages. *B.3.2.* I buy food with little or no packing around them. *B.4.1*. I buy locally sourced food. *B.4.2.* I buy food produced in other countries (e.g. bananas, coffee, chocolate) *B.5.1.* I buy fish and seafood with a sustainable logo such as the Marine Stewardship Council logo. *B.5.2*. I buy any fish and seafood. Logos indicating that it is sustainably sourced are not important. *B.6.1*. I buy animal products (e.g. meat and eggs) that are labelled as 'free range', 'freedom food' or similar. *B.6.2*. I buy any animal products (e.g. meat and eggs) whether they are 'free range', 'freedom food' (or similar) or not	*1-never* to 7-*always* And a 'Not applicable' option	Ajzen (2002; 2006)

Psychological Predictors	Definition	Questionnaire items	Answer scale	Source
Behaviour follow up question	Measure captures participant's reasons for choosing N/A as an option in the behaviour question.	Q2.1.1. Why did you select 'Not applicable' for any of the food options? You can select multiple reasons. Other reasons... Please explain.	1. I am a vegetarian. 2. I am a vegan. 3. I don't eat meat, fish or other animal products for health or dietary reasons. 4. I don't eat meat, fish or other animal products for sustainability reasons. 5. Text option	Ajzen (2002; 2006)
Intention	Construct captures future intentions of sustainable food purchasing.	In the future, I intend to buy more food products which are...: *Int1*.Organic *Int2*.Fair-trade *Int3.* Locally sourced *Int4*.With little or no packing *Int5*.Fish/Seafood from sustainable sources (e.g. with the Marine Stewardship Council (MSC) sign *Int6*.Animal products labelled free range, freedom food or similar	*1-very unlikely* to *7-very likely*. *And a 'Not applicable' option*	Ajzen (2002; 2006)

Psychological Predictors	Definition	Questionnaire items	Answer scale	Source
Habit	Construct measures main facets of habit; frequency, lack of awareness, lack of control and mental efficiency. Honkanen, Olsen & Verplanken(2005)	Sustainable food purchasing is something that...:' *Habit1*. I do frequently. *Habit2*. I do without having to consciously remember. *Habit3*. makes me feel strange if I do not do it. *Habit4*. something I do without thinking.	*1-strongly disagree* to 7-*strongly agree.*	Four items from Self-report habit index (12 items) (Verplanken & Orbell, 2003). Reduced scale based on Honkanen et al. (2005)
Perceived behaviour control (PBC)	Construct captures whether person feels able to, knows where to or finds it difficult to buy sustainable food products	*PBC1*. I know where I can buy sustainable food products. *PBC2*.It is not difficult for me to buy sustainable food products. *PBC3*.I feel able to buy sustainable food products.	*1-strongly disagree* to 7-*strongly agree*	Abrahamse and Steg (2011)
Personal norm (PN)	*Construct captures how morally obliged and good people feel if they buy sustainable products and how guilty they feel if they do not.*	*PN1*.I feel morally obliged to buy sustainable food products. *PN2*.I feel good when I buy sustainable food products. *PN3*.I feel guilty when I fail to buy sustainable food products.	*1-strongly disagree* to *7-strongly agree*	*De Groot and Steg (2010)*
Injunctive norm (IN)	*Construct captures whether a person feels that members of their social network expect them to buy* sustainable food.	*IN1*.My friends expect me to buy sustainable food products. *IN2.*My family members expect me to buy sustainable food products. *IN3.*Other people who are important to me expect me to buy sustainable food products.	*1-strongly disagree* to *7-strongly agree*	De Groot and Steg (2007)
Descriptive norm (DN)	Construct measures how participants perceive others to typically behave, i.e. whether they buy sustainable food or not.	*DN1*. I think my friends buy sustainable food products. *DN2*.I think members of my family buy sustainable food products. *DN3*.I think other people who are important to me buy sustainable	*1-strongly disagree* to 7-*strongly agree*	Ajzen (2006)

Psychological Predictors	Definition	Questionnaire items	Answer scale	Source
Attitude (ATT)	*Construct captures a person's negative and positive attitude towards sustainable food purchasing.*	For me to buy sustainable food products would be: ... '	*Att1. 1-very unimportant to 7- very important* *Att2. 1-very inappropriate to 7- very appropriate* *Att3. Very bad* to *7- very good*	Bamberg (2003).

Note. Highlighted items were not included in the final analyses.

3.2.6. Social network characteristics

Collecting ego network data can be difficult due to the fact that ego networks can be extremely large (Marsden, 2005), people are not reliable in recalling all network members (Brewer, 2000) and it might thus be necessary to set appropriate boundaries to collect information about 'appropriate' alters, i.e. friends, family, co-workers, neighbours or others that might be important influencing individuals in relation to the study question. Additionally different members of the ego network have different roles (Marsden, 2005); consequently, to find alters that are 'influential' or 'important' to egos in relation to sustainable purchasing behaviour the right eliciting question needs to be asked.

To collect information on 'appropriate' alters within the ego network researchers have traditionally used name generators (Marsden, 2005). Name generators are single or multiple questions which will elicit names of alters that are relevant for the research question, provide the appropriate complexity level of information within the right time constraint. Multiple name generators have been found to be more reliable than single name generators when measuring standard network characteristics such as size, density and mean measures of composition (Marin & Hampton, 2007). Therefore this study will include multiple name generators as well as name interpreters (further questions about the network members whose names are illicted through the name generators).

The name generators and name interpreters will focus on the main categories of name generators/interpreters which are exchange, role relationships, interaction and affect (for a discussion of there application in ego networks see Marin & Hampton, 2007). This strategy has been chosen for two reasons. Each name generator category has limitations the negative effect of which can be counteracted or minimized by applying several different types of name generators. Additionally as mentioned above, some researchers (Fischer & De Vries, 2008; Thøgersen et al., 2012) have suggested that in the developed world food purchasing is often a low level cognitive activity characterised by subconscious repetitive behaviour. Thus, I argue that people might not be aware of who they talk to about food purchasing matters and who might have influenced their behaviour.

For these reasons I am asking participants a number of different name generator questions with a varied focus on different aspects of their social network to maximise

the likelihood of identifying the right people in their social network that might influence their purchasing behaviour.

Name generator and interpreter questions

Name generator. Two main name generator approaches have been used in this research. The first approach applied was the *affect approach*. As the initial name generator this was used to identify people that are high in affective value (e.g. people that are close or important) to the ego (participant) and can collect a relatively broad set of alters, i.e. family and friends that are important to the participant.

Recall can be a problem when collecting ego network data (Brewer, 2000) and thus I theorised that starting with a broad question and then narrowing down to a subset of alters that might be important in relation to sustainable food purchasing might be a good strategy. Therefore, the first question asked to elicit names (i.e. initials or nicknames) from participants' ego networks was: 'Who belongs to your closest circle of friends and family?**'** (Table 3.2)**.**

The affect approach can be at times problematic due to possible confusions about interpretations of "what is closeness" when asking people to identify who belongs to their closest circle of friends and family (Marin & Hampton, 2007). However, I argue that in this study there is no need for a universal understanding of closeness and that participants are free to interpret 'closeness' in their own way. Additionally, by asking participants several name generator questions I am also restricting the limitations each type of name generator approach has.

The second type of name generator applied in this study is the *exchange approach* (3 questions). This approach focuses on generating names of people which are involved in some form of exchange of support (through an exchange of advice or discussion about food purchasing matters or eating/cooking together). The additional name generator questions therefore, for example asked: 'Now think about people who you frequently eat with, cook for/with or who cook for you. Below again is the list of all the people that you have mentioned. Can you please tick all the ones that apply to this' (Table 3.2.).

The exchange approach has been argued to lead to an important subset of a network of people that regularly provide supportive interaction such as an exchange about food purchasing matters (Marin & Hampton, 2007).

All exchange approach name generator questions were applied in two steps.

Step 1: Asked participants to identify already listed alters for each category that the name generator asked about, for example, “Who do you frequently eat/cook with or for”

Step 2: Asked participants to consider if they knew any other person that belonged to the category that Step 1 asked about and to list them.

Name interpreter questions are a traditional way of gathering further information about the nature of the ego-alter relationship as well as other alter characteristics (Marin & Hampton, 2007). This approach will be used to collect some more information to quantify the relationship between the ego and alters such as closeness, relationship role and alter-alter connections.

The name generators and interpreters collected data for a number of established social network characteristic measurements. These are discussed in the next section.

Social network characteristics

Nine social network characteristics (SNCs) were measured with the name generator and interpreter questions (Table 3.2.). Three types of SNCs measured structural properties of the social network measures. These SNCs were degree, social context diversity and density.

Degree refers to the number of people a person nominates as friends or influential person in a given name generator (Kadushin, 2011). Five different types of degree measures were taken in this survey. The overall degree (i.e. degree, the number of people that were mentioned to be included in a person’s ego network in general), sustainability degree (i.e. the number of sustainable shoppers in an ego network), shopping influence degree (i.e. the number of network members that directly influence shopping decisions), food discussion degree (i.e. the number of network members that

a person discusses food matters with) and food consumption degree (i.e. the number of network members a person eats or cooks with or for).

Social context diversity is a measure of the number of different areas of life the participants know their network members from.

Density measures the density of the network, i.e. the number of relational links between network members besides those with ego (the participant) out of the possible number of relationships. This is measured from ego's point of view.

Three additional social network characteristics were measured through the name generator and interpreter questions. These captured details about the nature of the ego-network relationships and were closeness and length of relationships.

Closeness measures mean network closeness of the participant-network member (alter) relationships as perceived by ego.

Length of relationships is a mean score of the average relationship length within the ego networks.

Details of how the social network characteristics were measured can be found in Table 3.2.

Table 3.2. Lists variable name, definition, questions item, answer scale, question type and theoretical range of scores for all social network characteristics

Variable (listed in the order measured)	Definition	Question item	Answer scale	Question type	Theoretical range of scores
Degree[1] /Network size	The sum of all people listed in name generator questions Q1, Q3, Q5 and Q7.	Q1. Who belongs to your closest circle of friends and family?	Open text boxes	Name generator: affect approach	2-35
Food consumption degree[1]	The sum of people participants indicated they cook/eat with. (Q2 and Q3)	Q2. Now think about people who you frequently eat with, cook for/with or who cook for you.	Tick list with already listed names	Name generator: exchange approach	0-25
		Q3.Please add any other names of people who you frequently eat with, cook for/with or who cook for you.	Open text boxes	Name generator: exchange approach	
Food discussion degree[1]	The sum of people participants indicated they discuss food purchasing matters with. (Q4 and Q5)	Q4.Who do you talk to about food purchasing matters?	Tick list with already listed names	Name generator: exchange approach	0-30

		Q5. Are there any others that you talk to about this that are not listed yet?	Open text boxes	Name generator: exchange approach	
Variable (listed in the order measured)	**Definition**	**Question item**	**Answer scale**	**Question type**	**Theoretical range of scores**
Sustainability degree[1]	The sum of people participants indicated as being sustainable food shoppers. (Answer 2: Yes in Q6 and Q7)	Q6.Who in your social network purchases sustainable food products and who does not?	List of names and Answer options: No (1), Yes (2), Don't know (3)	Name generator: exchange approach	0-35
		Q7. Are there any other people that you know that buy sustainable food products? Is there anybody else in your network that does not buy any sustainable products that you have not listed?	Open text boxes and Answer options: 1) No 2) Yes 3) Don't know	Name generator: exchange approach	
Purchasing influence degree[1]	The sum of people participants indicated as influencing their food purchasing decisions.(Q8)	Q8. Who influences your food purchasing decisions? Please tick all that apply.	Tick list with already listed names	Name interpreter: exchange approach	0-35

Variable (listed in the order measured)	Definition	Question item	Answer scale	Question type	Theoretical range of scores
Closeness[3]	Mean network closeness levels of the participant (ego)-alter relationships as perceived by ego.	Q9. How close are you to people that you have mentioned?	Measured for all network members Answer options: 1- I don't feel close at all *to* 5- I feel very close	Name interpreter: affect approach	1-5
Social context diversity	The sum of all the different social contexts that participants know their network members from.	Q10.How do you know the people in your social network? E.g. family, friends...from school, leisure activities... other areas of your life.	Open text boxes behind list of alters. Answer given: 615 different answers were given. They were grouped into 25 categories (details in Appendix III)	Name interpreter: role relational approach	1-25
Relationship length[3]	Mean score showing average length of relationships within networks	How long have you known people for?	Measured for all network members Answer: Open text box	Name interpreter	0-78 yrs

Variable (listed in the order measured)	Definition	Question item	Answer scale	Question type	Theoretical range of scores
Density[2]	Measure of the density of relational connections (ties) in the network as perceived by the participant {Sum of network ties divided by [degree*(degree-1)/2]}	Which of your friends are likely to have contact with each other independent of you? Put an X for those connected.	Matrix of all the people mentioned by the participant	Name interpreter	Range: 0-1

[1]) Kadushin, 2011, [2]) Hanneman & Riddle, 2005; Lubbers et al., 2010; [3]) Lubbers et al., 2010

3.3. Results

3.3.1. Analyses: Parametric vs. non-parametric tests with Likert scales

Researchers are divided over whether Likert scales can be analysed using parametric tests or not. One group of researchers (e.g. Jamieson, 2004) argue that Likert scales are ordered categories and the intervals are not equal between the scales and thus non-parametric tests should be applied. Another group (e.g. Carifio & Perla, 2007; Norman, 2010) argue that although individual Likert scale items are ordinal, Likert scales consisting of several items can be classed as interval. These researchers further argue that if assumptions of normality are met and certain numbers of categories (above 5) are applied, then it is possible to use parametric testing (e.g. Lubke & Muthén, 2004). Some researchers even argue that parametric tests are actually robust enough even if assumptions of normality are violated (Norman, 2010). I have implemented a number of precautionary measures to ensure the robustness of my results. Psychological constructs measured in this research have at least three items (questions per psychological scale) with seven point answers scales which appear to be spaced out equally ensuring more variation and thus interval like data. The sets of items per psychological construct are combined to a mean score. If the sample size is large enough for mean scores like this then they will be normally distributed based on the central limit theorem (Howell, 1997). Before I used parametric tests I have tested underlying assumptions of the test I am using such as normality and homogeneity of variance. Where possible I have also used non-parametric tests to confirm the results of the parametric tests.

3.3.2. Testing Normality and Homogeneity of variance

Normality. A number of researchers have suggested that normality tests, if at all, should only be used in conjunction with visual checks of the data such as P-P plots or histograms (e.g. Zuur et al., 2010; Ghasemi & Zahediasl, 2012). Additionally they argue tests of normality will always be significant (thus reject the normality assumption) with a

big sample size and that even moderate deviations from normality can be handled by parametric tests such as regression analysis (Howell, 1997; Field, 2009).

I checked my data visually, with a histogram and P-P plot of the regression standardized residuals, and run two types of normality tests, one being the Shapiro Wilk test (in SPSS) and the other checking critical ratio scores in AMOS. Results of these normality tests can be found in Appendix IV. Visual checks of the regression standardized residuals histogram and P-P plots confirmed that the data appears relatively normally distributed. Although results of the Shapiro Wilk test showed that the dependent variable items (behaviour) are non-normally distributed showing a significant p-value for the test. This result was expected as other researchers have reported that with big sample sizes small variations of normality in the data will always lead to a rejection of normality in significance tests like the Shapiro Wilk test (Field, 2009).

The second normality test in AMOS (results in Appendix IV), checking critical ratio scores, again confirmed results of the visual checks that my data is relatively normally distributed up to a degree that parametric tests like regression analysis can handle. Kline (2011) suggests that if the critical ratio is below 8, which all scores fall well below, it is legitimate to proceed with them as they are. Having visually checked my data and run two tests of normality I am now satisfied that my data only varies slightly from normality, but not enough to merit any transformations or non-parametric testing. I am thus proceeding with my analysis as planned.

Homogeneity of variance. The assumption of homogeneity of variance or homoscedasticity, as it is called for regression analysis, was checked for by plotting the regression standardized residuals and expected values in a scatterplot (Appendix IV). Again this showed no extreme violations of the homogeneity of variance of the residuals thus I will carry on with my analyses as planned.

3.3.3. Validity and Reliability

Based on the fact that all psychological items and constructs have been validated in previous research and that the number of factors (constructs) are known a priori,

Confirmatory Factor Analysis (CFA), instead of Exploratory Factor Analysis, was performed in AMOS 20 (an add-on module for SPSS designed for structural equation modelling, path analysis, and covariance structure modelling) and SPSS to test the validity and reliability of psychological items and constructs. In SPSS Multiple Group Method (MGM), which is a simple type of CFA, was performed (Guttman, 1952; Nunnally, 1978; De Groot & Steg, 2008). In the MGM correlations between constructs and corresponding items are checked while correcting for the item self-correlation. The correction for the item self-correlation is done because items are always highest correlated if they are a component in the construct. Correlations above .5 are deemed to show a good/moderate fit and around .7 and above a strong fit with the construct (Rumsey, 2009). Items should of course load highest onto their corresponding constructs and not onto other constructs after correcting for self-correlations. Details of the MGM can be found in Appendix V. The MGM was run with parametric and non-parametric correlations.

3.3.4. Multiple Group Method (MGM) in SPSS

Results of the MGM (Appendix V) showed that four behaviour items showed weak convergent reliability. These items are; reduced packaging item 1 (.472), locally sourced food (reversed) item 2 (-.254), Sustainable fish/seafood (reversed) item 1 (-.165*), 'Free range', animal products (reversed) item 2 (.103**). These items are therefore removed from the behaviour scale leaving eight behaviour items.

Additionally, MGM results showed that most items correlate with other scales, showing some discriminant validity issues. This is not uncommon in self-report measures as they are likely to be related due to sharing a common measurement variance (Bagozzi & Kimmel 1995). Furthermore, most constructs measured explain intention and or behaviour as well as sometimes each other. For example personal norms partly get created through an involvement with our social environment and behaviour we experience as acceptable in others. Therefore personal, injunctive and descriptive norms are naturally correlated. However, this does not mean that they are the same as they measure different facets of normative influences (White et al., 2009). All items that correlated higher than .7 with another scale besides their own were considered to be too highly correlated with another scale.

MGM results show that most norm (personal, injunctive and descriptive) and all habit items correlate very highly with each other (≥.7) with other scales. This can be seen in the highlighted scores in Appendix III. There was no marked difference in results between the parametric and non-parametric analysis. The only difference between the analyses was that item-construct correlations could not be corrected for the self-correlation of the item with the construct as this is a parametric reliability test result.

To gain further insight into the overall fit of the measurement model CFA was applied in AMOS.

3.3.5. Dealing with missing data

On inspection of the missing data it was found that the behaviour items have 72 cases with some data missing due to the N/A answer option (details of the distribution of missing data can be found at the end of Appendix V). On closer inspection of the follow up open text questions for the N/A answers I found three main themes of answers; 1. Participants reported not liking or eating fish or seafood products (N Fish/seafood item 1 = 49 and N item 2 = 43) or animal products (N item 1 = 9, N item 2 = 17) for sustainable, dietary or other convictions (vegan/vegetarian/religion); 2. Participants reported that they did not know the Marine Stewardship Council sign indicating that fish/seafood is from sustainable sources (N = 4); 3. Participants reported not knowing what answer to choose (N = 6).

Unlike in SPSS were data is deleted listwise or pairwise, AMOS applies a procedure called the Full Information Maximum Likelihood (FIML, also known as "Raw Maximum Likelihood") to handle missing data. This procedure has been found to outperform most other common missing data handling methods, such as the ones applied in SPSS (Jöreskog & Sörbom, 1993). However, AMOS cannot handle missing data when running CFA with modification indices. Therefore missing data needs to be dealt with before running the CFA in AMOS.

Due to the fact that listwise deletion of missing data is not an acceptable method when the missing data exceeds 5% as in this case (72 cases = 14%) it was decided to remove some behaviour items from the analysis to avoid deleting such a large section of the sample (Roth, 1994). Firstly, the four behaviour items that showed a poor fit with

the behaviour construct variable were excluded. The items with the largest amount of missing data were both sustainable fish/seafood items although at this stage item 2 has already been excluded from the analysis due to poor fit. The other sustainable fish/seafood item (item 1) was hence also excluded from further analysis. To keep missing data to the minimum two further behaviour items were removed before the start of the CFA in AMOS to leave just single behaviour items for each purchasing behaviour (organic, fair-trade, local, reduced packaging, 'free range' or 'freedom food' animal products) measured. Organic item 2 and fair-trade item 1 were deleted based on both items having weaker item-construct fit. Therefore the initial measurement model includes one item for each of the five purchasing behaviours measured excluding any fish/seafood items.

All six intention items were included in the analyses. Although the intention items also had missing data (N = 56, 11%), with the biggest amount missing in the fish item (N = 53), I decided to leave this item in the analyses (details of missing data in Appendix V). This was done for two reasons; 1. The amount of missing data was not as large as with the behaviour items, and 2. I wanted to keep the complete spectrum of intention to compare this to the behaviour findings.

3.3.6. Confirmatory Factor Analysis in AMOS

To address discriminant and convergent reliability and validity issues a further CFA analysis was undertaken in AMOS. Convergent reliability scores were checked through the measurement model in AMOS. Additionally composite reliabilities (CR) and average variance extracted scores (AVE) were calculated with the formula proposed by Fornell and Larcker (1981) to check discriminant validity issues. CR values > 0.6 and AVE values > 0.5 were taken as acceptable (Fornell, 1982).

Appendix VI provides details of the initial measurement model and steps taken to achieve an improved model fit. Schreiber et al (2006) provide a summary of cut off criteria for fit indexes CFA results (Table is reproduced in Appendix VI). The following guidelines for fit indexes were applied; $\chi 2$ = ratio of $\chi 2$ to df ≤ 2 or 3; Root mean square approximation (RMSA) < 0.06 to 0.08; Standardized root mean square (SMRS) ≤ 0.08; Comparative fit index (CFI) ≥ 0.95 for acceptance.

The initial model, including 5 behaviour items and all items for the psychological predictor variables, showed a relatively poor fit: $\chi 2$ (231) = 834.88, $p < 0.001$, $\chi 2/df$ = 3.61, RMSEA= 0.07, SRMR = 0.05, CFI = 0.94.

To improve the model fit the Multiple Group Method Table and non-parametric correlation matrix (Appendix V) and Modification Indices (MI, produced in AMOS) were consulted simultaneously. Modification Indices can be conceptualised as *χ2* with one degree of freedom where the MI value corresponds with the drop in overall *χ2* should the parameter be freely estimated in the next model run (Byrne, 2013). However, one should not solely rely on MI statistics to make modifications to the model but model changes should be based on additional statistics as well as theoretical knowledge (Byrne, 2013). According to Byrne (2013) there is no clear guideline how to use the MIs but if items or residuals cross load highly onto other residuals, items or constructs then there are problems of discriminant validity with these items. Therefore the best way of dealing with items causing discriminant validity issues is to delete these items. To identify such issues MIs (Appendix VI) and parametric correlation Tables (Appendix V) were consulted. The process is an iterative one and is detailed in Appendix VI.

The final model, included the same behaviour items as the initial measurement model and a reduced set of items for all predictor scales besides attitude, descriptive norm (DN) and perceived behavioural control (PBC) (details in Table 3.3.), showed acceptable fit statistics: $\chi 2$ (149)= 462.45, $p < 0.001$, $\chi 2/df$ = 3.10, RMSEA = 0.07, SRMR = 0.05, CFI = 0.96.

Table 3.3. Standardized regression weights (Beta), composite reliabilities (CR) and average variance extracted (AVE) for measurement model

Psychological constructs	**Items**	**Beta**	**CR**	**AVE**
Behaviour	Behaviour_Fair_1.1	0.79	0.85	0.53
(5/12 items originally measured)	Behaviour_Organic_2.2	0.78		
	Behaviour_Packaging_3.2	0.63		
	Behaviour_Local_4.1	0.77		
	Behaviour_Free_6.1	0.66		
Intention (5/5)	Int1_Organic	0.69	0.93	0.68
	Int2_Fairtrade	0.85		
	Int3_Reduced packaging	0.86		
	Int4_ Local produce	0.75		

	Int5_Sustainable fish	0.90		
Attitude (3/3)	Attitude_1	0.81	0.91	0.77
	Attitude_2	0.94		
	Attitude_3	0.88		
Habit (2/4)	Habit_2	0.88	0.93	0.81
	Habit_4	0.89		
Descriptive norm (3/3)	DN_1	0.85	0.88	0.72
	DN_2	0.80		
	DN_3	0.89		
Personal norm (2/3)	PN_1	0.88	0.87	0.68
	PN_2	0.77		
Perceived behavioural control	PBC_1	0.78	0.85	0.65
(3/3)	PBC_2	0.78		
	PBC_3	0.86		
Injunctive norm	IN_1	0.91	0.90	0.82
(2/3)	IN_3	0.90		

Table 3.3. shows standardised regression weights (Beta), composite reliabilities (CR) and average variance extracted (AVE) with scores being above the acceptable values of 0.60 (CR) and 0.50 (AVE) (Fornell, 1982).

The final model, however, showed some discriminant validity issues between the behaviour and habit scale with habit (0.74) showing a higher squared correlation than the AVE score for behaviour (0.73) as can be seen in Table 3.4. The reason for this high correlation could be that if habits are strong, behaviour could be highly regular and subconscious thus showing a high correlation between habits and behaviour. Since the fit of the rest of the model is acceptable and being mindful of the danger of over fitting the model by deleting further items (Byrne, 2013), I have decided to continue my analysis with the items and constructs as they are in this final model for behaviour as the dependent variable.

Table 3.4. Discriminant validity of measurement model with AVE (bold scores in diagonal line) and squared correlations scores

	Behaviour	Intent	Attitude	Habit	DN	PN	PBC	IN
Behaviour	**0.73**							
Intention (Intent)	0.70	**0.83**						
Attitude	0.64	0.67	**0.88**					
Habit	0.74	0.64	0.61	**0.90**				
Descriptive norm (DN)	0.71	0.62	0.60	0.81	**0.85**			
Personal norm (PN)	0.71	0.76	0.74	0.82	0.79	**0.83**		
Perceived behavioural control (PBC)	0.67	0.63	0.60	0.76	0.73	0.74	**0.81**	
Injunctive norm (IN)	0.66	0.56	0.54	0.84	0.84	0.82	0.67	**0.90**

Highlighted scores indicate non-optimal discrimination between habit and behaviour.

3.3.7. Explaining current sustainable food purchasing behaviour with social network characteristics and psychological predictors

The hypotheses aimed to assess relationships between social network characteristics, psychological factors and sustainable food purchasing behaviour. To explore these relationships, I applied structural equation modelling (SEM) in AMOS 20. All variables were standardized for the SEM.

Figure 3.2. shows the model of the final theoretical framework excluding the non-significant relationships. The overall fit is deemed acceptable due to the complexity of the model (Hu & Bentler, 1999), $\chi^2 = 209.07$, $df = 40$, $p < 0.001$, CFI = 0.94, TLI = .875, IFI=0.943, SRMR = 0.06 $p < 0.001$. Similar model fit statistics are found in the meta-analysis by Klöckner (2013). All displayed β-coefficients were significant at the $p < 0.05$ level.

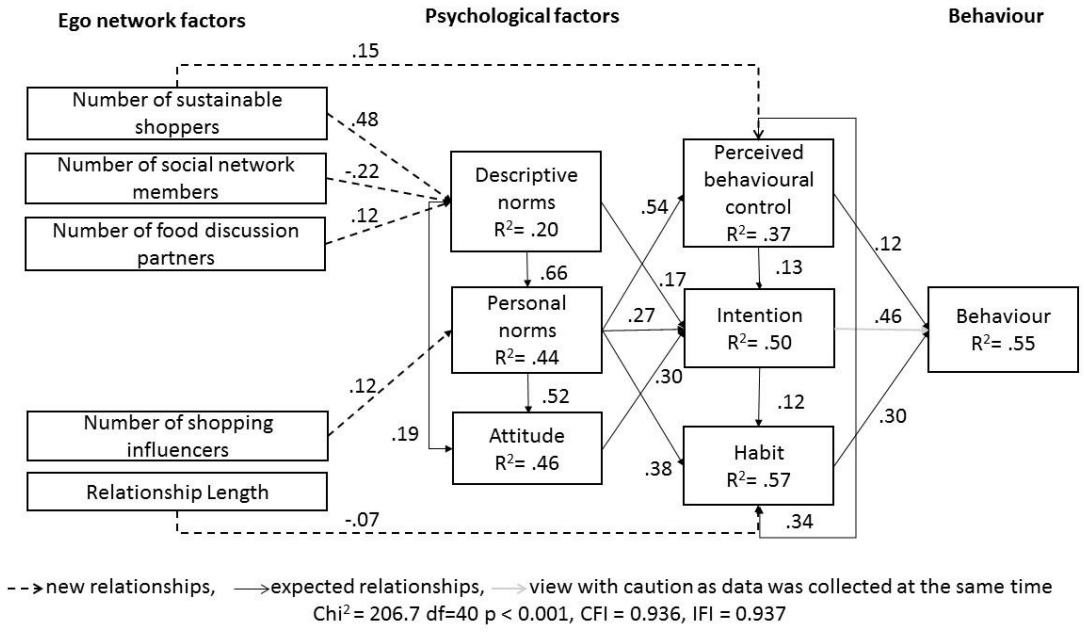

Figure 3.2. Full theoretical framework modelled using structural equal modelling. Notes: Correlated exogenous variables were specified to covary. These were: number of sustainable shoppers (i.e. sustainability degree), number of social network members (i.e. degree), number of food discussion partners (i.e. food discussion degree) and number network members directly influencing food shopping decisions(i.e. purchasing influence degree). Figure shows standardized regression weights on the lines (i.e. Beta weights) and explained variance (R^2) in the boxes in the dependent variables. The relationship between intention and behaviour should be viewed with caution as future intentions were measured at the same time as self-reported behaviour (i.e. past).

From the ten hypotheses included in this study six were supported and four unsupported by the results. The relationship between degree (i.e. the number of network members) and sustainable food purchasing behaviour was mediated through descriptive norms thus supporting hypothesis 1. Results showed that the smaller the social network the larger the descriptive norms to shop sustainably (β = - 0.22, p < 0.001).

The relationship between sustainability degree (i.e. the number of sustainable shoppers in the network) and sustainable food shopping purchasing behaviour was mediated through descriptive norms. Results showed that the more sustainable shoppers participants had in their social networks the higher their descriptive norms (β = 0.48, p < 0.001) supporting hypothesis 2.

Furthermore, the relationship between the number of food discussion partners within the social network (i.e. food discussion degree) and sustainable food purchasing behaviour was mediated by descriptive norms: the more network members a person discusses food matters with (food discussion degree) the larger the descriptive norm (β = 0.12, p < 0.05). These findings supported hypothesis 3.

Hypothesis 4, on the other hand was not supported as the number of food consumption partners (i.e. the number of network members a person consumes food with or cooks for) was not significantly related to descriptive norms (β = -0.07, p = 0.10).

No significant relationship between descriptive norms and emotional closeness (β = -0.45, p = 0.28, hypothesis 5), social context diversity (β = 0.27, p = 0.51, hypothesis 6) and density (β = -0.16, p = 0.69, hypothesis 7) were found and thus not supporting their respective hypotheses. These hypothesized relationships were therefore excluded from the final reported SEM (Figure 3.2.).

In total three social network characteristics out of the seven hypothesized had a relationship with descriptive norms (i.e. degree, sustainability degree and food discussion degree) and explained a total variance of 20 % in the descriptive norms scores.

Furthermore, there was a positive relationship between the number of shopping influencers in the network (i.e. the number of people directly influencing ego's shopping decisions) and personal norms, showing that the relationship between the number of people directly influencing a person's sustainable food purchasing decisions and their sustainable food purchasing behaviour was mediated by personal norms. Results showed that the larger the number of people that directly influenced a person's shopping decisions the higher ego's personal norm to buy sustainable food (β = 0.12, p < 0.001), supporting hypothesis 8. A total of 44% of personal norms was explained by one further factor, descriptive norms (β = 0.66, p < 0.001) in addition to the number of shopping influencers in the network.

The relationship between sustainability degree (i.e. the number of sustainable shoppers in the network) and sustainable food shopping purchasing behaviour was further mediated perceived behavioural control (in addition to descriptive norms, supported hypothesis 2). Results showed that the more sustainable shoppers participants had in their social networks the higher their perceived behavioural control (β = 0.15, p < 0.001), supporting hypothesis 9. One additional factor had a positive relationship with perceived behavioural control, personal norms and together they

explained a total variance of 37% in perceived behavioural control. As personal norms ($\beta = 0.54$, $p < 0.001$) towards sustainable food purchasing increased so did the perceived behavioural control (i.e. the feeling of being able to perform the behaviour).

Finally, a negative relationship was found between the length of the relationship within the ego-network and habit, showing that the relationship between relationship length and sustainable food purchasing behaviour is mediated by habit. Results showed that the shorter the relationship length in the network (i.e. the newer the relationships) the more likely it was that a person habitually shopped sustainably ($\beta = - 0.07$, $p < 0.05$), therefore supporting hypothesis 10. A total of 57% of sustainable purchasing habits were explained by relationship length in the network and two further factors; perceived behavioural control ($\beta = 0.34$, $p < 0.05$) and intention ($\beta = 0.12$, $p < 0.05$).

The relationships between the psychological factors were modelled based on relationships established in previous empirical research and where found to be mainly in line with previous research (e.g. Klöckner, 2013; Terry, Hogg & McKimmie, 2000). As the focus of this article is on the mediated relationship of social network characteristics with sustainable food purchasing behaviour via psychological factors, the relationships between psychological factors will not be discussed in details. However, I would like to point out that the relationship between personal norms and perceived behavioural control appeared stronger when modelled in the direction of personal norms affecting perceived behaviour control and was therefore drawn in this direction in the SEM. Furthermore, I would like to point out that I did not find a relationship between injunctive norms and intention ($\beta = 0.02$, $p = 0.59$) and therefore excluded it from the SEM.

3.4. Discussion

The current study looked at the relationship between nine social network characteristics and psychological factors with sustainable food purchasing behaviour. Results revealed a strong relationship of social network factors with antecedent factors of sustainable behaviour, hereby indicating that social network factors are important for understanding the underlying mechanisms that guide sustainable consumer behaviour.

In particular, three social network characteristics seem to most strongly affect sustainable purchasing behaviours via descriptive norms, i.e. the number of sustainable shoppers within one's network, the overall network size, and the number of people in one's network discussing food-related issues. The larger the number of sustainable shoppers in a network the stronger a person's descriptive norm, and, the larger the personal networks, the weaker a person's perception that sustainable food shopping is the norm within their social network. Both results are in line with Social Identity Theory (Tajfel & Turner, 1979; 2004) and its extension, Self-Categorization Theory (Turner et al., 1987). That is, group norms (descriptive norms) are perceived strongly if a large group of people (in the social network) performs sustainable shopping behaviours. However, if the social network is large and there is a variation in sustainable and non-sustainable shopping behaviour then there appears to be a cut-off point at which descriptive norms are not perceived as clear anymore. Other researchers have found similar results that increased network size can lead to a decrease in diffusion of behaviour (e.g. Lamberson, 2010; Siegel, 2009).

The third factor that showed to have a relationship with descriptive norm was the number of food discussion network members, indicating that the more network members talk about food matters, the higher their descriptive norm in relation to sustainable food purchasing. This finding supports the notion of homophilic tendencies within groups as it seems to reveal that people with similar interests, values and opinions are more likely to interact with each other (Lazarsfeld, & Merton, 1954). It further suggests that if people talk about food matters then they can make conscious decisions about their food choices which can lead to an increase in sustainable behaviour.

Although descriptive norms do not directly influence sustainable food purchasing behaviour the findings of how descriptive norms are formed are important as they are antecedent factors of intentions (the strongest predictor of behaviour) as well as

personal norms. Indeed, in line with this assumption and Klöckner's meta-analysis (2013), the model shows that descriptive norms are especially affecting sustainable shopping behaviours through their personal norms. However, another factor that explained personal norms, besides descriptive norms, was the number of people that directly influenced a person's food shopping decisions (i.e. food purchasing degree). The findings showed that the more people had a say about the shopping decisions (e.g. people sharing a household) the more likely it was that the shopper developed a strong personal norm towards sustainable food shopping behaviour. In other words, the stronger the shoppers moral and personal conviction that buying sustainable food was necessary and important. These findings seem to suggest that a person that shares responsibility in making shopping decisions, possibly as part of a family or as a carer for others, might feel more responsible about the wellbeing of those others. This concern for the wellbeing of others might be expressed through choosing products that might be healthier for those they shop for (e.g. organic) or the planet (e.g. buying products that are local, less packaged, organic or animal friendly). These findings are supported by research showing that having a baby or small children increases the sustainable food purchasing of the family (Schäfer, Herde, & Kropp, 2010).

In addition to showing a relationship with norms (descriptive and personal), social network factors related to two further psychological predictors of sustainable food purchasing behaviour. Firstly, the number of sustainable food shoppers in the network affected perceived behavioural control, a direct predictor of sustainable food purchasing behaviour. The number of sustainable food shoppers positively related to perceived behavioural control, thus indicating that the larger the number of sustainable shoppers in a person's network the more people perceived themselves as being able to perform sustainable food shopping behaviours (i.e. perceived behavioural control). Therefore, seeing other people being able to shop sustainable food, maybe in the same area or on a similar budget, increases a person's perceived behavioural control, as suggested by Bandura's Social Learning Theory (1977) where behaviour is theorized to be learned through observing and imitating others who perform the behaviour.

Surprisingly, the second social network factor, relationship length in the social network, showed a negative relationship with the second strongest predictor of sustainable food purchasing behaviour, habit. The shorter the average relationship lengths within the network the stronger the sustainable habits. Although the result is explorative in nature, a potential explanation could be as new relationships develop in a person's life, which

could be due to life changes such as changing job, moving house or starting a family, these might open windows of change for habit changes (Verplanken & Wood, 2006; Wood, Tam & Witt, 2005). Additionally, new relationships might develop based on homophilic tendencies (i.e. people with similar attitudes and behaviours being attracted to each other and forming relationships) and thus strengthening the sustainable food purchasing habits. However, it is important to point out that relationship length was the least strong factor in explaining habit and the results are based on cross-sectional data which means no causal inferences can be drawn. Future research should examine the nature of this relationship in more depth.

My research questions 1-6 aimed to explore the nature of the relationships between the social network factors; network closeness, density, social context diversity and the number of people a person eats and cooks with (food consumption degree) and sustainable food purchasing behaviour and intention. None of these four social network factors showed to have a significant relationship with behaviour and its antecedent factors, hereby providing no support for theories and empirical evidence as suggested in the introduction. However, this is the first study that has ever explored such relationships between social network factors, sustainable food purchasing behaviour and its psychological predictor variables. Furthermore, the nature of the study was explorative, therefore no definitive conclusions can be drawn. However, some alternative explanations for the non-significant findings could be further examined in future studies.

First, relationships between some of the social network factors and sustainable food purchasing behaviour could be non-linear, which has not been tested in the present study. For example, the relationship between network closeness and behaviour (and its antecedent factors) could be curvilinear rather than linear. If people feel moderately close to others in their network, they might be more likely to change their behaviour towards that of their friends (such as sustainable behaviour) compared to if they feel a low or high closeness level as the first may feel stronger pressure of having to fit in with the in-group than those not close or very close to their network members. A similar curvilinear relationship between popularity levels and online purchase decisions has been found were moderately popular friends were more likely to be influenced by their friends shopping decisions than those at the lower and higher spectrum end of popularity (Iyengar, Han & Gupta, 2009). The next chapter explores whether non-linear relationships are present by investigating social network profiles.

Second, previous research into Word of Mouth marketing had found that diversity of networks positively influenced message spread because people heard the message from different sides in the network (Groeger & Buttle, 2014). This was suggested to lead to increased uptake of behaviour. I had hypothesised that if people have high social context diversity (i.e. increased diversity of social contexts) and high density (i.e. high numbers of ties between network people) then this could lead to increased sustainable food purchasing behaviour and intention due to an increased chance of hearing about sustainable products in the social network. However, there was no significant relationship between social context diversity, density and behaviour and intention. A reason for this could be that, since network members could still vary in their sustainable behaviour, the chance that people heard about sustainable products from different sides was maybe smaller than theorised and thus network density and diversity of social contexts played no role in this.

Finally, regarding the insignificant relationship between food consumption degree (i.e. the number of people a person eats or cooks with from their network) and sustainable food purchasing behaviour and its antecedent factors, it is possible that conversations over cooking or eating food are not focussed on food shopping or sustainable issues but revolve around other topics. If these conversations cover a much wider spectrum of topics it is likely that they would not be sufficient to influence a specific behaviour such as sustainable food purchasing or its antecedent factors in a significant way. Indeed it is likely that conversation at mealtimes revolve around a whole host of topics such as daily occurrences and the transmission of cultural norms and values in families with children (e.g. Aukrust & Snow, 1998) or that meaningful conversations might be limited or non-existent due to the television being on during mealtimes (e.g. Contento, Williams, Michela & Franklin, 2006; Wansink & Kleef, 2014).

Collecting ego network data has some strong advantages over sampling whole networks as discussed in the introduction. However, a potential limitation is that data gathered about a network is only perceived by one person, namely the ‘ego’. The ego could perceive their social network quite different from how other people think about the subject, what other people actually do (e.g. are they sustainable shoppers or not), and how these people within the networks are linked. However, psychologists have long established that everyone perceives the world through their own filters and no two people perceive it the same, therefore ego’s perceptions are just as likely to influence their actual attitudes, perceived behavioural control and behaviour. Thus, studying the effect of social network characteristics from ego’s perspective might be the best

approach to understanding the influence such factors have on the person rather than any 'objective' measures.

The findings of this study could have important practical implications. Firstly, as the number of sustainable shoppers within a network affects both norms and perceived behavioural control, any interventions aiming to increase sustainable shopping behaviour through social networks should focus on bottom-up approaches. A bottom-up approach would entail changing behaviour one network at a time rather than on a larger scale because people within social networks are more likely to take on in-group norms and behaviour to distinguish themselves from out-groups (e.g. Social Identity Theory, Tajfel & Turner 1979, 2004). Secondly, people targeted within their social network are likely to feel more able to perform sustainable consumer behaviours if they can observe others in their social network performing such behaviours (Social Learning Theory, Bandura, 1977). Furthermore, since network size negatively influences behaviour via descriptive norms, focussing interventions on small social network groups compared to large network of groups will aid the spread of behaviour (e.g. Lamberson, 2010; Siegel, 2009). Thirdly, finding ways to introduce more food discussions in social networks might offer a way forward to change sustainable consumption behaviour in social networks. Finally, homophily, the tendency of similar people to interact and bond, could provide a good foundation for social influence and therefore enhance the uptake of sustainable behaviour as suggested by Centola (2011).

Since this study is based on cross-sectional data, meaning no causality can be drawn and only a measure of self-reported sustainable consumption behaviour was collected, I will investigate the influence of social network factors on actual sustainable consumption behaviour in an experimental setting. The experimental set up of the study will allow me to investigate the influence of social networks on actual sustainable consumption behaviour. Additionally, I am aiming to shed further light onto the discussion about homophily or social influence with the experiment. The debate in social network research focusses on whether people influence each other or are drawn together because of similar demographics, attitudes and values (i.e. homophily, the tendency to associate yourself or bond with similar others, Lazarsfeld, & Merton, 1954) which leads to a display of similar behaviour (for reviews see McPherson et al., 2001 or Huston & Levinger, 1987). To disentangle the direction of the relationships between social network factors and behaviour it is necessary to explore these factors in an experiment, which is reported in chapter 5 of this thesis.

3.5. References

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Chapter 4: Sustainable shoppers' social network profiles

Chapter abstract

Previous research has shown that individuals' sustainable food shopping behaviour is influenced by their social networks. Such external factors are often omitted in sustainable food consumer research as this information is difficult to collect. Therefore, this study extends previous research through profiling consumer's social networks. Online survey data from 460 UK participants, detailing information about ego-network factors, psychological predictors and sustainable food shopping behaviour, was analysed for three consumer segments (high, medium and low sustainable consumers). ANOVA findings revealed that the consumers in the three segments varied significantly in their current sustainable food purchasing, intentions and perceived ability to purchase sustainable food. In addition, through structural equation modelling, a previously tested model of sustainable food purchasing behaviour, including social network characteristics and psychological factors was validated for the high, medium and low sustainable food consumer segments. Different social marketing and intervention strategies to increase the uptake of sustainable food purchasing behaviour for each segment are discussed based on the findings.

4.1. Introduction

Sustainable consumption is seen as a requirement to help address world-wide challenges of environmental degradation and poverty (Thoresen, 2008). The European Commission, among other international and national policy driving institutions, implemented 'the Sustainable Consumption and Sustainable Industrial Policy (SCP/SIP) Action Plan' in 2008, which includes proposals on strategies to increase the demand for sustainable products (Council of the European Union, 2008). The Oslo Symposium defined sustainable consumption as "the use of services and related products which respond to basic needs and bring a better quality of life while minimizing the use of natural resources and toxic materials as well as emissions of waste and pollutants over the life cycle of the service or product so as not to jeopardize

the needs of future generations." (p. 3; Ministry of Environment Norway, 1994). Food consumption is responsible for 20-30 % of anthropogenic greenhouse gas (GHG) emission and up to 70% of human water consumption (Smith et al., 2014; Vermeulen et al., 2012). Sustainable food consumption is therefore one of the main components of sustainable consumption.

One way that sustainable consumption could be achieved would be for consumers to make more sustainable choices, by purchasing products that are associated with lower environmental impact, that protect human rights and that foster well-being in communities (Thoresen, 2008). Although there is a trend of increasing sustainable consumption, research shows that despite the majority of consumers being aware and in favour of purchasing sustainable products, only a small number actually do so (European Commission, 2011). One reason for this gap may be because policies, social marketing and intervention strategies designed to change consumer behaviour don't sufficiently take into account that consumers experience different barriers or opportunities (Verplanken & Roy, 2016) and are likely to be at different stages of change (Bamberg, 2013). Therefore various research has attempted to profile consumers into different segments to encourage sustainable food purchasing (Gunter & Furnham, 2014). For example, consumers have been profiled based on demographics and socioeconomic status (e.g. Roberts, 1996; Verbeke, 2015), consumer or brand attitudes (e.g. Roberts, 1996; Verbeke, 2015; Zarantonello & Schmitt, 2010), and psychographics, which include life stages, lifestyles, personality or opinions (e.g. Aslihan Nasir & Karakaya, 2014; Gunter & Furnham, 2014). Consumer research tends to focus on these individual characteristics when profiling shoppers, however it tends to neglect external influencing factors such as the influence of people's social networks (partners, family, friends, neighbours, colleagues etc.). Researchers have pointed out that including social network factors could yield greater understanding of consumer behaviour through, for example, improved profiling (e.g. Axsen, Orlebar & Skippon, 2013; Gorlin & Dhar, 2012; Simpson, Griskevicius & Rothman, 2012; Wood & Hayes, 2012).

Indeed, improving consumer profiling by including social network factors seems to be a promising research avenue as research into sustainable food consumption behaviour has found that people are not only affected by psychological characteristics but they are also influenced by their social networks when making sustainable food purchasing decisions (Salazar, Oerlemans, & van Stroe-Biezen, 2013; Schubert, de Groot, et al., 2015; Schubert, Newton, de Groot, 2015). Indeed, social networks have been found to affect sustainable food consumption behaviour via psychological characteristics such

as norms, habits and perceived behavioural control (Schubert, de Groot, et al., 2015; Schubert, Newton, de Groot, 2015), and attitude or opinions (Salazar et al., 2013).

Empirical studies into sustainable food consumer behaviour, including social network characteristics is limited and only a small number of studies has focused on social networks in relation to sustainable food consumer behaviour (i.e. Salazar et al., 2013; Schubert, de Groot, et al., 2015; Schubert, Newton, de Groot, 2015). Salazar et al. (2013) found that people were more likely to choose a sustainable product when they knew how many of their peers had chosen such a product, or how positively they rated it. In addition, people that had received prior knowledge about sustainable products from their social network (e.g. friends and family) were more likely to choose a sustainable product compared to those that had been introduced to sustainable products via information campaigns.

Furthermore, Schubert, de Groot, et al. (2015) found five social network characteristics (and six relationships) that provided the basis for understanding sustainable consumer behaviour, via four psychological consumer characteristics (i.e. habits, perceived behavioural control, descriptive and personal norms, relationships are displayed in Figure 4.1.) The five social network characteristics that had a mediated relationship with sustainable food purchasing behaviour via the psychological consumer characteristics were, the number of sustainable shoppers, the number of social network members, the number of food discussion partners, the number of shopping influencers and the average relationship length within a network (i.e. newer or more established friendships or relationships).

Schubert, de Groot et al. (2015) found that three social network characteristics affected sustainable purchasing behaviours via descriptive norms. These three characteristics were the number of sustainable shoppers within one's network (i.e. sustainability degree), network size (i.e. degree), and the number of people in one's network discussing food-related issues (i.e. food discussion degree). They found that the larger the number of sustainable shoppers in a network the stronger a person's descriptive norm, and, the larger the personal networks, the weaker a person's perception that sustainable food shopping is the norm within their social network. These results were in line with Social Identity Theory (Tajfel & Turner, 1979; 2004) and Self-Categorization Theory (Turner et al., 1987) showing that descriptive norms appear clearer when more people perform the target behaviour and when group sizes are smaller (leading to less diversity in behaviour). Similar results were found in other research showing that increased network size can lead to a decrease in diffusion of behaviour (e.g.

Lamberson, 2010; Siegel, 2009). Additionally, the number of network members discussing food issues (i.e. food discussion degree) was also related to descriptive norms, indicating that the more network members talk about food matters, the higher their descriptive norm in relation to sustainable food purchasing. Schubert, de Groot et al. (2015) had suggested that this finding supported the notion of homophilic tendencies within groups as it seems to reveal that people with similar interests, values and opinions are more likely to interact with each other (Lazarsfeld, & Merton, 1954) and strengthening their descriptive norms.

As depicted in Figure 4.1. personal norms mediated the relationship between other antecedents of sustainable food purchasing behaviour (i.e. intention, habits and perceived behavioural control) and the number of people directly influencing food purchasing decisions. The more people had a say about the shopping decisions (e.g. people sharing a household) the more likely it was that the shopper developed a strong personal norm towards sustainable food shopping behaviour (i.e. feeling morally obliged to purchase sustainable food). Other research has shown that having children increases the sustainable food purchasing of a family (Schäfer, Herde, & Kropp, 2010) thus indicating that this caring responsibility and concern for the wellbeing of others could be expressed through an increase in products that might be either healthier (e.g. organic) or better for the planet (e.g. buying products that are local, less packaged, organic or animal friendly).

The fifth mediated relationship between sustainable food purchasing and a social network characteristic was between relationship lengths in the social network and habits. This relationship was negative indicating that the shorter the average relationship lengths within the network the stronger the sustainable habits. Although this relationship is not fully understood at this point, it is worth exploring further. One suggestion put forward by Schubert, de Groot et al. (2015) was that new relationships might have developed in a person's life due to life changes such as changing job, moving house or starting a family, which have opened windows of habit change (Verplanken & Wood, 2006; Wood, Tam & Witt, 2005). Another suggestion was that these new relationships could have developed due to homophilic tendencies (i.e. similar people in attitude and behaviour being attracted to each other and forming relationships) which would lead to a strengthening of behaviour and thus lead to stronger sustainable food purchasing habits.

Finally, the number of sustainable food shoppers in the network (i.e. sustainability degree) was also related to perceived behavioural control (in addition to descriptive

norms). The number of sustainable food shoppers positively related to perceived behavioural control, thus indicating that the larger the number of sustainable shoppers in a person's network the more people perceived themselves as being able to perform sustainable food shopping behaviours (i.e. perceived behavioural control). Schubert, de Groot et al. (2015) had suggested that this relationship was most likely an indication that seeing other people successfully performing a behaviour such as purchasing sustainable food (in the same area or on a similar budget) was likely to increases a person's perceived behavioural control. This mechanisms was called vicarious learning (Bandura, 1977) and described how behaviour is theorized to be learned through observing and imitating others who perform the behaviour.

The relationships between social network characteristics, psychological factors and sustainable food purchasing, depicted in Figure 4.1., form the basis of this current study. These relationships will be explored in different sustainable consumer segments. The aim of this is firstly to test how well the model developed by Schubert, de Groot et al. (2015) is able to explain sustainable food purchasing through psychological and social network characteristics in different sustainable behaviour segments (i.e. high, medium and low sustainable shoppers). Secondly, based on the findings for the different behaviour segments, tailored intervention strategies can be suggest for the three behaviour segments.

Specifically, this research aimed to address the following question:

How do sustainable and non-sustainable shoppers differ in terms of their psychological and social network characteristics?

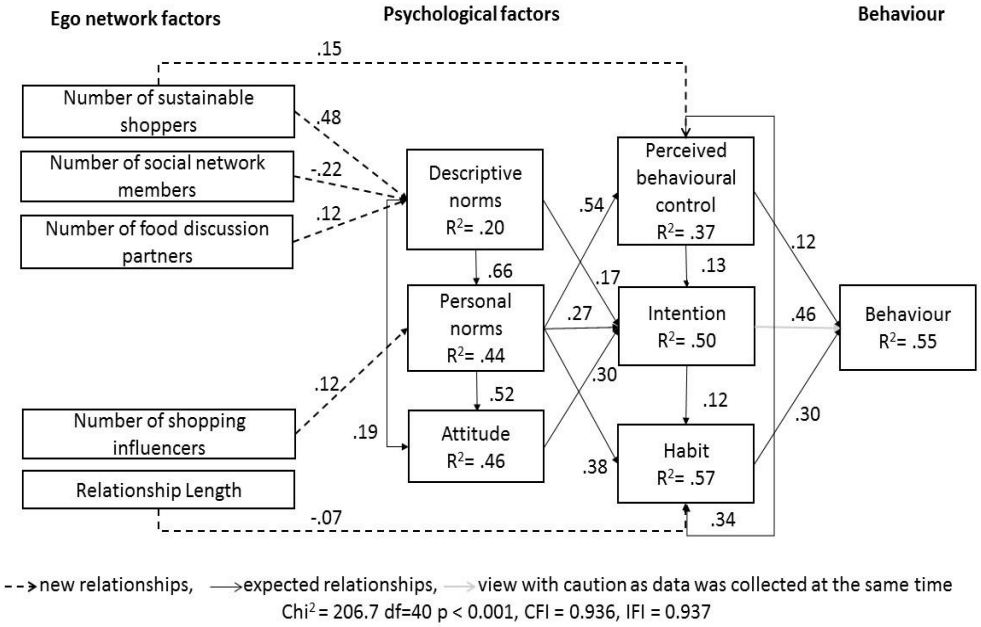

Figure 4.1. Theoretical framework modelled using structural equal modelling (from Chapter 3)

Notes: Correlated exogenous variables were specified to covary. These were: Number of sustainable shoppers, number of social network members, number of food discussion partners and number of shopping influencers. Figure shows standardized regression weights (Beta weights) and explained variance (R^2) in the dependent variables. The relationship between intention and behaviour should be viewed with caution as future intentions were measured at the same time as self-reported behaviour (i.e. past).

4.2. Method

4.2.1. Participants and Procedure

The sample consisted of 507 participants, recruited via a loyalty programme (Maximiles, http://www.maximiles.co.uk/). Participants were given vouchers for shops and points to spend online for filling in the survey. The survey took approximately 20-30 min to complete. The survey was intended for adults who shop for food most of the time in their household. The final sample consisted of 460 participants after missing

data was dealt with (details described in Schubert, de Groot, et al., 2015, in thesis Chapter 3).

The final participant sample included 43% male and 57% female participants with a mean age of 48.7 years (SD = 13.9, ranging from 19-78), with a wide range of political views and ethnic backgrounds. The sample was slightly higher educated than the average UK population with 36.1% of the sample reported having a university degree, 19.1% had finished their A-levels or equivalent and 23.3% GCSE/O-level or equivalent (National Office for Statistics, 2011 census data). Most participants had a full-time job (33.5%) or were part-time employees (14.1%), while 24.1% were retired and 7% unemployed. Therefore, the sample shows variation in relevant socio-demographics and is regarded as broadly representative for the adult UK population in relation to food shopping behaviour (National Office for Statistics, 2011 census data).

4.2.2. Survey design and variables

The sample consisted of 507 participants, recruited via a loyalty programme (Maximiles, http://www.maximiles.co.uk/). Participants were given vouchers for shops and points to spend online for filling in the survey. The survey took approximately 20-30 min to complete. The survey was intended for adults who shop for food most of the time in their household. The final sample consisted of 460 participants after missing data was dealt with (details described in Schubert, de Groot, et al., 2015, in thesis Chapter 3).

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4.3.2. Survey design and variables

The survey data was collected online via Qualtrics (http://www.qualtrics.com/) and consisted of three parts. Social network characteristics were collected in part one. Part two measured sustainable food purchasing behaviour. Part three measured socio-demographics to assess the representativeness of the sample compared to the UK population.

Dependent variable: Sustainable food shopping behaviour

Sustainable food purchasing behaviour was measured for six behaviours. Specifically the purchasing behaviour of food products was measured for each of the following categories; organic, fair-trade, local produce, with little or no packing, fish and/or seafood from sustainable sources (e.g. with the Marine Stewardship Council (MSC) sign), animal products that are free range or freedom food.

For the purpose of the study a brief definition of 'sustainable food purchasing' and 'sustainable food products' was provided:

'Sustainable food purchasing refers to items with labels such as 'organic', 'fair trade', or 'locally sourced', and/or those items with little or no packaging. Additionally this means selecting fish and seafood from sustainable sources (e.g. with the Marine Stewardship Council (MSC) logo), and/or animal products that are labelled as 'free range', 'freedom foods', or similar.'

This definition was given before and during the survey when questions referred to sustainable food purchasing or sustainable food products.

Sustainable food purchasing behaviour was measured with 12 items (two per food category). The question asked participants to rate how often they buy e.g. fair-trade products on a 7-point Likert scale (Alwin, 1997) from 'never' to 'always'. Each set of questionnaire items for behaviour was computer randomized to avoid order effects. For the analysis the behaviour scores were included in two different ways. Firstly a composite score of the six food categories as compiled in the previous chapter (Chapter 3), was included. For the composite sustainable purchasing behaviour score, only one item for each food category excluding any fish and seafood items were included as confirmatory factor analysis via SEM showed stronger construct validity

with the exclusion of these items from the measurement model (details of this analysis are given in Chapter 3). The sustainable purchasing behaviour construct was created by taking the mean of all five questionnaire items included in the analyses (Chronbach's alpha = 0.84, *M* = 4.36, *SD* = 1.00). Secondly the five sustainable food purchasing behaviour items were also included separately, e.g. organic (*M* = 4.02, *SD* = 1.35), fair-trade (*M* = 4.13, *SD* = 1.35), local produce (*M* = 4.44, *SD* = 1.18), with little or no packing (*M* = 4.41, *SD* = 1.10), animal products that are free range or freedom food (*M* = 4.80, *SD* = 1.42) to explore the sustainable purchasing behaviour in more details. For this exploration I also included one fish and/or seafood item (*M* = 4.13, *SD* = 1.67).

Independent variables

The psychological and social network variables that showed to have a direct or mediated relationship with sustainable food purchasing behaviour (as found in the previous chapter (Chapter 3) were included). The psychological variables were intentions, habit, perceived behavioural control, attitudes, personal- and descriptive norms. The social network variables were network size (i.e. degree) and subgroup sizes (i.e. sustainable shoppers (i.e. sustainability degree), food discussion (i.e. food discussion degree) and purchasing influencers (i.e. purchasing influence degree)) and relationship length. Details of all variables included can be found in Chapter 3 in the method section.

4.3. Results

4.3.1. Analyses

To answer the research question I applied an Analysis of Variance (ANOVA) with Bonferroni post-hoc tests, to examine whether the sustainable food behaviour segments were significantly different in their purchasing behaviour, intentions and perceived behavioural control. Additionally, I further applied three structural equation analyses to test how well the model of sustainable food purchasing behaviour, explained by social network characteristics and psychological factors (from the Chapter 3), is suitable to explain behaviour in each sustainable food consumer segment (i.e. high, medium and low). All analyses were performed in SPSS 22. Below I report the testing of assumptions for these tests.

4.3.2. Checking assumptions

Normality. The social network factors and the sustainable food purchasing behaviour measure did not pass the Shapiro Wilk normality testing as all factors showed a significant p-value for the test (Appendix VII). However, these result were expected, as normality tests like the Shapiro Wilk have a tendency to be highly sensitive to variation in larger data sets resulting in the rejection of the normality assumption (Johnson, 1995). Visually checking the normality assumption with Q-Q plots revealed that the factors are mildly to moderately non-normally distributed (Appendix VII). Since mild to moderate deviations from normality can be handled by parametric tests, such as ANOVA and structural equation modelling and within larger group sizes the central limit theorem (CLT) infers approximate validity of methods that assume normality, I deem the data acceptable for parametric analysis (Howell 1997; Field 2009).

4.3.3. How do sustainable and non- sustainable shoppers differ in terms of their social network characteristics?

To understand how sustainable and non-sustainable shoppers differ in terms of their psychological and social network characteristics I divided sustainable food shoppers into high (n = 158, *M* = 5.41, *SD* = 0.59), medium (n = 176, *M* = 4.25, *SD* = 0.22) and low (n = 127, *M* = 3.19, *SD* = 0.66) behaviour segments by sorting participants into equal percentile groups based on the 33.33% and 66.66% percentile rating. ANOVA and Bonferroni post-hoc tests showed that the segmentation of participants based on their food purchasing behaviour was successful, showing a significant difference between all three behaviour segments (Table 4.1.)

Table 4.1. ANOVA and Bonferroni post-hoc test comparing consumer segments (low, medium and high) on their sustainable food purchasing behaviour

Significant variables	**Sustainable food purchasing segments, *M* *(SD)***	**Compared with group**	***P***
Sustainable food purchasing behaviour *F* (2,457) = 682.32, *p* < 0.001	High 5.41 (0.59)	Medium	.000
		Low	.000
	Medium 4.25 (0.22)	Low	.000
		High	.000
	Low 3.18 (0.66)	Medium	.000
		High	.000

Low group *n*= 127, Medium group *n*= 176, High group *n* = 156

Exploring food purchasing behaviour in more detail within the segments revealed that the high behaviour segment (n=156) performed all six behaviours (i.e. buying organic, fairtrade, sustainable fish, animal products that are free-range or freedom food, products with little or no packaging and locally produced food) often to almost always (ratings ranging from 5-6, scale 1-7). The medium segments (n=176) frequency of the six sustainable purchasing behaviours ranged from sometimes to often (i.e. ratings from 4-5) and the low segments (n=127) from seldom to sometimes (i.e. ratings from 3-4). The differences between all segments were significant as can be seen in Table 4.2.

The most frequently performed sustainable behaviour in the high and medium segment was buying animal based products that were free-range or freedom food (High: *M* = 5.96, *SD* = 0.98, Medium: *M* = 4.65, *SD* = 1.00) and buying food with little or no packaging in the low sustainable group (Low: *M* = 3.61, *SD* = 1.10). The least performed behaviour in all three segments was buying organic food (High: *M* = 5.16, *SD* = 1.04, Medium: *M* = 3.92, *SD* = 0.71, Low: *M* = 2.72, *SD* = 1.12). The order of most to least frequent behaviours varied in each group and can be found in Table 4.2.

Table 4.2. Sustainable food purchasing behaviour per behaviour category and sustainable food consumer segment; mean, standard deviation and F statistics

	Sustainable food consumer segments			
Purchasing behaviour categories	**High** *M (SD)*	**Medium** *M (SD)*	**Low** *M (SD)*	**F statistics**
Free-range/freedom food animal produce	5.96 (0.98)	4.65 (1.00)	3.56 (1.22)	*F*(2, 457) = 183.78**
Local food	5.44 (0.81)	4.35 (0.67)	3.32 (1.07)	*F*(2, 457) = 225.06**
Sustainably sourced fish	5.30 (1.48)	4.09 (1.19)	2.73 (1.35)	*F*(2, 428) = 121.15**
Food with little/no packaging	5.26 (0.90)	4.22 (0.66)	3.61 (1.10)	*F*(2, 457) = 130.03**
Fairtrade food	5.22 (1.05)	4.14 (0.74)	2.76 (1.08)	*F*(2, 457) = 233.59**
Organic food	5.16 (1.04)	3.92 (0.71)	2.72 (1.12)	*F*(2, 457) = 230.40**

** significant at < 0.001, Colour coding: red = almost never - seldom (scores from 2-3.49), yellow = seldom - sometimes (scores from 3.5-4.49), green = often - almost always (scores from 4.5-6), Segment participant numbers: Low sustainable group n=126 all items apart from fish (n=119), Medium sustainable group n=176 all items apart from fish (n=164), High sustainable group n=158 all items apart from fish (n=148).

Mapping the behaviour segments willingness (i.e. intention) and ability (i.e. perceived behavioural control) onto a graph (Figure 4.1.), following Defra's framework for pro-

environmental behaviours (Defra, 2008), showed significant differences between the three behaviour segments' willingness ($F(2, 457) = 157.13$, $p < 0.001$) and perceived ability $F(2, 457) = 91.87$, $p < 0.001$) to perform the behaviour. People in the high behaviour segment are willing ($M = 5.67$, $SD = 0.86$) and feel able ($M = 5.13$, $SD = 0.96$) to perform sustainable food purchasing behaviours. People in the medium behaviour segment expressed that they are somewhat willing to perform the behaviours ($M = 4.67$, $SD = 0.83$) but unclear about being able to (i.e. neither agree nor disagree where to buy or if they feel able to) purchase sustainable food products ($M = 4.30$, $SD = 0.87$). The low segment are still undecided and sit between somewhat unlikely to neither likely nor unlikely to purchase sustainable food products in the future ($M = 3.79$, $SD = 1.01$) and feel somewhat unable to buy sustainable food products ($M = 3.53$, $SD = 1.17$).

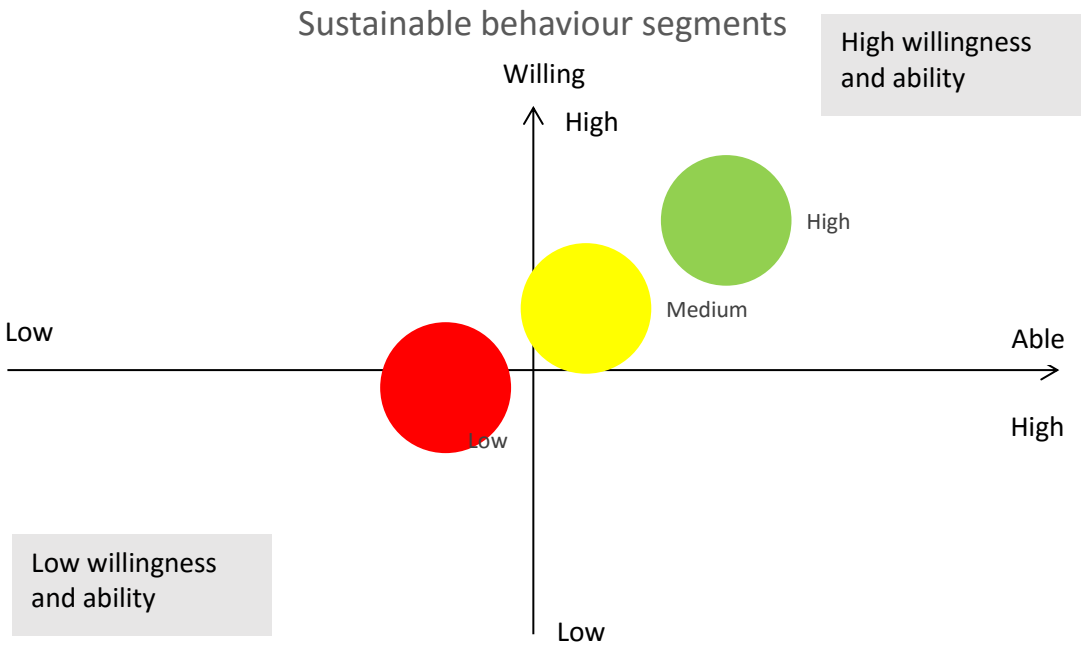

Figure 4.2. Willingness (i.e. intention) and ability (i.e. perceived behavioural control) for sustainable purchasing behaviour segments.

Looking at the intention scores for the six sustainable food purchasing behaviours for each behaviour segment highlights possible intervention or social marketing angles. Table 4.3. shows that the high and medium behaviour segment is most willing to increase the purchase of local food (High: $M = 5.87$, $SD = 0.89$, Medium: $M = 4.93$, SD

= 1.05) and the low segment to reduce packaging (*M* = 4.10, *SD* = 1.33). All segments are least willing to increase the purchasing of organic food (High: *M* = 5.28, *SD* = 1.36, Medium: *M* = 4.09, *SD* = 0.71, Low: *M* = 3.17, *SD* = 1.45). The willingness (i.e. intention) to perform the other sustainable purchasing behaviours and thus the order of preference varies from segment to segment and segments vary in their overall willingness to perform these behaviours from the high group being the most willing, followed by the medium group and then the low group as can be seen in Table 4.3.

Table 4.3. Sustainable food purchasing intention per behaviour category and behaviour segment; mean, standard deviation and F statistics.

Purchasing behaviour categories	High	Medium	Low	
Local food	5.87 (0.98)	4.93 (1.05)	4.05 (1.28)	*F*(2, 457) = 98.16**
Free-range/freedom food animal produce	5.84 (1.03)	4.77 (1.06)	3.92 (1.29)	*F*(2, 457) = 105.55**
Sustainably sourced fish	5.80 (1.04)	4.72 (0.97)	3.79 (1.25)	*F*(2, 428) = 115.34**
Food with little/no packaging	5.76 (0.98)	4.79 (0.98)	4.10 (1.33)	*F*(2, 457) = 82.10**
Fairtrade food	5.60 (1.11)	4.69 (1.04)	3.71 (1.31)	*F*(2, 457) = 95.71**
Organic food	5.28 (1.36)	4.09 (0.71)	3.17 (1.45)	*F*(2, 457) = 84.47**

** significant at < 0.001, Colour coding: red = almost never - seldom (scores from 2-3.49), yellow = seldom - sometimes (scores from 3.5-4.49), green = often - almost always (scores from 4.5-6), Segment participant numbers: Low sustainable group n=126 all items apart from fish (n=119), Medium sustainable group n=176 all items apart from fish (n=164), High sustainable group n=158 all items apart from fish (n=148).

Additionally, I ran three structural equation models, one for each segment, which were of the same format as in the previous chapter, including established psychological predictors of sustainable food purchasing behaviour (i.e. intention, habit, perceived behavioural control, attitudes, descriptive and personal norms) and social network characteristics. The social network characteristics included were network size (i.e.

degree), number of sustainable shoppers in the network (i.e. sustainability degree), number of network members a person discusses food issues with (i.e. food discussion degree), number of network members that directly influence food purchasing decisions (i.e. shopping influencers degree) and network relationship lengths (i.e. the average time span of relationships in the network). By applying the same SEM to each behaviour segment (i.e. high, medium and low sustainable shopper groups) I was able to test the applicability of the SEM model for each behaviour segment and its usability to inform about useful social marketing/intervention strategies for the different sustainable food purchasing behaviour segments.

Results revealed that the SEM adequately explained the sustainable food purchasing behaviour in the high sustainable consumer segment (Figure 4.3.). Model fit was deemed acceptable, $Chi^2 = 78.48$ df= 40 $p < 0.001$, CFI = 0.935, IFI = 0.939, RMSEA = .078 (Bentler, 1990) with similar model fit reported by (Klöckner, 2013). From the hypothesized six relationships between social network characteristics and psychological antecedents of sustainable food purchasing behaviour, three were found to be significant. Firstly, results showed that the more sustainable shoppers participants had in their social networks the higher their descriptive norms ($\beta = 0.40$, $p < 0.001$). Secondly, the more sustainable shoppers participants had in their social networks the higher also their perceived behavioural control ($\beta = 0.09$, $p < 0.001$). Thirdly, the smaller the social networks the larger the descriptive norms to shop sustainably ($\beta = - 0.24$, $p < 0.001$). Furthermore, descriptive norms was the only factor to explain personal norms. Results showed that the higher the descriptive norms the higher the personal norms ($\beta = 0.52$, $p < 0.001$), explaining a total of 25% in personal norms. Additionally, personal norms significantly explained habits (the strongest explanatory factor of behaviour), intention (the second strongest explanatory factor of behaviour) and perceived behavioural control (an indirect explanatory factor of behaviour via habits). As personal norms increased so did habits ($\beta = 0.25$, $p < 0.001$), intention ($\beta = 0.17$, $p < 0.001$) and perceived behavioural control ($\beta = 0.42$, $p < 0.001$). Finally, habits and intention were positively related to sustainable food purchasing behaviour and explained a total of 26% of the variance in sustainable food purchasing. As habits ($\beta = 0.29$, $p < 0.001$) and intention increased ($\beta = 0.17$, $p < 0.001$) so did the sustainable food purchasing behaviour.

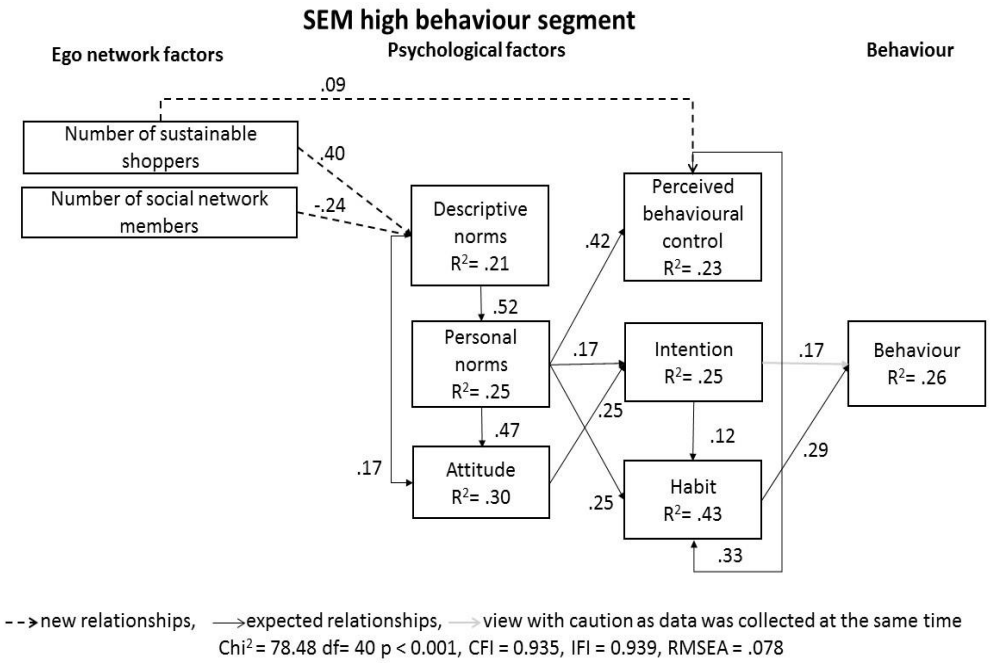

Figure 4.3. Structural equation model (from Chapter 3) tested for the high consumer segment.

Notes: Correlated exogenous variables, number of sustainable shoppers and number of social network members, were specified to covary. Figure shows standardized regression weights on the lines (i.e. Beta weights) and explained variance (R^2) in the boxes in the dependent variables. The relationship between intention and behaviour should be viewed with caution as future intentions were measured at the same time as self-reported behaviour (i.e. past).

Results for the second SEM, testing the same model for the medium consumer segment, revealed that the model did not have acceptable fit statistics and therefore did not explain the sustainable food purchasing behaviour adequately in the medium sustainable consumer segment (Figure 4.4.). Model fit was deemed unacceptable, Chi^2 = 90.073 df= 40 p < 0.001, CFI = 0.882, IFI = 0.892, RMSEA = 0.085 (Bentler, 1990). Bentler (1990) suggests that both CFI and IFI should be >.90 and RMSEA <.8, therefore all measures were outside the ranges of their respective acceptable fit levels. This indicates that the behaviour for the medium sustainable consumer segment could not be explained by the model of social network characteristics and psychological predictors from Schubert et al. (2015, Chapter 3). However, two relationships from this model are noteworthy. Firstly, intention explained a total of 4% in sustainable food purchasing behaviour in this segment, increasing as behaviour increased (β = 0.04, p < 0.001). Secondly, only one social network characteristic's relationship with sustainable

food purchasing behaviour was mediated via descriptive norms, the number of sustainable shoppers in the network (i.e. sustainability degree). As the number of sustainable shoppers went up so did the descriptive norms ($\beta = 0.17$, $p < 0.001$), explaining 5% of the variance in descriptive norms in this segment.

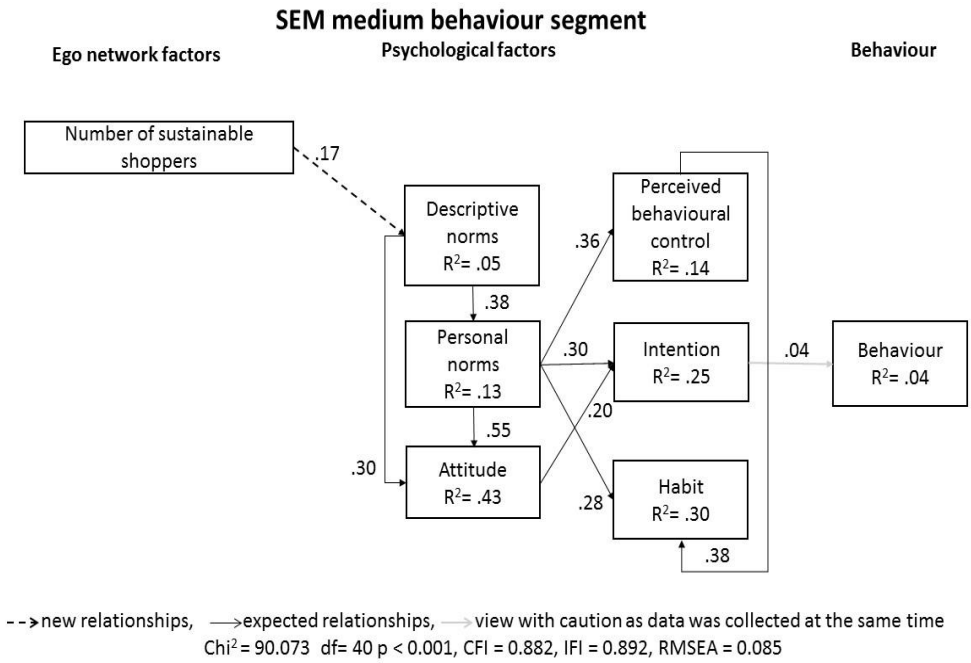

Figure 4.4. Structural equation model (from Chapter 3) tested for the medium consumer segment.

Notes: Figure shows standardized regression weights on the lines (i.e. Beta weights) and explained variance (R^2) in the boxes in the dependent variables. The relationship between intention and behaviour should be viewed with caution as future intentions were measured at the same time as self-reported behaviour (i.e. past).

Results from the third SEM, testing the same model for the low sustainable food consumer segment showed that the model adequately explained the low segments sustainable food purchasing behaviour, $Chi^2 = 75.52$ df= 40 $p < 0.001$, CFI = 0.905, IFI = 0.914, RMSEA = 0.084. Although the RMSEA score was still slightly elevated (RMSEA <.8, Bentler, 1990) all other fit statistics lay in their acceptable ranges (CFI and IFI should be >.90) and the model was thus deemed acceptable. Two out of the six hypothesized relationships between social network characteristics and psychological antecedents of sustainable food purchasing behaviour, were found to be significant. Again, as in the high and medium segments, the number of sustainable shoppers affected descriptive norms. Results showed that the more sustainable shoppers participants had in their social networks the higher their descriptive norms ($\beta = 0.46$, $p < 0.001$). Secondly, the more network members directly influenced participant's food purchasing decisions (i.e. shopping influence degree) the higher their personal norms ($\beta = 0.19$, $p < 0.001$). In addition to the shopping influence degree, descriptive norms also affected personal norms, to a much greater extent than the number of shopping

influencers. As descriptive norms increased so did the personal norms (β = 0.58, p < 0.001). Both social network characteristics explained a total of 41% indeed. As in the high sustainable shoppers segment, personal norms significantly explained intention (the only direct explanatory factor of behaviour), perceived behavioural control (an indirect explanatory factor of behaviour via intention) and habits (not a significant direct or indirect explanatory factor of behaviour). As personal norms increased so did intention (β = 0.25, p < 0.001), perceived behavioural control (β = 0.54, p < 0.001) and habits (β = 0.49, p < 0.001, although habits did not significantly explain behaviour). Finally, intention positively related to sustainable food purchasing behaviour and explained a total of 27% of the variance in sustainable food purchasing. As intentions increased so did the sustainable food purchasing behaviour (β = 0.39, p < 0.001).

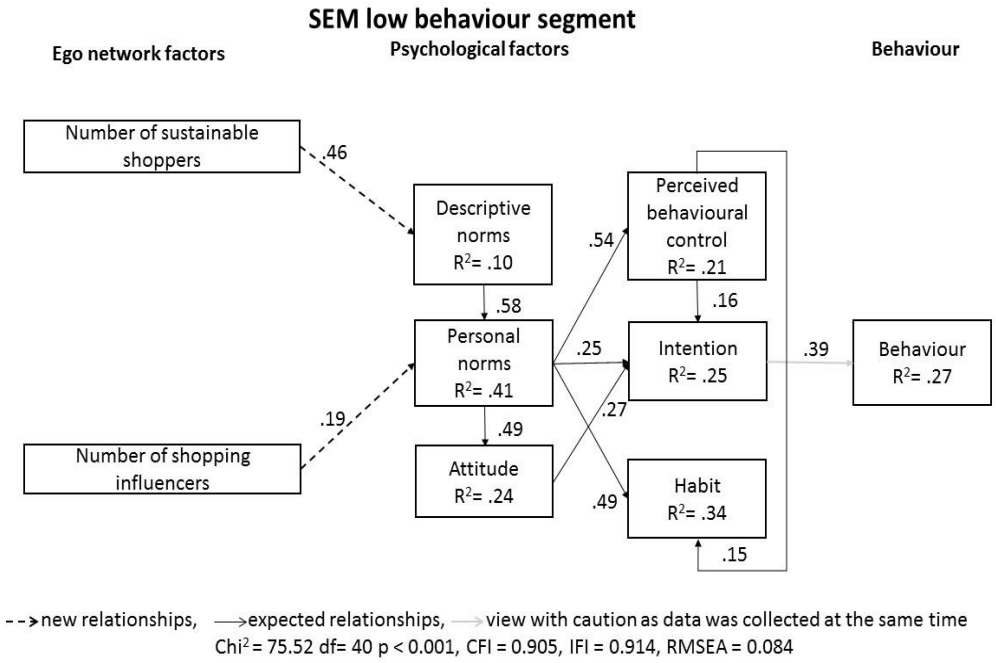

Figure 4.5. Structural equation model (from Chapter 3) tested for the low consumer segment.

Notes: Correlated exogenous variables, number of sustainable shoppers (i.e. sustainability degree) and number of network members directly influencing food purchasing decisions (i.e. shopping influencing degree), were specified to covary. Figure shows standardized regression weights on the lines (i.e. Beta weights) and explained variance (R^2) in the boxes in the dependent variables. The relationship

between intention and behaviour should be viewed with caution as future intentions were measured at the same time as self-reported behaviour (i.e. past).

4.4. Discussion

Social networks influence sustainable consumption choices, but research is only beginning to understand the mechanism of this influence on such choices (Salazar, 2013; Schubert, de Groot, et al., 2015; Schubert, Newton, de Groot, 2015). In this study I explored how segments of low, medium and high sustainable shoppers vary in terms of their psychological and social network characteristics and how this can be used in consumer profiling for social marketing or intervention strategies. Results show that consumers in the low, medium and high sustainable segments show differences in the types of specific sustainable food purchasing behaviours they already perform and are willing to do more of. Furthermore the behaviour segments vary significantly in terms of the psychological and social network factor underlying their sustainable purchasing behaviour. The next sections will explain the findings per behaviour segment in detail.

4.4.1. High sustainable consumers

High sustainable consumers regularly engage in all six sustainable purchasing behaviours (i.e. buying organic, fairtrade, sustainable fish, animal products that are free-range or freedom food, products with little or no packaging and locally produced food). They particularly seem to be interested in animal welfare and supporting local businesses as they tend to most frequently purchase free-range/freedom food animal produce, local food and sustainably sourced fish. They are willing to purchase more of these products and feel able to do so, especially in relation to local food and the animal welfare food categories. They least frequently buy organic food and least intend to buy more of it. Furthermore, there is a link between their social network characteristics, psychological factors and their sustainable food purchasing behaviour. People in this category that have a lower number of others influencing their shopping decisions, a smaller network and a higher number of sustainable shoppers in the network, are more likely to buy sustainable food products from the six categories. Additionally, a positive attitude towards sustainable food purchasing, a sustainable food shopping habit and intention to buy more sustainable food products are linked to purchasing more sustainable food.

To encourage people in the high segment to do more sustainable shopping could be useful to highlight the positive impact that they have on those categories they most frequently purchase and intend to purchase more of; local businesses and animal welfare food (i.e. free-range/freedom food produce and sustainably sourced fish). This strategy is likely to increase their own positive attitudes which has been linked to an increased intention towards purchasing sustainable products, and, in turn increased sustainable purchasing behaviour (Klöckner, 2013).

Secondly, there is a positive relationship between numbers of sustainable shoppers in the network and network size with sustainable food purchasing behaviour via descriptive norms. Results show that the larger the number of sustainable shoppers and the smaller the network size the stronger the descriptive norms to purchase sustainable food. Therefore, a useful strategy seems to be to encourage the 'sharing' or 'making visible' of sustainable food purchasing behaviour in the network. Making sustainable behaviour visible would make the descriptive norms, that purchasing sustainable food is the normal behaviour in the social network, salient, as suggested by the Social Identity Theory (Tajfel & Turner, 1979; 2004) and the Self-Categorization Theory (Turner, Hogg, Oakes, Reicher & Wetherell, 1987). The theories suggest that behaviour is influenced through group norms of relevant social network groups. Therefore, by making these norms visible and thus salient, people are more likely to distinguish themselves with the norms of the in-group and thus behave accordingly (Fielding, Terry, Masser & Hogg, 2008). Also smaller networks are more likely to have less diversity in behaviour than larger networks and thus the normative message may be clearer. Results also showed that although descriptive norms are not significant direct explanatory factors of sustainable consumer behaviour, they explain personal norms to a large extent in the high segment. Personal norms are the strongest factors explaining perceived behavioural control and habits (the strongest explanatory factor of sustainable food purchasing) as well as explaining intentions. Thus when descriptive norms are increased, so are the internalised descriptive norms (i.e. personal norms) which in turn affect perceived behavioural control (affecting habits), intentions and habits, the latter two affecting sustainable food purchasing behaviour directly.

4.4.2. Medium sustainable consumers

The medium segment has started to engage and perform all of the sustainable food purchasing behaviours on a semi-regular to regular basis (i.e. sometimes to often). They currently most frequently purchase animal produce that are free-range/freedom food, followed by locally produced and fairtrade products. They are somewhat willing to do more and are most willing to increase their purchasing of local food, food with little or no packaging and animal produce that are free-range/freedom food. They are least willing to increase their organic food purchasing. However, they feel to a certain extent unable to purchase more sustainable products.

When analysing the segment's social network and psychological characteristics, in relation to their sustainable food purchasing behaviour, results revealed that the model did not adequately explain sustainable food purchasing. In fact, intention, the only significant direct explanatory factor of behaviour only explained 4% of sustainable food purchasing behaviour in this segment. Therefore, further research investigating other factors that explain sustainable food purchasing behaviour in this medium segment, is urgently needed. I suggest that until research has found other explanatory factors for sustainable consumer behaviour in this segment, it might be advisable not to focus interventions on this segment, as a successful outcome is less likely.

However, if interventions need to include the medium segment then the following suggestions could be taken into account. Findings showed that this segment, like the high segment, is most willing to increase food purchases of local food and least willing to purchase more organic food. The relationship between the number of sustainable shoppers and descriptive norms, is a lot weaker than in the high segment. It is also the only social network characteristic to show a significant relationship with any of the psychological predictors of sustainable food purchasing behaviour. Nevertheless, it offers an intervention route which might be successful. An intervention strategy in this segment could further engage this segment by encouraging them to share their own behaviour through campaigns that lie at the heart of this segment (e.g. animal welfare or supporting the local economy). Again, by sharing or making 'visible' of their own sustainable consumer behaviour they also make the descriptive norms in relation to sustainable food purchasing salient (Tajfel & Turner, 1979; 2004; Turner, Hogg, Oakes, Reicher & Wetherell, 1987). If descriptive norms are made visible and thus salient people are more likely to distinguish themselves with the norms of the in-group and thus behave accordingly (Fielding, Terry, Masser & Hogg, 2008).

In addition, it might be useful to provide this segment with information to encourage others to purchase products that support animal welfare and local food products. This strategy will inform those spreading the information and inform others. By making behaviour 'visible' in this segment, showing that others successfully purchase sustainable food perceived behavioural control also gets inadvertently strengthened. Bandura (2004) suggests that such an approach which celebrates the successes and builds on them builds people's perceived behavioural control (or self-efficacy as he calls it) thus enabling them to act on their intentions and perform the behaviour. Since intentions are the only, albeit weak direct explanatory factor of behaviour this link should be strengthened.

4.4.3. Low sustainable consumers

The low segment is so far not doing much sustainable shopping. This segment's sustainable shopping entails almost never/seldom purchasing food from the six sustainable food categories (e.g. fairtrade, sustainably sourced fish, local food) and slightly more regularly (sometimes) food with little or no packaging or free-range or freedom food animal produce. Like all the other segments, they are least likely to buy organic food and least willing to change this. In general they are still undecided whether they are likely to purchase more sustainable food products in the future but they are most willing to increases their purchase of those products reduced in packaging and sustainably sourced fish. However, they have also expressed that they feel somewhat unable to buy sustainable food products which intervention or social marketing strategies could focus on changing.

This segment showed a strong link between two social network characteristics (i.e. the number of sustainable shoppers and the number of shopping influencers) and descriptive and personal norms, respectively. In addition, personal norms (including internalised descriptive norms) partially explain intentions, the main and only factor to explain behaviour in this segment. It appears that this segment has a larger caring role than the medium and high segment as indicated by the relationship between the number of shopping influencers and personal norms. In addition they show concern for the environment (i.e. willing to increase the purchase of products with reduced packaging) and animal welfare concerns. Interventions could therefore most usefully provide further information to this segment about positive impacts of purchasing

sustainable products, in particular those that support animal welfare and reduced packaging. It also appears that, like in the other segments, the best approach to deliver this information would be through social network members.

Intervention or social marketing strategies to motivate consumers that don't purchase much sustainable food currently could therefore focus on strengthening intentions and perceived behavioural control targeting households that have more people living in them and thus influencing the food purchasing decisions (e.g. family households). Social marketing strategies that focus on personal commitment making or pledge making may be useful in areas where low sustainable purchasing is prevalent. Pledging to buy more from certain sustainable food categories will strengthen the person's commitment (i.e. intention), in particular if pledges are put in writing or made public compared to just being made verbally. This could work particularly well in small communities or social networks as making public pledges indicates to others that you are similarly committed to changing your behaviour, and shows the individual that they are not alone (McKenzie-Mohr, 2013; Cole & Fieselman, 2013). Additionally, group pledges in social networks has also been found to be successful in changing behaviour in a community (McKenzie-Mohr, 2013).

Future research should test the effectiveness of the strategies suggested in changing sustainable food shopping behaviour for the different behaviour segments. Since this study is the first to profile consumers through the inclusions of social network and psychological characteristics in relation to sustainable food purchasing behaviour more research in this field needs to be undertaken to validate my findings.

4.5. References

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Chapter 5: The influence of social networks on organic consumption behaviour: An experimental study

Chapter abstract

In order to draw inferences about whether social network factors influence sustainable food consumption behaviour, an experimental study was run manipulating one social network factor. The experimental study, reported in this chapter, investigated the influence of the discussion of food matters with a social network member (vs. a stranger), on organic food consumption behaviour. Additionally, the study corrected for the effect of two other social network factors; the percentage of sustainable shoppers in the network and social network size. The 134 participants were attendees of the Bournemouth University Festival of Learning and data was collected in 2014 and 2015 over three days each. The experimental design was a between subjects design as participants were divided into pairs of social network members (experimental group) and strangers (control group). The pairs were asked to work through individual and discussion questions. The dependent variable was actual organic consumption behaviour measured after the discussion took place. Findings showed that discussion with a social network member significantly predicted organic food consumption behaviour. Implications and further research directions are discussed.

5.1. Introduction

Social Identity Theory (Tajfel & Turner, 1979; 2004) and Self-Categorization Theory (Turner, Hogg, Oakes, Reicher & Wetherell, 1987) suggest that behaviour is influenced through group norms of relevant social network groups. These group norms, especially perceptions about how other people commonly behave within in-groups (Schultz, Nolan, Cialdini, Goldstein & Griskevicius, 2007), are made salient on the basis of self-categorization to distinguish oneself and the in-group (i.e. their social network) from the out-group. Indeed, research in the area of sustainable consumer behaviour has long demonstrated that such behaviour is influenced by how we perceive other people, similar to us (i.e. in-group) to think and to behave (e.g. Klöckner, 2013; Arvola, 2008).

One of the most important group norms explaining sustainable consumer behaviour are descriptive norms. Descriptive norms are based on the perception of how people around you behave, especially those in your in-group or social network (Cialdini, Kallgren & Reno, 1991). Some experimental studies show that descriptive norms can directly influence sustainable consumer behaviour, such as re-using towels in hotel rooms, recycling and energy conservation (e.g. Goldstein, Cialdini & Griskevicius, 2008; Schultz et al., 2007). For example, Goldstein et al. (2008) made descriptive norms towards reusing towels in hotels salient with messages expressing how the majority of hotel guests behaved (i.e. “75% of hotel guests reused towels”) and compared such message with the ‘common’ environmental message (i.e., “please...to save the environment”). The use of the descriptive norm message directly influenced the towel re-usage behaviour of guests in a positive way and was stronger than messages not making salient these norms, such as messages focusing on the environmental consequences only.

Although studies show that descriptive norms influence sustainable consumer behaviours especially when people are made aware of such norms, others have shown that descriptive norms only promote the desired behaviour when there are no conflicting normative messages in the context. Indeed studies have shown that people increased their own non-sustainable behaviour if the descriptive norm said that others were also not behaving sustainably e.g. by also taking petrified wood from a forest (i.e. Cialdini, Demaine, Sagarin, Barrett, Rhoads, Winter, 2006) or increasing their household energy consumption if the neighbourhood average was higher than their own (e.g. Schultz et al., 2007). If, however, the household energy consumption was more than the neighbourhood average the descriptive norm message had a positive effect and let to a reduction in energy consumption in that household. Finally, Schultz et al. (2007) and Cialdini et al. (2006) found that if the descriptive norm message when combined with an injunctive norm message towards the desired behaviour, thus adding an approval of the sustainable behaviour (e.g. descriptive norm: ‘everyone in your neighbourhood conserves energy and you are conserving…’ with injunctive normative messages: ‘your neighbours approve of you conserving energy; smiley face’), cancelled out the boomerang effect and let to consistent results of an increase in sustainable behaviour.

These experimental studies show that descriptive norms seem to directly influence sustainable consumer behaviour, especially when they are made salient in a specific context and when aligned with other norms in the context (Keizer & Schultz, 2012).

Although important as direct determinants of sustainable consumer behaviour, descriptive norms have been shown to be even more important as indirect predictors of sustainable consumer behaviour influencing personal norms (i.e. feelings of moral obligations) and intention, the strongest predictor of sustainable consumer behaviour (see meta-analysis Klöckner, 2013). As the meta-analysis of Klöckner mainly consisted of cross-sectional data (e.g. Bamberg, 2003; Cordano, Welcomer, Scherer, Pradenas, & Parada, 2010; Gardner & Abraham, 2010; Klöckner & Matthies 2009) while the direct relationships are mainly investigated via experimental studies (Cialdini et al., 2006; Goldstein et al., 2007; Schultz et al., 2007), the mechanisms underlying the influence of descriptive norms on sustainable consumer behaviour are still unclear. Although descriptive norms have been identified as important factors influencing sustainable consumer behaviour this relationship is not always direct as seen above. One way to further understand the underlying mechanisms of when descriptive norms are directly influencing behaviour and when they play a supportive role would be to investigate the social structure that surrounds people (i.e. social networks) and forms the basis of their normative perceptions as suggested by the Social Identity Theory (Tajfel & Turner, 1979; 2004) and Self-Categorization Theory (Turner et al., 1987).

Social network theory (SNT, e.g. Wasserman, 1994) suggests that by studying social networks, which are made up of actors (i.e. people) and ties (i.e. relationships between people), we can better understand the influential relationships of people within the social network. Thus, instead of assuming that all people within the in-group/social network influence a person's sustainable consumer behaviour equally we might find that some people or groups within a social network have stronger influencing powers than others.

Indeed, a recent study found that three social network characteristics in particular, influenced people's descriptive norms towards sustainable food purchasing thus making it ultimately more likely that they buy sustainable food themselves (Schubert, de Groot, Newton, & Lubbers, 2015; in thesis Chapter 3). The first two social network characteristics were positively related to sustainable food shopping behaviour. That is, the more sustainable food shoppers in one's social network and the larger the number of food discussion partners within the network, the more someone developed a positive descriptive norm towards sustainable food shopping behaviour (i.e. the more they perceived that buying sustainable food is the 'normal thing to do' in their network). The third social network characteristic influencing sustainable food shopping behaviour via descriptive norms was the network size. This factor was negatively related to descriptive norms; the larger one's social network the less strong one's descriptive

norm towards sustainable food shopping behaviour, hence, the less likely one was to buy sustainable food.

Schubert, de Groot, et al. (2015) show that network size, number of sustainable shoppers and food discussion partners are particularly important for the formation of descriptive norms and thus indirectly rather than directly explain sustainable food purchasing behaviour. However, like a large number of studies investigating factors of sustainable consumption showing indirect relationships between descriptive norm on sustainable behaviour (e.g. Bamberg, 2003; Cordano, Welcomer, Scherer, Pradenas, & Parada, 2010 Gardner & Abraham, 2010; Klöckner & Matthies, 2009), Schubert, de Groot, et al. (2015) also collected cross-sectional data only and thus no causal inferences could be drawn from the study. Therefore, the direction of causality is uncertain, that is do social networks really influence behaviour or do we select social network members based on our behaviour (i.e. based on our shared norms) as suggested by some researchers (for a review see McPherson, Smith-Lovin & Cook, 2001). This tendency of people to associate themselves or bond with similar others in ways that confirm rather than test our core beliefs has been called homophily (Lazarsfeld, & Merton, 1954). Additionally, unclear is also whether the relationship between social network factors and sustainable behaviour is indirect only, thus mediated by other psychological factors such as norms, as found in Schubert, de Groot, et al. (2015) or whether social network factors also directly influence sustainable behaviour. This experimental study will thus investigate the direction of causality and whether a direct relationship can be found in addition to the indirect one.

Indeed, Salazar et al. (2013) showed in an experimental study that participants that were aware of (1) how many of their peers had chosen a sustainable product (i.e. descriptive norm saliency with peers) or (2) how many had chosen a sustainable product and approved of it (i.e. descriptive norm together with injunctive norm) were in both conditions more likely to choose a sustainable product themselves compared to those in the control group who received no normative information. Salazar et al.'s (2013) findings seem to hint at a direct link between social network factors and sustainable behaviour. However, the study did not measure any social network characteristics directly so one can only speculate about the underlying mechanisms such as whether the number of people that had chosen the product might have influenced the chosing of the product as in Schubert, de Groot, et al. (2015) where the larger the number of sustainable shoppers the more likely it was that a person was a sustainable shopper. In this experimental study I want to investigate whether social

network factors also directly influence sustainable consumption behaviour. Therefore, this study will examine the relationship between the three social network factors (number of sustainable shoppers, network size and the influence of social network discussion partners) and sustainable consumer behaviour.

Furthermore, a lot of studies in sustainable consumer research, including Schubert, de Groot, et al.'s (2015) study, rely on measuring behavioural intentions or self-reported behaviours only (e.g. Bamberg, 2003; Cordano, Welcomer, Scherer, Pradenas, & Parada, 2010; Gardner & Abraham, 2010; Klöckner & Matthies, 2009). Although measuring behavioural intentions and self-reported behaviours are important to explore the underlying processes of sustainable consumer behaviour, measuring actual behaviour has advantages over self-report behaviour as the possible effect of biases such as social desirability (i.e. the tendency to attribute to oneself socially desirable values/attitudes) can be ruled out completely (Tarrant & Cordell, 1997). More importantly, however is that when measuring actual behaviour we can draw causality which unlike with most self-reported behaviour, unless collected longitudinally, cannot be done as the behaviour will always be in the past.

The main aim of this experimental study is to examine the influence of social network factors on actual sustainable consumer behaviour. In particular, this study will focus on the discussion of food matters with a social network member compared to a stranger. An effective way to reveal and make salient the injunctive norm of social network members is to discuss one's attitudes towards the behaviour. The attitude towards sustainable shopping (i.e. the importance of buying sustainable food shopping, i.e. injunctive norm) is likely to be positive because research has shown that if there are no negative personal consequences involved in choosing sustainable behaviour, such as a higher price or less available, then people are more likely to choose the more sustainable option as most people have values and norms that are in favour of doing good for the environment (e.g. De Groot & Steg, 2007, 2009). Thus, the prevalent injunctive norm (i.e. what is the approved behaviour in the situation) will be the desired behaviour (i.e. to choose organic over non organic consumables). Therefore, participants paired with a social network member will make more sustainable consumption choices than those paired with strangers.

Additionally, the study will test the importance of the discussion factor (i.e. with a social network member versus stranger), in influencing organic consumption behaviour, whilst correcting for other relevant social network variables. Specifically, the study will correct

for the number of sustainable shoppers and network size, previously found to be significant factors in explaining self-reported sustainable shopping behaviour, via descriptive norm (Schubert, de Groot, et al., 2015). They showed that people are more likely to buy sustainable food the larger the number of sustainable shoppers in their network as the perceived prevailing norm of how to behave (descriptive norm) becomes more apparent the larger the group that behaves in a certain way. Conversely, participants were less likely to buy sustainable food the larger their social network as large social networks diffuse the prevalent descriptive norm. Both the number of sustainable shoppers in the social network and social network size will make a descriptive norm about sustainable consumption salient, and could therefore influence the impact of discussion degree on actual sustainable choices. Present study will therefore examine the influence of the discussion of food matters with a social network member (compared to a stranger) on organic food consumption while correcting for the impact of other important social network characteristics.

I put forward the following hypothesis:

H1: Food discussions among social network members (vs. strangers) will positively predict organic food consumption over and above the effect of other social network factors (i.e. the number of sustainable shoppers in one's social network and one's network size).

5.2. Method

The experiment was run as an activity for the Festival of Learning at Bournemouth University, UK. Participants were attendees at the Festival of Learning, which is an annually organised festival and offers attendees numerous experiences provided by employees and students at the university. The activity was run in two consecutive years on the following dates; 10.06.-12.06.2014 and 11.07-13.07.2015. The activity was advertised under the following title, 'What others tell us about our shopping behaviour'. The following information was provided about the activity: 'Ever wanted to take part in psychology research? Now is your chance! Come and see our psychology department and have the opportunity to take part in a short experiment about your shopping behaviour as an example of how and why we measure human behaviour. You can also learn about the type of information collected and conclusions that can be drawn from such research.' Ethical approval for the experiment was sought from the University of Bournemouth Research Council prior to running both activities and collecting data.

5.2.1. Procedure

Participants arrived at the psychology research lab either on their own, in pairs or small groups. Upon arrival they were greeted by the researcher who explained the experiment. Before the start of the activity participants were explained that they were free to leave at any time and written consent was sought from each participant in order to use the data.

At the start of the experiment participants were either paired with a stranger or with a member of their social network (friend, family member or other person they arrived with). The pairing up of participants was based on opportunity sampling. Sampling occurred in three ways, (1) when people arrived with one other social network member they were mainly kept together, (2) When two people arrived that did not know each other (strangers) they were paired together, (3) If two groups of people arrived they were sometimes split into pairs of strangers. Sampling occurred in this way to balance out stranger and social network group samples. All participant pairs were then taken to separate cubicles to work through the experiment (Appendix VIII). The experiment consisted of three parts.

In the first part of the experiment, participants were asked to independently fill in one question about their *current sustainable food shopping behaviour*. This was followed by two questions they were asked to discuss with their assigned partner. In the discussion questions the partners were asked to discuss their *past food shopping behaviour* and their perceived importance (i.e. *attitudes*) of buying sustainable food products. They were asked to write down similarities and differences in these behaviours and attitudes between each other found during the discussion. The discussion was used to make social network partners and strangers aware of their experiment partner's attitude towards sustainable food shopping behaviour thus revealing their injunctive norm. After the discussion, they were asked to independently fill in some further questions. These asked three social network characteristics (i.e. *degree*, *sustainability degree* and *relationship lengths*) and basic demographic information (e.g. age and gender).

Once they had completed the three tasks described above, the dependent variable was introduced. That is, they were asked to join the researcher for a hot/cold drink and biscuits. It was not revealed to the participants that their consumption choices were part of the experiment until after they had made their consumable choices. The participants were given the choice of organic and non-organic consumables to measure their *actual consumption* choice, which is the dependent variable in this study. The consumables on offer were: tea (black and peppermint), coffee, water, orange juice, milk, sugar and biscuits. All consumable choices were offered as organic and 'non-organic' and were matched in appearance. All consumable items were decanted into matched containers such as glass Kilner jars (i.e. for teas and coffees), glass jugs (i.e. for orange juice and water), bowls (i.e. for sugar), small milk jugs (i.e. for milk) and plates (i.e. for the biscuits). The only visible differences between the consumption choices on offer were the labels for each consumable item (e.g. organic tea vs. tea (for the non-organic consumable) which were written on same-sized labels in the same font. The labels were placed in front of the consumable items to avoid participants choosing consumable items based on any visible differences between the consumable items.

The consumables were on offer in a separate room only accessed after the pair-work was completed. Participants were allowed to enter the room with their paired up partner, thus their social network member or stranger and were left to make their own choices before re-joining the researcher. The organic and non-organic options were set up on separate tables, one in a more obvious and easily reachable position when the participant entered the room and the second table was positioned at the back of the

room in a less visible and less reachable position (Photos in Appendix IX). The set-up was chosen to test whether consumer choices were made based on the position of the food in the room rather than actual choices (Martin, S. & Walker, I., in preparation). The drinks containers (plastic cups, cardboard cups, ceramic cups and glasses) were placed on the table next to the easily reachable consumables. The setup of the organic and non-organic consumables was regularly reversed during the day and over the period of the data collection so that at different times of the day either organic or non-organic items were placed on the easily reachable and visible position. This was done to exclude that the choice of consumables were based on their position in the room rather than due to actual preferences (i.e. order-effect).

The actual consumption choices made were recorded twice. Once, covertly by the researcher, while participants made their choice. Secondly, by the participant, during the debrief. The double recording was done to avoid missing and incorrect data that might occur owing to social desirability recording of data on behalf of the participants and human errors made in recordings on both the participants and researchers side.

During the debrief participants were asked a *manipulation check* question to test whether they were blind to the actual behaviour measure of the study, thus the measure of actual sustainable food consumption choices made before the debrief. At the end of the debrief participants were thanked for their participation and escorted out.

5.2.2. Participants

The participants included people from the local community and university who are interested in attending the various activities organised during the Festival of Learning. The total sample included 176 participants, however 6 participants were excluded because they did not pass the manipulation test by guessing that the consumables they chose were part of the experiment, leaving 170 participants. A further 21 participants did not want any consumables and had to be excluded from the experiment. A further 15 participants chose an equal amount of organic and non-organic consumables which meant that they could not be categorized into having made organic or non-organic choices (DV) thus were also excluded from the analysis, leaving a total sample of 134 participants for the analyses. This participant sample consisted of

76 participants in the social network (SN) members group and 58 in the strangers group.

5.2.3. Research Design

The present study used a one-way between-subject design. The manipulation variable was the pairing of participants either with a social network member or a stranger to discuss food matters (i.e. their past sustainable shopping behaviour and attitude towards sustainable food shopping) during the pair-work activity.

5.2.4. Dependent variable

The dependent variable was the actual consumption choices people made. On offer were organic and non-organic consumables. The *actual consumption* score was created by subtracting the sum of all the organic consumable choices from the sum of all the non-organic consumable choices made by each participant. The resulting score was then recoded, the negative score (i.e. indicating an overall non-organic consumption) was recoded into 0 indicating a non-organic consumption whereas a positive score (i.e. indicating an overall organic consumption) was recoded into 1 indicating an organic consumption. Participants that chose an equal amount of organic and non-organic consumables were excluded from the analysis as they could not be categorized in either the organic or non-organic actual consumption choice categories.

5.2.5. Independent variables

The independent variables included the following social network characteristics.

Discussion with network member (manipulation variable). Participants were either paired with somebody they knew (i.e. social network member) or with a stranger to complete the experiment. This was a binary variable.

Past sustainable consumer behaviour was defined as self-reported frequency of buying organic, fairtrade, locally sourced food and food with little or no packaging. The four items were developed based on the item development guidelines by Ajzen (2002; 2006). An example item is: 'How often do you buy any of the following: I buy *organic* food…'. Answers were measured on a 7- point semantic Likert scale ranging from *never* to *always.*

Attitude towards sustainable food shopping was asked in terms of 'How important do you think it is to buy sustainable food and why?'. This question was used to reveal the attitude (here importance of sustainable food shopping) of the discussion partner towards sustainable food and thus revealed the injunctive norm (i.e. approval or disapproval). Although the qualitative answers provided for this question were not analysed in this study, I felt it necessary to list the question so the reader could evaluate how this study attempted to reveal the injunctive norm of each discussion partner.

Degree. Participants were asked to estimate the size of their social network (i.e. *degree*) (Kadushin, 2011). The specific question asked was: 'How large is your social network of friends, family and important others? Please tick one of the options below: 1 – 5, 6 – 10, 11 – 15, 16 – 20, 21 – 25, 26 – 30, >30' (people) (size categories given by the researcher).

Percentage of sustainable shoppers in each participant's social network was measured on a scale from 0-100%. Participants were asked: 'How large is the percentage of people that buy sustainable food products in your social network? Please use the slider bar below to indicate the percentage of people that buy sustainable food products in your social network by marking your answer with an **X** in the appropriate position. Below are some guidelines: ≤ 25% indicating a minority (about ¼ or less), ≈ 50% (more or less half of the people), ≥ 75% indicating a majority (more than ¾ of the people).' The slider bar was divided into steps of 10% from 0-100%. This measure was based on a measure in Kadushin (2011).

Relationship length was measured in relation to the person the participant completed the experiment with. For the stranger pairs this item was a manipulation test to verify that the strangers did not know each other at all. For social network member pairs this question measured the length of the relationship between the two network members.

The question asked was: ‘How long have you known the person sitting next to you?’ Answer options: 1. I don’t really know them., 2. Relationship lengths in years _____, and was based on Lubbers, Molina, Lerner, Brandes, Ávila & McCarty (2010). This variable was only analysed for the manipulation check.

Experiment manipulation check. To test whether participants guessed that the consumables were part of the experimental set up all participants were asked the following question once they had chosen their consumables: ‘What do you think the experiment was about?’ This was an open ended question.

5.3. Results

5.3.1. Analyses

Analyses of the experiment results were performed in SPSS 22, IBM Statistical Analysis tool. The analysis section lists findings for the testing of assumptions for the statistical tests performed (Section 5.3.2.) and preliminary data analysis (5.3.3.).

5.3.2. Testing of assumptions

In order to use chi-square tests with this data the dependent variable should be measured on a nominal level, categorisation for the dependent variable should be mutually exclusive and every observation must be independent of each other (Brace, Kemp & Snelgar, 2006). All three of the assumptions were met by the data. A chi-square test was used to test for differences of choices made on the basis of setup location of the dependent variable (i.e. the location of the organic and non-organic consumables on different tables in the room). The chi-square test results for the setup location difference are reported in Section 5.3.3.

Testing for normality of the independent pre-experiment variables, in order to run t-test for group differences, I applied the Shapiro-Wilk normality test and visually checked the distribution of the data with histograms (Appendix X). The Shapiro-Wilk test is significant for all independent variables and thus indicates that all three variables are non-normally distributed. Furthermore, the histograms show some deviation from a normal distribution. Unlike with large samples were normality can be assumed based on the central limit theorem, the sample of this study is relatively small (N=134) therefore I will apply non-parametric tests (i.e. Mann-Whitney U) to check for differences between the groups of strangers and social network members on the pre-experiment variables (Howell, 1997). The results of the preliminary data testing are listed in Section 5.3.4.

Assumptions for the binary logistic regression are that the dependent variable should be binary and coded correctly so that factor level 1 equals the desired outcome.

Additionally, there should be no (multi)collinearity (Fields, 2013). The data met all the assumptions; the dependent variable was non-organic vs. organic consumption (coded 0 & 1 respectively) and there was no (multi) collinearity as shown by the variance inflation factor (VIF) below 10, the tolerance above 0.1 and correlations between factors below 4 (Landau & Everitt, 2004) (Appendix X). Therefore, a binary logistic regression was used to test Hypothesis 1. All variables were standardized for the logistic regression and results are reported in Section 5.3.5.

5.3.3. Preliminary data testing: Testing for differences between the setup positions of the consumables

There was no significant difference between the two different setups (i.e. front and back of the room, Table 5.1.) as shown by the chi –square test results (X^2 (1, N = 135) = 3.35, p = .067; Fischer's Exact test: p = .090, Table 5.2.) and therefore the results of both setup conditions where combined for the analyses.

Table 5.1. Descriptive data of setup conditions of non-organic vs. organic in the front

Variables			**Consumption**		**Total**
			Non-organic choices	**Organic choices**	
Setup	**Non-organic front**	Count	25	43	68
		Expected Count	20.1	47.9	68.0
	Organic front	Count	15	52	67
		Expected Count	19.9	47.1	67.0
Total		Count	40	95	135
		Expected Count	40.0	95.0	135.0

Table 5.2. Chi-square and Fischer's Exact test results comparing differences between the setup conditions of non-organic vs. organic in the front

	Value	Df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)
Pearson Chi-Square	3.35	1	.067	
Fisher's Exact Test				.090

5.3.4. Descriptive Results

The descriptive information for all independent variables is presented in Table 5.3. Participants self-reported past sustainable shopping behaviour varied from seldom (3) to sometimes (4) for social network members and from seldom (3) to often (5) for the strangers. Therefore past sustainable shopping behaviour centred around 4 (sometimes) for both groups and thus was not very high. The reported size of the social networks varied for both groups (social network group and strangers) between 6-30 people with means and medians around 4 (16-20 people). The percentage of sustainable shoppers reported in the social network members group varied between (19-51%) and that of the strangers group between (18-54%) with medians at 34% for social network members and 30% for strangers.

Table 5.3. Descriptive data for independent variables; number of participants, mean, standard deviation, standard error and median

	Social network members					***Strangers***				
Independent variables	*N*	*M*	*SD*	*SE*	*Mdn*	*N*	*M*	*SD*	*SE*	*Mdn*
Past sustainable shopping behaviour[a]	76	3.85	0.66	0.08	3.75	58	3.92	0.94	0.12	4
Degree category[a]	76	3.99	1.68	0.19	4	57	3.90	1.81	0.24	4
Percentage of sustainable shoppers[b]	73	34.95	16.13	1.89	34	55	35.84	17.87	2.41	30

[a] Variables were measured on a 7-point Likert scale.; [b] Variable was measured ranging from 0-100%.; [c] Variable was measured as an open-ended number entry in years.

Checking for group differences between the social network and stranger groups

To exclude the fact that social network members don't make organic food choices based on similarity of behaviour towards sustainable food shopping, thus homophilic

tendencies (e.g. McPherson, Smith-Lovin & Cook, 2001), prior sustainable food shopping behaviour levels will be evaluated and compared to the stranger group. Mann-Whitney U test results showed that there were no significant differences on the pre-experiment variables, age, percentage of sustainable network members, network size and past sustainable consumer behaviour, between the stranger and the social network group (Table 5.4.). Additionally chi-square test results showed no significant group differences on gender with both groups having a slightly higher female population than males (SN group: Females = 59.2%, Males = 40.8.7%) (Strangers group: Females = 63.8%, Males = 36.2%) (X^2 (1, N = 134) = .291, p = .590). Therefore, although the experimental group (i.e. social network pair group) was slightly larger than the control group (strangers pair group), they seemed to be not different on the variables of interest in this study or on socio demographics.

Table 5.4. Mann-Whitney U test results comparing strangers and social network member groups on pre-experiment variables

Pre-experiment variables	**Strangers vs. social network members**	***N***	***M Rank***	***U***	***P***
Age	Strangers	57	73.85	1775.50	.076
	Social network members	76	61.86		
	Total	133			
Percentage of sustainable network members[a]	Strangers	55	65.48	1953.00	.794
	Social network members	73	63.76		
	Total	128			
Network size (i.e. degree)[a]	Strangers	57	65.52	2081.50	.696
	Social network members	76	68.11		
	Total	133			
Past sustainable consumer behaviour[a]	Strangers	58	69.68	2077.50	.568
	Social network members	76	65.84		
	Total	134			

[a] Pre-experiment variables were measured on a 7-point Likert scale.

5.3.5. Predicting organic consumption from social network characteristics

The binary logistic regression analysis, run to test Hypotheses 1: Food discussions among social network members (vs. strangers) will positively predict organic food consumption over and above the effect of other social network factors (i.e. the number of sustainable shoppers in one's social network and one's network size). The regression analysis included social network factor discussion with a social network member (0=no (paired with stranger), 1=yes) and the dependent variable; organic consumption (0=no, 1=yes). Additionally, to correct for the influence of other social network factors two further independent social network variables, the percentage of sustainable shoppers within the network and the network size, were included in the model.

A Pearson chi-square test of the full model in relation to a constant only model revealed that the predictor variables, as a set, significantly distinguished between organic consumers and non-organic consumers (X^2 (4, N = 134) = 12.87, p < .05) (Table 5.5.). The Hosmer-Lemeshow test statistics also show that the data fits the model well ($X^2(8, N = 134)$ = 7.43, p = .491), as unlike in the Pearson chi-square test the p value needs to be above 0.5 to be significant (Lemeshow & Hosmer, 1982) (Table 5.5.). Overall the model explained 13.6 % of organic choices (Nagelkerke R square) with 90.0% of the organic consumable choices correctly predicted and 23.7% of the non-organic choices being predicted correctly by the model (Table 5.6.). The overall correctly predicted percentage was 70.3%. Discussion with a social network member significantly predicted organic consumption behaviour as indicated by the Wald criteria and significant levels (Wald = 9.87, p < .05, Table 5.5.), thus supporting H1. Exp(B) indicates that when people were paired with social network members they were 3.7 times more likely to choose organic consumption choices. The percentage of sustainable shoppers and the social network size, on the other hand, did not significantly predict organic consumption behaviour (i.e. percentage of sustainable shoppers: Wald = 2.99, p = .084; social network size: Wald = 0.02, p = .882, Table 5.5.).

A follow up chi-square test showed that social network members made significantly more organic consumption choices than strangers with 82.9% of social network

members choosing organic consumables vs. 53.4% of strangers (X^2 (3, N = 134) = 13.62, p < .001) (Table 5.7.).

Table 5.5. Binary logistic regression analysis predicting organic consumption behaviour with social network characteristics

Independent variables	Wald test						Effect size
	z	*df*	*P*	*B*	*SE*	*Exp(B)*	*Nagelkerke* R^2
Discussion with network members (vs. strangers)	9.87	1	.002	1.30	.41	3.66	.136
Percentage of sustainable shoppers	2.99	1	.084	.39	.22	1.47	
Network size	.02	1	.882	.03	.21	1.03	

Notes: Model performance: (1) Hosmer-Lemeshow test; $X^2(8, N=134)$ = 7.43, p = .491; (2) Model fit: $X^2(3, N=134)$ = 12.87, p < .05. Note: With the Hosmer Lemeshow test the model is rejected when the p-value below .05, (Lemeshow & Hosmer, 1982). The model fit based on Pearson's chi-square test rejects the model with a p-value above .05 (Landau & Everitt, 2004). Wald test: measures independent factors contribution to model (significant contribution = p < .05) (B (with SE) indicates the direction of the relationship with organic consumption behaviour (- negative & + positive). Exp. (B) shows the odds ratio of organic consumption behaviour per unit increase of the independent variable (<1 = decrease, > 1= increase) (Burns & Burns, 2008).

Table 5.6. Observed organic consumption choices and predicted choices by the logistic regression

		Predicted		
		Organic consumption		Percentage Correct
Observed		No	Yes	
Organic consumption	No	9	29	23.7
	Yes	9	81	90.0
Overall Percentage				70.3

Table 5.7. Chi-square results comparing organic and non-organic consumption choices in stranger vs. social network member groups

Discussion with	Organic consumption	Frequency	Percentage

Stranger	No	27	46.6
	Yes	31	53.4
	Total	58	100.0
Social network member	No	13	17.1
	Yes	63	82.9
	Total	76	100.0

5.4. Discussion

This experimental study investigated the influence of the discussion of food matters (i.e. the attitude towards sustainable food shopping behaviour) with a social network member (vs. a stranger) on organic consumption behaviour. The study, further, corrected for the effect of two other social network factors; the percentage of sustainable shoppers in the network, social network size.

Discussion with a social network member, significantly predicted organic consumption behaviour. Overall 14% of consumption behaviour was explained by this factor. Discussing attitudes (i.e. injunctive norms) towards sustainable food shopping with a social network member compared to a stranger proved to be a more useful concept when trying to understand organic choices made (i.e. 90% of organic choices were predicted correctly) than the non-organic choices (i.e. 23.7% of non-organic choices predicted correctly). This seems to indicate that social network members have a stronger influence on organic consumer behaviour than non-organic consumer behaviour as indicated by the fact that 82.9% of social network members chose organic consumables compared to 17.1% choosing non-organic consumables.

Thus, making salient injunctive norms by revealing the attitude towards sustainable food consumer behaviour of in-group or social network members, as suggested by the Social Identity Theory (Tajfel & Turner, 1979; 2004) and Self-Categorization Theory (Turner et al., 1987), seems to be a successful strategy to increase organic consumer behaviour in these groups. This reasoning seems to also be reflected in the lower organic behaviour choices made in the strangers group where organic consumables were only chosen 53.4% of the time. The reason for the lower number of organic consumable choices in the social network group is that knowing about the injunctive norm (i.e. the attitude towards sustainable food consumer behaviour) of the stranger is more likely to have the opposite effect as people try to distinguish themselves from the out-group (i.e. Social Identity Theory, Tajfel & Turner, 1979, 2004; Self-Categorization Theory, Turner et al., 1987). This drive to distinguish oneself from the out-group may result in opting for the opposite choice as the stranger. This was reflected by the choices people made: half of this group went for the organic options and the other half for the non-organic options.

It might also be possible that rather than the salience of injunctive norms being responsible for the increase in organic consumption behaviour, descriptive situational

norms or social pressure might explain the differences between social network members and strangers. In other words, it might be possible that observing a social network member making organic consumption choices (i.e. observing a situation based descriptive norm) or feeling under pressure to make the same choice as the social network member (social pressure) might have led to an increase in this behaviour in the group. However, I was unable to separate discussion members when they made their choices so as to not arouse suspicion about the actual behaviour measure, nor was I able to record which member made the first choice, therefore I am only able to speculate about the underlying normative mechanism of the influence of social network members on the consumption choices.

Both groups (i.e. strangers and social network members) showed similar initial scores of relatively low past sustainable behaviour (i.e. sometimes) and reported social networks that varied similarly in size and sustainable shopping members. Nevertheless, the organic consumption behaviour displayed varied significantly between the groups suggesting that social network members influenced each other when making their choices. A number of social network researchers might argue that the similarity of their choices was down to their similarity in other characteristics such as demographics or attitudes and beliefs (i.e. homophily, the tendency to associate yourself or bond with similar others, Lazarsfeld, & Merton, 1954, for reviews see McPherson et al., 2001 or Huston & Levinger, 1978). Huston and Levinger (1978), for example, reviewed a large amount of experimental literature that showed that similarity in beliefs, attitudes and values often leads to mutual attraction and interaction. In other words, these researcher would argue that the significantly increased amount of organic consumption behaviour shown by the social network member group indicates that people are friends on the basis of the similarity of their attitudes and values and therefore display a similarity in behaviour. On the other hand, there might be more than homophilic tendencies influencing behaviour. The similarity of the initial behaviour with the strangers group and the increase of behaviour seems to point to a directional causality of influence of social network members on sustainable consumption behaviour rather than the other way round. Centola's (2011) findings seem to support my suggestion that having a homophilious relationship (e.g. thus being friends with somebody because of similar demographics, beliefs or friends) can actually provide a good foundation for social influence. He found that people that were put together in an artificial network based on demographic homophilious factors influenced each other significantly more on the uptake of a health related diet than those that were just put in a random network. This seems to imply that homophily and influence can function in

both directions suggesting that social network members can be helpful when trying to change behaviour.

Furthermore, the study corrected for the effect of other social network factors that might be linked to the descriptive norm information of the participants' social network. Unlike the discussion with a social network member factor, the other two social network factors, the percentage of sustainable shoppers and the social network size, did not predict organic consumption behaviour. I speculate that the information about the number of sustainable shoppers, thus the descriptive norm of the wider social network and not just the person involved in the task was not made salient in this experiment. The information about the percentage of sustainable shoppers was retrieved as a survey question but not discussed. I argue that mere retrieval did not influence the behaviour of the participants as it was not enough to make it salient in the situation. Additionally, the number of social network members was not a significant predictor as again this information was not made salient and thus was not important for the decisions made in this experiment.

One could further speculate that the influence of both, the social network size and the number of sustainable shoppers in the network, is a more indirect one as found in previous research (Schubert, de Groot, et al., 2015) which showed that the relationship between the number of sustainable shoppers, network size and sustainable food purchasing behaviour was mediated by descriptive norms. Based on Social Identity Theory (Tajfel & Turner, 1979; 2004) descriptive norms of the in-group (i.e. social network) are assumed to be adopted by social network members. It is, however, also possible that should the discussion topic between social network members have focussed on the number of sustainable shoppers in the network rather than past shopping behaviour or attitude about sustainable shopping, for example, then this could have triggered the descriptive norm in relation to the prevalence of sustainable shopping in the network instead. This in turn might have meant that there could have been a direct relationship with the organic consumption behaviour. Future research could try to disentangle whether there is a difference between the influences of the different types of norms that might be revealed in the discussions. For example, are there differences in the influence if the discussion focusses on the overall sustainability of the network (i.e. network descriptive norm) compared to a social network members behaviour (i.e. network member's descriptive norm). Furthermore, is the combination of descriptive (i.e. past sustainable shopping behaviour) and injunctive norms (i.e. attitude towards sustainable food shopping), as applied in this study, more successful in

influencing sustainable behaviour than just applying one or the other as found in other research (Cialdini et al., 2006; Schultz et al., 2007).

Additionally, of course, the experimental situation created was unique in that negative consequences were removed from the sustainable consumption situation (i.e. no increased cost or inconvenience) thus making people feel able to choose more sustainable options (i.e. organic consumables in this case) which they would do so as most people believe it is the 'right thing to do' (e.g. De Groot & Steg, 2007, 2009). To validate the findings it would be necessary to repeat this experiment under more realistic conditions to investigate if the social influence of network members is strong enough to overcome negative consequences or barriers naturally inherent in sustainable consumption situations such as increased cost (Robinson & Smith, 2002) or food shopping habits (e.g. Magnusson et al., 2001; Padel &Foster, 2005; Aertsens et al., 2009). Nevertheless it seemed suprisingly easy to influence people's sustainable consumption behaviour despite reported relatively low past sustainable food consumption behaviour (i.e. sometimes). Therefore it might be possible to develop social marketing strategies and interventions which could harness the power of social networks in situations where new norms can be made salient and behaviour can be changed. This might also provide opportunities to break old habits and create new ones (Verplanken, 2011, Verplanken & Wood, 2006). Naturally, this also leads to questions such as; how stable is the behaviour change effect is, will it disappear again once the social network members have separated, and could a more stable habit be established with repeated exposure?

Experimental studies in general have advantages and disadvantages (Lilienfeld et al., 2011). One major advantage being that one can isolate and study causal factors as I have done in this study. This also means that the results should be clear cut and causal inferences can be drawn if the study is designed well. However, the isolation of one factor might also distort the validity of the importance of the obtained results to the extent that it is unknown how relevant the isolated factor is outside of the laboratory environment where numerous other external factors are at play which was discussed in relation to this study in the paragraph above. Additionally, the necessity of the highly controlled design for the experiment means that errors are possible which would lead to the non-replicability of the experiment results. I have repeated the same experiment in two consecutive years and tested whether the results where different in either experiment, which they were not (Appendix XI). These findings lead me to conclude that the experimental findings are valid for the laboratory and could be replicated.

Finally, although the sample of the study was varied it was nevertheless a particular cohort of individuals that enjoyed learning new things and was open to new experiences. Since this applied to both groups, strangers and social network members, and I established that both groups were matched on key demographic and pre-experimental variables I feel confident that the particular cohort had no significant impact on the results of this study.

The findings from this research, if replicated outside the laboratory, could suggest new routes into changing sustainable consumer behaviour. Findings suggest it might be most successful to focus on bottom-up approaches of behaviour change which focus on small-scale social network influence. Recent simulation research has found similar results which suggest that small networks with small numbers of sustainable shoppers lead to the fastest uptake of behaviour (Schubert, Newton, de Groot, 2015, Chapter 6). The positive news is, the current study and the simulation study seem to suggest that no large numbers of already established sustainable consumers are needed to change the mind of others to change their consumer behaviour. Additionally, the findings seem to suggest that the influence of social network members might be strong enough to change sustainable consumer behaviour regardless of the initial situation.

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Chapter 6: Influence of social networks on sustainable food purchasing behaviour explored with an empirically grounded agent-based model

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Chapter abstract

This study reports an agent-based model (ABM) grounded in psychological theory and empirical data to understand the spread of sustainable food purchasing behaviour. Specifically, the ABM was used to examine how three social network factors (i.e. network size, percentage of sustainable consumers and percentage of food discussion partners) influence the spread of behaviour via psychological predictors of purchasing behaviour (i.e. intention, habit, personal and descriptive norm). The agents in the model were individual consumers. The three social network factors were systematically varied in the decision making process of the agents. Findings provide evidence that there is a threshold effect during the spread of sustainable food purchasing behaviour. The rate of spread of behaviour change was higher in smaller networks and in those with a lower initial proportion of sustainable consumers. These results suggest that interventions aimed at increasing sustainable food purchasing behaviour could usefully target individuals through social networks.

6.1. Introduction

Reconciling the need to feed the growing human population while avoiding intensification of environmental degradation represents a significant societal challenge. One potential solution is to encourage a shift towards consumption of sustainable food products, which are associated with relatively low environmental impacts (Defra, 2011a, 2011b; UNEP, 2012). Sustainable food purchasing has been identified as a key behaviour for sustainable development in many government action frameworks, such as the UK's sustainable lifestyles framework (Defra, 2011b), which target a number of

underlying sustainability issues. Based on the definition of sustainable development and following the guidelines of major non-governmental organisations such as Sustain (i.e. a UK charity promoting sustainable food), for the purpose of this study, food is defined as sustainable if it is environmentally, socially and economically sustainable. Within this category falls food which is organic, fairtrade, locally produced, food with reduced or no packaging and meat and animal products that protect the welfare of animals and wild species (e.g. free range or Freedom Food). In a recent European survey of participants from all 28 countries showed that 21% of people in the EU buy environmentally friendly products with the UK lying slightly higher at 22% (European Commission, 2014). Organic food purchases in the UK are rising again after a dip during the recent recession and 4 out 5 households now buy some organic products (Soil Association, 2015). However, organic food purchasing still only accounts for 1.3% of all food and drinks products purchased in the UK (Soil Association, 2015).

The aim of this study is to explore how an increase in sustainable food purchasing behaviour can be achieved in practice. We address this by developing an agent-based model (ABM), firmly grounded in prominent psychological theories (i.e., Theory of planned behaviour, norm activation model and theories in habits) in relation to sustainable food purchasing behaviour, extended with social network theories. The ABM incorporates empirical evidence, and is used to systematically examine how changes in social network characteristics might influence sustainable food purchasing behaviour.

6.1.1. Psychological predictors of sustainable food purchasing behaviour

Numerous researchers have investigated factors influencing sustainable food purchasing behaviour (e.g. Aertsens, Verbeke, Mondelaers, & Van Huylenbroeck, 2009; Arvola et al., 2008; Campbell-Arvai, Arvai, & Kalof, 2012; de Barcellos, Krystallis, de Melo Saab, Kügler, & Grunert, 2011; Klöckner & Ohms, 2009; Padel & Foster, 2005; Tarkiainen & Sundqvist, 2005; Vermeir & Verbeke, 2006). These studies consistently show that two psychological factors seem to dominate in the explanatory power of sustainable purchasing behaviour, namely behavioural intentions and habits.

The intention toward sustainable food purchasing behaviour indicates how hard people are willing to strive to perform the behaviour. One of the most prominent theories used

in Environmental Psychology, the theory of planned behaviour (TPB, Ajzen, 1985), explicitly assumes that intention is the most important predictor for actual behaviour. In line with this assumption, numerous studies, reviews and meta-analyses provide support for this assumption in the domain of sustainable behaviour in general and in sustainable food purchasing behaviour specifically (e.g. Aertsens et al., 2009; Bamberg & Möser, 2007; Klöckner, 2013).

Habits have been defined as frequently performed (e.g. daily) activities in the same behavioural and situational context, with little conscious deliberation, which tend to be relatively stable over time (Wood, Quinn, & Kashy, 2002). Due to the automaticity of habits they are often seen as barriers to sustainable behaviour change. More specifically, it has been suggested that food purchasing behaviour is a low level cognitive activity characterised by subconscious repetitive behaviour, especially in the developed world (Fischer & De Vries, 2008; Thogersen, Jorgensen, & Sandager, 2012). Consequently, many studies explaining environmentally significant behaviours, such as sustainable food purchasing behaviours, include habits in their models (Klöckner & Verplanken, 2012; Verplanken & Wood, 2006). Such studies show that habits are an important direct predictor of sustainable shopping behaviour (e.g. Honkanen, Olsen & Verplanken, 2005; Padel and Foster, 2005), even when behavioural intention is also included in the model (for a meta-analysis see Klöckner, 2013).

Two important antecedent predictors of intention and habits are descriptive and personal norms (Aertsens et al., 2009; Klöckner & Ohms, 2009; Tarkiainen & Sundqvist, 2005). Descriptive norms are included in prominent theories, such as the Norm Activation Model (NAM, Schwartz, 1977) and the TPB (Ajzen, 2002). Descriptive norms can be described as perceptions of how others behave in certain situations (Cialdini, Kallgren, & Reno, 1991). In other words, descriptive norms express what people perceive as typical and normal behaviour by others. Personal norms are feelings of moral obligation to behave in a certain way (Schwartz & Howard, 1980). We propose that an increase in sustainable food purchasing behaviour could be achieved by changing existing descriptive and personal norms via an individual's social network, as explained below.

6.1.2. Social network factors influencing sustainable food purchasing behaviour

Although researchers have made great progress in identifying how psychological factors explain sustainable food purchasing behaviour, they have largely neglected the role of social networks. In order to understand how behaviour spreads, it is vital to understand the role social networks play in this process (Holtz, 2011; Squazzoni, Jager, & Edmonds, 2014). Reasons for the lack of research involving social networks are that collecting social network data can be time consuming, expensive and often it is difficult to determine the natural boundaries of a social network (Carrington, Scott, & Wasserman, 2005). The scant empirical evidence available provides some support for relationships between social networks, sustainable practices and consumer behaviour. Research suggests that social networks (i.e. friends, family, colleagues, important others) influence sustainable behaviour via psychological predictors, such as descriptive and personal norms (Fielding, Terry, Masser & Hogg, 2008; Schubert, de Groot, Newton and Lubbers, 2015). These results are in line with a recent meta-analysis of Klöckner (2013). The meta-analysis was based on 56 different data sets with factors from the theory of planned behaviour, norm activation model and habit. The study found that of the normative influence only descriptive and personal norms significantly predicted environmental behaviour. Therefore this study only focuses on these two norms.

Research into the influence of social networks on sustainable agricultural practices found that descriptive norms of in-groups predict intentions toward sustainable behaviour, which in turn influenced sustainable behaviour (Fielding et al., 2008). Schubert et al. (2015) investigated the influence of social network factors on sustainable food purchasing behaviour in relation to psychological predictors from main environmental psychology theories (i.e. theory of planned behaviour, norm activation model and habit theories). Findings showed that three social network factors were especially important in relation to sustainable food purchasing behaviour: the number of sustainable consumers within a network, the size of the network, and the number of food discussion partners within a network. In this context, ‘discussion partners’ refers to the people within an individual’s social network with whom they discuss food purchasing choices. These social network characteristics influenced sustainable food purchasing behaviours via their influence on mainly descriptive norms. Consistent with other research (e.g. Klöckner, 2013), descriptive norms were directly related to

personal norms and were found to indirectly influence sustainable purchasing behaviour (Schubert et al., 2015).

The direct influence of social network characteristics on descriptive norms, and their indirect effect on actual sustainable food purchasing behaviour, appears to be in line with Social Identity Theory (Tajfel & Turner, 1979, 2004) and its extension, Self-Categorization Theory (Turner, Hogg, Oakes, Reicher, & Wetherell, 1987). These theories suggest that social norms (i.e. descriptive norms) are made salient on the basis of self-categorization to distinguish oneself and the in-group (i.e. one's social network) from the out-group. These theories also assume that behaviour is influenced through the internalisation of group norms or descriptive norms of relevant social network groups. This assumption is in line with the mediating role of descriptive norms between social networks and sustainable behaviour, which has been found in empirical research (Fielding et al., 2008; Schubert et al., 2015).

In summary, based on the empirical evidence above, it appears that social networks most strongly influence sustainable food purchasing behaviour via descriptive norms of people's social networks. In this study we therefore focus on the three social network factors that were found to be relevant to influence descriptive norms (Schubert et al., 2015). These include the personal network size, the percentage of sustainable consumers and food discussion partners within a network. In addition, we focus on the most significant predictors of sustainable food purchasing behaviour that are influenced by descriptive and personal norms (as these are strongly influenced by descriptive norms, e.g. Klöckner, 2013) which are intention towards performing the sustainable behaviour and habits (see Klöckner, 2013). A representation of how the three social network characteristics influence sustainable purchasing behaviour via relevant psychological factors is shown in Figure 6.1.

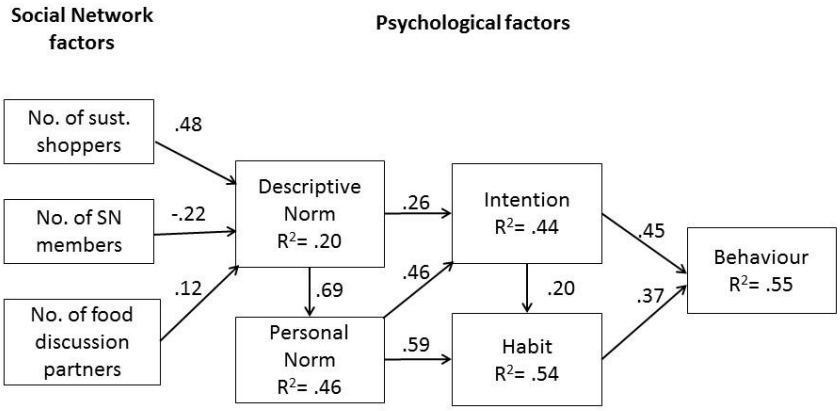


Figure 6.1. Representation of research model

Notes. Explained variance and beta weights of psychological and social network factors identified in a questionnaire survey of sustainable shopping behaviour by Schubert et al. (2015). Relationships between social network and psychological factors were identified by a structural equation model, and are supported by theories in environmental psychology (see text). For further details of this investigation, see Methods. Figures within the boxes titled R^2 refer to the overall explained variance by the predictors of the factor. Figures above the lines refer to beta weight coefficients of the predictor variables.

6.1.3. Applying agent-based modelling to understand the spread of sustainable food purchasing

It is extremely difficult to understand the aggregated behaviour of a group of people that interact over a length of time, owing to the interactive effects between individual behaviour and social dynamics and structures (Squazzoni et al., 2014). Therefore methods are needed that can integrate micro-, meso- and macro level factors that facilitate research on the complex interactions between societal changes and individual behaviour change. Social simulation, a research field that is rapidly growing, applies

computational methods to understand complex phenomena such as the spread of sustainable behaviour in social networks through the application of simulation tools.

Agent-based models (ABMs) are simulation tools that can be used to understand the interaction between individual decision making behaviour of heterogeneous agents and emerging macro-phenomena such as the spread of behaviour (Janssen, 2005). ABMs are comprised of rule-based 'agents' representing humans that interact dynamically and can create real-world-like complexities through designed algorithms (Bonabeau, 2002). They enable simulation of behavioural processes within and between actors and their environment (Jager & Mosler, 2007). Most ABMs are comprised of the following elements: (1) numerous agents; (2) decision making heuristics (rules of thumb); (3) learning rules or adaptive processes; (4) an interaction structure; and (5) a non-agent environment (Garcia & Jager, 2011). ABMs are an increasingly popular choice for tackling complex real life phenomena such as consumerism, societal behaviour change and diffusion dynamics (e.g. Garcia & Jager, 2011; Gilbert, Jager, Deffuant, & Adjali, 2007; Holtz, 2011; 2014). This popularity can be attributed to the fact that ABMs can be used to perform large-scale artificial experiments with different combinations of factors to produce and understand macro-level phenomena. Indeed the advantage of ABMs over alternative research methods lie in the fact that ABMs enable researchers to run a multitude of experiments examining complex combinations of factors and their interactions, which would be difficult to achieve with field or controlled experiments (Delre, Jager, Bijmolt, & Janssen, 2010).

A number of ABMs have investigated the spread of behaviour in green consumerism focussing on sustainable food (e.g. Bravo, Vallino, Cerutti, & Pairotti, 2013; Janssen & Jager, 2002), sustainable transport (e.g. Bravo et al., 2013; Köhler et al., 2009), diffusion of green technology and energy saving innovation (e.g. Cantono & Silverberg, 2009; Chappin & Afman, 2013; Linkola, Andrews, & Schuetze, 2013; Schwarz & Ernst, 2009; Tran, 2012; Zhang & Nuttall, 2011). Most of these studies have investigated the interplay between micro and macro factors, namely individuals and their environment, such as manufacturers or shops. For example, Janssen and Jager (2002) modelled the coevolution of firms and consumers in the diffusion of green products. Bravo et al. (2013), in contrast, focussed on testing policy scenarios in relation to reducing greenhouse gas emission through household consumption.

Our study contributes to the literature in three ways. First, we investigate the combination of psychological factors and specific social network characteristics to understand how an increase in sustainable consumption behaviour may be achieved,

which has not been previously examined. Second, our study addresses a recent call for more psychologically realistic models validated with empirical evidence (Kiesling, Guenther, Stummer, & Wakolbinger, 2012; Squazzoni et al., 2014). To achieve this, our model includes established psychological predictors of sustainable consumer behaviour and empirical data. Third, we test a new method developed by Lorscheid, Meyer, Pakur, & Ringle (2014) in which the results of structural equation modelling (SEM) are applied in the parameterization of variables incorporated in the ABM.

This paper presents an ABM grounded in both psychological theory and in empirical evidence that investigates how social networks can influence individual sustainable food purchasing behaviour. The ABM is based on key factors from main environmental psychology theories of sustainable consumer behaviour; i.e. factors from the TPB (i.e. intention and descriptive norm, Ajzen, 2002), NAM (i.e. personal norm, Schwartz, 1977) and habit theories (i.e. sustainable behaviours as habits, e.g. Aarts, Verplanken, & Knippenberg, 1998; Verplanken, Aarts, Knippenberg, & Moonen, 1998). Therefore, the key psychological factors included in the ABM are: intention, habit, and personal and descriptive norms. The relationships between these psychological factors are based on the meta-analysis findings presented by Klöckner (2013). Additionally the ABM includes three social network factors that most strongly influenced descriptive norms towards sustainable food purchasing behaviour in past research (Schubert et al., 2015)

We used the ABM to investigate two research questions:

RQ1: Is the spread of sustainable food purchasing behaviour in a social network characterised by a threshold response?

RQ2: What is the influence of social network characteristics (i.e. number of sustainable network members, personal network size or number of food discussion partners), mediated by descriptive norm, personal norm, habit and intention, on the rate and pattern of spread of sustainable food purchasing behaviour in a social network?

6.2. Method

6.2.1. Empirical data applied to ABM

The SEM that provided empirical grounding for the ABM was derived from an online survey of 474 UK participants (Schubert et al., 2015). The participant sample was broadly representative of the adult UK population with 42.6% male and 57.4% female participants with a mean age of 48.6 years (SD = 13.9, ranging from 19-78), with a wide range of political views and ethnic backgrounds. The survey included questions on the main psychological predictors of sustainable food purchasing behaviour and self-reported frequency of sustainable food shopping behaviour. The psychological predictors measured included intention, habit, perceived behavioural control, attitude, descriptive-, injunctive- and personal norms. Additionally the survey collected ego-network information from participants. This information consisted of reported social network data from the participant's point of view, including nine social network characteristics such as social network size, number of sustainable consumers in the network, number of food discussion members, number of food consumption members, number of people consuming food together, number of members directly influencing food purchasing decisions, density, closeness and social context diversity. The SEM model was derived from the data and identified relationships that have previously been indicated in the psychological research literature (see Klöckner, 2013). The SEM of Schubert et al.'s study had an acceptable fit (χ^2= 209.07 *df* = 40 $p < 0.001$, CFI = 0.94, TLI = .875, SRMR = 0.06 $p < 0.001$), which was similar to fit statistics of other psychological research in the field of sustainable consumer behaviour (e.g. Klöckner, 2013). New relationships found in this study were those that linked social network characteristics (i.e. number of sustainable consumers within the network, the personal network size and the number of food discussion partners within a network) with psychological predictors of sustainable food purchasing behaviour (i.e. descriptive norms), which in turn showed strong relationships with personal norms and direct predictors of sustainable consumer behaviour. Owing to the complexity of the overall SEM we applied a reduced version, focussing only on these new relationships, to build the ABM (see Figure 6.1.).

6.2.2. Experimental design

The experimental design of the ABM was based on findings from empirical data among a representative UK sample in which nine social network factors together with popular psychological factors were included in a structural equation model (SEM) to explain sustainable food purchasing behaviour (Schubert, et al. 2015). The SEM showed that the relationship of three social network factors in particular were important to explain sustainable food purchasing behaviour, that is, network size, number of sustainable consumers in the network and number of discussion partners in the network. The influence of these social network factors on sustainable food purchasing behaviour was mediated via descriptive norms, which influenced personal norms. Therefore we chose to manipulate these three social network factors to explore how a variation of these factors influences the spread of sustainable behaviour via norms and direct predictors of sustainable consumer behaviour.

To obtain the variation in the size of the personal networks, we modified the initial size of the overall social network (50, 70 and 100 consumers) rather than the personal network sizes to include an element of stochasticity. The percentage of sustainable consumers and discussion partners were similarly defined for the whole social network, with values of 10%, 30% and 50% for the same reason. The percentage variations for sustainable consumers and discussion partners were chosen based on those given in the literature (European Commission, 2014; Soil Association, 2015) and our own survey findings (Schubert et al., 2015). Behaviour that can be identified as sustainable food purchasing behaviour, such as buying environmentally friendly products as well as organic produce, has been reported to vary between 20%-80% of the population buying some products in the UK and other European countries (European Commission, 2014; Schubert et al., 2015; Soil Association, 2015). Additionally, our results showed that people reported that on average 35% of their personal network members bought sustainable products. They also reported that they had food discussions with about 38% of their personal network members. To explore lower and higher levels of initial sustainable consumer percentages and discussion partner percentages we chose settings that covered our own results and those reported in the literature with three settings varying between 10%, 30% and 50%. Values for the network size of the personal networks, percentage of sustainable consumers and percentage of discussion

partners that were generated by the ABM for each experimental scenario are reported scenario are reported in Table 6.1.

Table 6.1. Experimental settings for 3*3*3 independent variable combinations. Values of the variables generated by the ABM are presented, for each experimental setting.

Experiment numbers	**Experimental settings**			**Mean (±SE) of values generated by the ABM for independent variables**		
	Overall Network size	%Sustainable shoppers	%Discussion partners	Personal network size	%Sustainable shoppers	%Discussion partners
ES1	100	50	50	29.12 (0.16)	49.93 (0.32)	49.74 (0.38)
ES2	100	50	30	29.05 (0.16)	49.47 (0.32)	29.36 (0.30)
ES3	100	50	10	29.07 (0.16)	50.45 (0.33)	9.8 (0.19)
ES4	100	30	50	29.39 (0.17)	30.25 (0.32)	49.23 (0.38)
ES5	100	30	30	29.29 (0.16)	30.22 (0.30)	29.61 (0.30)
ES6	100	30	10	29.38 (0.16)	30.11 (0.29)	10.01 (0.22)
ES7	100	10	50	29.18 (0.17)	10.25 (0.20)	49.42 (0.38)
ES8	100	10	30	29.09 (0.16)	10.35 (0.20)	30.26 (0.31)
ES9	100	10	10	29.15 (0.16)	10.09 (0.19)	9.92 (0.20)
ES10	70	50	50	20.39 (0.13)	50.37 (0.27)	49.84 (0.30)
ES11	70	50	30	20.33 (0.12)	50.17 (0.25)	29.75 (0.26)
ES12	70	50	10	20.34 (0.12)	50.24 (0.26)	10.22 (0.17)
ES13	70	30	50	20.15 (0.12)	30.47 (0.24)	49.68 (0.29)
ES14	70	30	30	20.28 (0.12)	29.98 (0.26)	29.84 (0.26)
ES15	70	30	10	20.25 (0.12)	30.01 (0.22)	10.02 (0.15)
ES16	70	10	50	20.31 (0.12)	9.97 (0.17)	50.21 (0.31)
ES17	70	10	30	20.29 (0.12)	10.17 (0.16)	29.95 (0.26)
ES18	70	10	10	20.30 (0.12)	10.17 (0.16)	9.92 (0.16)
ES19	50	50	50	14.52 (0.10)	49.70 (0.22)	49.62 (0.24)
ES20	50	50	30	14.58 (0.10)	49.70 (0.22)	29.24 (0.21)
ES21	50	50	10	14.34 (0.10)	50.12 (0.22)	9.62 (0.14)
ES22	50	30	50	14.40 (0.10)	30.48 (0.21)	50.04 (0.23)
ES23	50	30	30	14.39 (0.10)	29.36 (0.21)	29.86 (0.22)
ES24	50	30	10	14.45 (0.10)	30.46 (0.21)	10.06 (0.15)
ES25	50	10	50	14.36 (0.10)	10.30 (0.13)	50.36 (0.25)
ES26	50	10	30	14.42 (0.10)	10.18 (0.14)	29.98 (0.23)
ES27	50	10	10	14.40 (0.09)	.6 (0.15)	10.30 (0.14)

6.2.3. Model setup

The ABM[1], written in NetLogo 5.01 (Wilensky, 1999), was designed to simulate the behaviour change process of individual agents (i.e. consumers) from an unsustainable to a sustainable consumer. The initial setup of the model includes a mix of unsustainable and sustainable consumers with the exact percentages (10%, 30% or 50%) depending on the experimental setup. Each consumer was embedded in a personal network or social circle, which was linked to other social circles forming one large social network varying between 50, 70 or 100 agents depending on the experimental setting (see Figure 6.2.). The size of each agent's *personal network* was determined through the number of possible connections between agents that were constrained by a link radius, meaning that agents were only able to be linked to other agents within a certain radius (kept constant during the study). This type of social network model, including social circles, was chosen based on research suggesting that popular types of social network models applied in ABM do not adequately replicate all the structures of real-life social networks such as the size, the variations in the number of relationships from individual to individual, and the display of high clustering (Hamill & Gilbert, 2010). For the setup of the social network we applied elements from the social network model developed by Watts (2010) as a starting point, such as the use of the link radius (i.e. the creation of social circles) to form personal networks within a larger social network.

[1] The ABM model can be found at: https://www.openabm.org/model/4818/version/1/view'

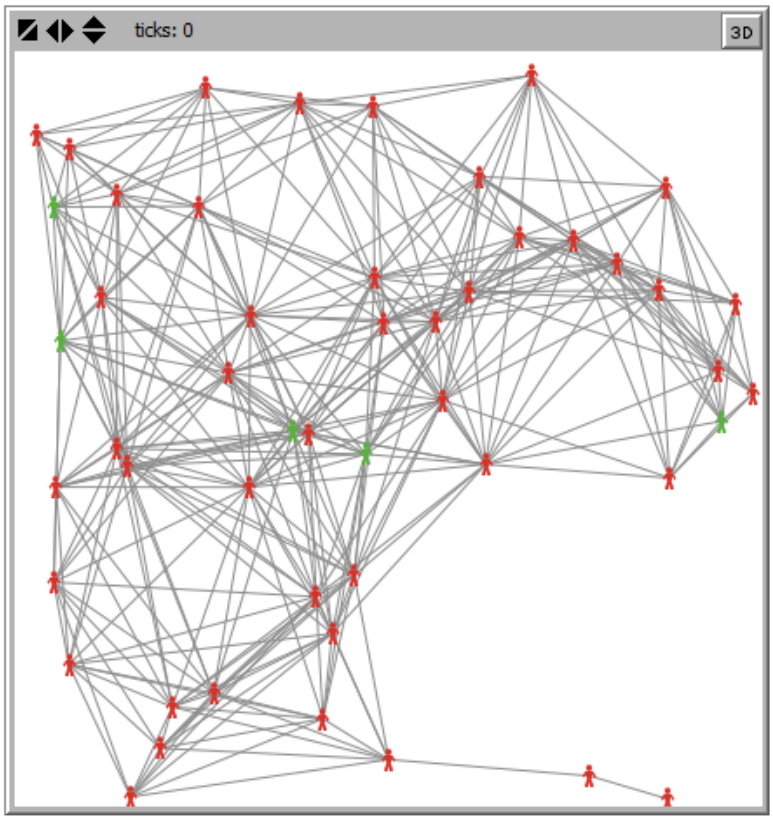


Figure 6.2. Example of a social network created in the ABM for sustainable shopping behaviour.
Green figures are sustainable consumers and red figures unsustainable consumers. Connecting lines between agents illustrate relationships within a social network, generated by the ABM.

The *decision making process* for each agent (see Figure 3) followed a sequential procedure based on the SEM data described above, and as applied by Lorscheid et al. (2014). All steps of the decision making process were performed at the same time step (tick), with each time step represented by a single tick in the ABM. Time steps (i.e. ticks) have no literal meaning as real time but represent the time taken for an agent to make a decision. However, only one agent at a time went through the decision making process at each time step. Each experimental setting was run for 3500 ticks, a value that was chosen based on the fact that this was sufficient time for the simulation to reach saturation in terms of the process of behaviour change.

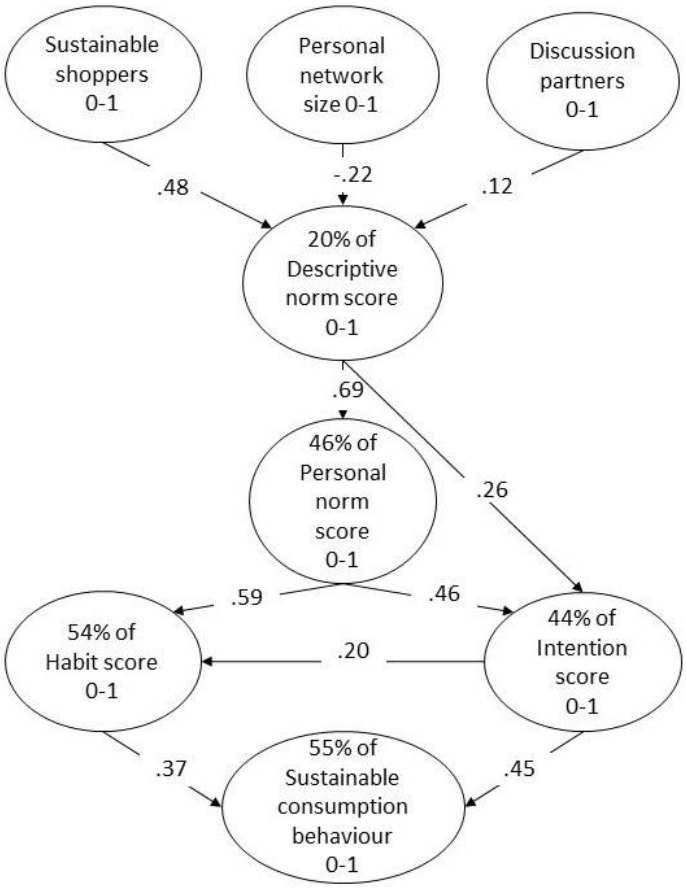


Figure. 6.3. Single agent decision making process as incorporated in the ABM.

Notes. Each single agent will decide whether to become a sustainable consumer or stay unsustainable based on the decision process depicted above. The process is based on the results of the SEM of questionnaire survey data (Schubert et al., 2015). The figures on the lines represent beta weight coefficients applied to calculate the individual weighting of the predictor, i.e. the strength of the influence of the predictor on the variable. The figures in the circles represent the possible total explained variance for each factor based on the SEM data. Therefore agents are only influenced to a certain amount (i.e. the percentage of the explained variance) by the predictor variables and the rest of the time the factor score is based on chance.

In the decision making process each agent explicitly decided whether to become a sustainable consumer or remain unsustainable (unless already sustainable from the outset). The process each agent applied was based on the SEM and is depicted in Figure 6.3. In the first step of the decision making process the three social network characteristic (i.e. personal network size, percentage of sustainable consumers in the personal network and percentage of discussion partners in the personal network) influenced descriptive norms. Each social network factor was calculated separately and the achieved score was multiplied by the beta weight coefficient from the SEM to

weight the relative importance of each factor in forming the descriptive norms score (i.e. social network: -0.22, sustainable consumers: 0.48, discussion partners: 0.12). The personal network size was set by counting all agents that were linked to the individual agent. Additionally the model counted the number of agents in the personal network that were sustainable consumers at the outset together with the number of discussion partners. Classification of an agent as a sustainable consumer or as a discussion partner was not mutually exclusive; both were determined as a randomly selected subset of the total number of agents. Values of all network factors were transformed to proportions (i.e. on a scale of 0-1) for comparability of the weighted social network factors. Note that values of the personal network size score were inverted owing to the fact that the relationship between personal network size and descriptive norms was found to be negative in the questionnaire survey (see Schubert et al., 2015). A *descriptive norm score* was calculated by creating a mean score from the three weighted social network factor scores. However, this score was only applied 20% of the time as indicated by the SEM (i.e. only 20% of participants' descriptive norm scores were explained by the social network factors). Therefore, 80% of the time the descriptive norm score (in the ABM) was a random value of between 0-1.

The second step calculated the *personal norm score.* This was calculated through multiplication of the descriptive norm score by the regression coefficient (0.69), again to weight the importance of the influence of descriptive norms on personal norms as found in the SEM. Personal norm was assigned a random value between 0-1 for 31% of the time, again to reflect the empirical results obtained that only 46% of this score could be explained through descriptive norms. The *intention score* was calculated by calculating a mean score from the weighted personal norm and descriptive norm scores, which were multiplied by their respective coefficients (0.46 and 0.26) derived from the SEM. The intention score was randomly assigned 56% of the time. Similarly the *habit score* was calculated by creating a mean from the intention and personal norm scores multiplied by their weights (0.20 and 0.59 respectively), and was generated randomly 46% of the time. Finally the habit and intention scores were multiplied with their respective weights (0.37 and 0.45 respectively) and a mean score was calculated to create the *sustainable behaviour score*. Values of this score were defined randomly 45% of the time. Sustainable consumer behaviour was conceptualised as a binomial variable, hence if a consumer received a sustainable behaviour score > 0 they were classified as sustainable consumers. Once a consumer had achieved the sustainable consumer status it was assumed that they did not revert to unsustainable behaviour. This restriction on the non-reversal was set to address the

main aim of the study; to investigate the influence of social network factors on the spread of sustainable consumer behaviour.

6.2.4. Sensitivity analysis

To determine the number of runs necessary for consistent results we ran 12 experimental scenarios with four increasing repetitions per experiments; 10, 100, 250, 500. Results of the sensitivity analysis showed that in all experimental scenarios, the coefficient of variance stabilised at 250 runs (i.e. 250 repeats of the same experiment). Therefore each scenario was run 250 times (see Table 6.2.) (following Lorscheid, Heine & Meyer, 2012). Further exploration of the model indicated that changing the link radius (i.e. the maximum distance a person could create links with another agent to form a person network), from 12 to 15, did not significantly influence the results of the experiments (see Table 6.2.). Therefore the same value of the link radius (12) was used in all of the experiments. To facilitate statistical analysis of results, the experimental scenarios were then each repeated five times, to provide five replicate sets of outputs.

Table 6.2. Mean and coefficient of variance for sustainable consumer behaviour for different experimental scenarios with different numbers of runs (i.e. repeats of the experiment).

Design	**Social circle radius 12**					**Social circle radius 15**			
Scenario numbers	Sustainable	Runs per scenario				Runs per scenario			
	behaviour	10	100	250	500	10	100	250	500
ES27	Mean	40.12	40.24	40.01	39.97	41.41	40.10	40.19	40.06
(10sust/10disc/50agents)	Coefficient of variance	0.27	0.28	**0.29**	**0.29**	0.26	0.29	**0.28**	**0.28**
ES25	Mean	39.16	39.99	40.08	40.07	39.93	40.01	39.94	40.04
(10sust/50disc/50agents)	Coefficient of variance	0.27	0.26	**0.28**	**0.28**	**0.28**	**0.28**	**0.28**	**0.28**
ES19	Mean	40.42	40.04	40.29	40.05	40.42	40.01	40.01	40.06
(50sust/50disc/50agents)	Coefficient of variance	0.25	0.26	**0.28**	**0.28**	0.28	0.28	**0.29**	**0.29**
ES9	Mean	64.44	64.44	64.26	63.85	63.57	64.38	64.05	63.91
(10sust/10disc/100agents)	Coefficient of variance	0.32	0.33	**0.35**	**0.35**	0.34	0.33	**0.35**	**0.35**
ES7	Mean	64.78	63.85	63.69	63.96	65.31	64.24	63.84	64.09
(10sust/50disc/100agents)	Coefficient of variance	**0.35**	**0.35**	**0.35**	**0.35**	0.33	**0.35**	**0.35**	**0.35**
ES1	Mean	65.96	64.54	63.70	63.95	62.56	63.97	64.10	63.85
(50sust/50disc/100agents)	Coefficient of variance	0.33	**0.35**	**0.35**	**0.35**	0.36	0.34	**0.35**	**0.35**

Note: Numbers in bold indicate a stabilising coefficient of variance.

6.3. Results

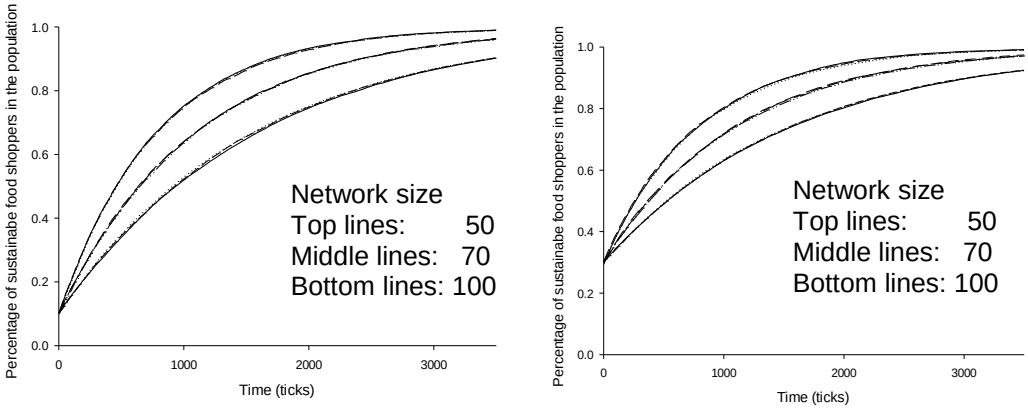
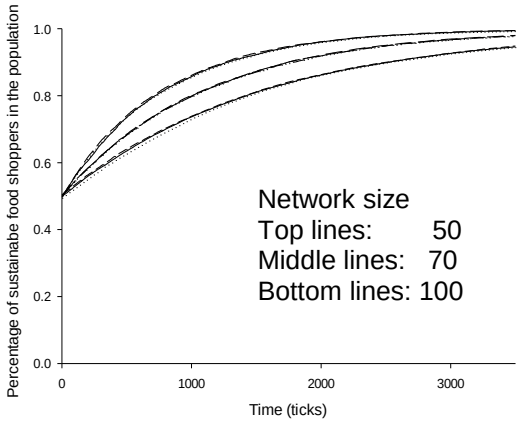


Fig. a. 10% of initial sustainable consumers with three different network sizes b. 30% of initial sustainable consumers with three different network sizes



c. 50% of initial sustainable consumers with three different network sizes

Figure 6.4. Uptake of sustainable food purchasing in a population over time (ticks), as simulated with the ABM for 27 different experimental scenarios. Figures **(a)** 10%, (**b)** 30% and **(c)** 50% sustainable consumers at outset, respectively.

Notes: The figures show mean experiment scenario scores (i.e. mean behaviour scores for 5 replicates of each experiment). Scenarios are visually divided into three distinct groups based around the initial setup of sustainable consumers within the total network (i.e. around 10%, 30% of 50%) here shown as three separate graphs (i.e. (a), (b), (c)). The highest line within each graph corresponds to the experiment scenarios with the initial setup of 50 agents in the total network, the middle line to 70 agents and

the lowest to 100 agents. The lines of different scenarios have different patterns (i.e. dashed, dotted and full lines), however due to the overlapping lines of the scenarios varying the percentage of discussion partners within the overall network (10%, 30% and 50%) the figure is not able to distinguish between these experiment scenarios. Therefore, only three lines, showing the variation of the network size, can be seen within each graph.

6.3.1. Identification of threshold response

Linear regression lines were fitted to three sequential time sections (i.e. ticks 1-1000, 1001-2000, and 2001-3500) of each experiment to compare the rate of the spread of behaviour across experiment and time sections (see Table 6.3). In each case, a curvilinear response was observed indicating that the spread of sustainable food purchasing behaviour was not a linear process but was characterised by a higher initial rate, followed by a lower rate of increase. This provides evidence of a threshold response in each experiment. A MANOVA test confirmed that there was a significant difference in the gradients of the lines fitted to different sections of the curves derived from model outputs (i.e. ticks 1-1000, 1001-2000, and 2001-3500, see Table 6.4.).

Table 6.3. Gradients of the lines fitted to different sections of the curves describing the spread of sustainable consumer behaviour, derived from model outputs. Values are means (M) and standard errors (SE) of the gradients of the lines, determined by regression analysis.

Experimental settings				**Mean/SE regression lines for sustainable behaviour**					
				Ticks 0-1000		Ticks 1001-2000		Ticks 2001-3499	
	Network size	% Sust. shoppers	% Discussion	M ($\times 10^{-3}$)	SE ($\times 10^{-3}$)	M ($\times 10^{-3}$)	SE ($\times 10^{-3}$)	M ($\times 10^{-3}$)	SE ($\times 10^{-3}$)
ES1	100	50	50	0.23	0.002	0.13	0.002	0.06	0.0005
ES2	100	50	30	0.23	0.002	0.13	0.002	0.06	0.0005
ES3	100	50	10	0.22	0.006	0.13	0.002	0.06	0.0004
ES4	100	30	50	0.33	0.002	0.17	0.002	0.08	0.0002
ES5	100	30	30	0.32	0.002	0.18	0.002	0.08	0.0007
ES6	100	30	10	0.32	0.002	0.17	0.002	0.08	0.0004
ES7	100	10	50	0.42	0.002	0.22	0.002	0.10	0.0001
ES8	100	10	30	0.42	0.002	0.23	0.002	0.10	0.0002
ES9	100	10	10	0.42	0.002	0.22	0.002	0.10	0.0004
ES10	70	50	50	0.29	0.002	0.12	0.0001	0.04	0.0007
ES11	70	50	30	0.29	0.002	0.12	0.0001	0.04	0.0003
ES12	70	50	10	0.29	0.002	0.12	0.0001	0.04	0.0003
ES13	70	30	50	0.40	0.002	0.17	0.002	0.05	0.0004
ES14	70	30	30	0.40	0.002	0.17	0.002	0.05	0.0006
ES15	70	30	10	0.40	0.002	0.17	0.002	0.06	0.0009

Experimental settings				Mean/SE regression lines for sustainable behaviour					
				Ticks 0-1000		Ticks 1001-2000		Ticks 2001-3499	
	Network size	% Sust. shoppers	% Discussion	M (x 10^{-3})	SE (x 10^{-3})	M (x 10^{-3})	SE (x 10^{-3})	M (x 10^{-3})	SE (x 10^{-3})
ES16	70	10	50	0.51	0.006	0.21	0.002	0.07	0.0004
ES17	70	10	30	0.52	0.002	0.21	0.004	0.07	0.0002
ES18	70	10	10	0.52	0.002	0.21	0.002	0.07	0.0002
ES19	50	50	50	0.32	0.01	0.10	0.001	0.02	0.0002
ES20	50	50	30	0.33	0.01	0.10	0.001	0.02	0.0002
ES21	50	50	10	0.32	0.02	0.10	0.001	0.02	0.0004
ES22	50	30	50	0.48	0.002	0.14	0.002	0.03	0.0005
ES23	50	30	30	0.48	0.002	0.14	0.001	0.03	0.0005
ES24	50	30	10	0.48	0.002	0.14	0.002	0.03	0.0006
ES25	50	10	50	0.63	0.002	0.18	0.002	0.04	0.0004
ES26	50	10	30	0.63	0.002	0.18	0.002	0.04	0.0002
ES27	50	10	10	0.62	0.006	0.18	0.003	0.04	0.0001

Table 6.4. Summary of MANOVA results to determine the influence of social network factors on the rate of spread of behaviour change (gradients).

Variables	*F*	*df*	*p*
Within factor effects			
Gradients	90815.45	2,107	0.000
Between factor effects			
Network size	545.93	4,214	0.000
Sustainable shoppers	472.59	4,214	0.000
Number of discussion partners	0.87	4,214	0.485
Network size*Sustainable shoppers	34.91	8,214	0.000

Notes: Sustainable shoppers refers to the number of sustainable shoppers within the social network, and number of discussion partners refers to the number of agents with whom individuals discuss food purchasing behaviour.

6.3.2. Influence of social network factors on sustainable food shopping behaviour

To investigate the influence of the social network characteristics on the rate of the spread of behaviour, we compared the regression lines fitted to model outputs in the different scenarios. The MANOVA results showed two significant main effects; the network size and the percentage of initial sustainable consumers in the network both significantly influenced the spread of behaviour ($p < 0.001$ in each case, see Table 6.4.). To understand the significant differences between the gradient means within each main effect we ran Fisher's least significant difference (LSD) post hoc tests. Comparing the means of the gradients of the network size scenarios (50, 70 and 100) the tests revealed that, the smaller the initial network size, the higher the rate of behavioural spread (see Table 6.4.). Comparing within factor differences for the sustainable consumer scenarios (10%, 30% and 50%) with an LSD post hoc test revealed that the lower the percentage of initial sustainable consumers within a network, the higher was the rate of spread of behaviour (see Table 6.5.). There was no significant difference in the rate of spread of sustainable food shopping behaviour in relation to variation in the number of discussion partners within the network ($p = 0.485$) in each case, Table 6.4. and Table 6.6.).

The MANOVA further revealed significant interaction effects between the network size and percentage of initial sustainable consumers in the network ($p < 0.001$, see Table 6.4.). Analysis of the interaction effect between network size and the percentage of sustainable consumers within the network at the outset revealed that the combination of the smallest initial network size and the lowest percentage of sustainable consumers in the network led to the highest rate of behavioural spread (see Fig. 6.5.). The rate of behavioural spread decreased with combinations of increasing network size and percentage of sustainable consumers (see descriptive results in Table 6.7.)

Table 6.5.. Fisher's least significant difference (LSD) post hoc test comparing sustainable shopper scenarios; showing Mean difference, Standard Error (SE), significant's value (*p*) and confidence intervals

Sustainable shoppers	**Sustainable shoppers**	**Mean Difference**	**SE**	***P***	**95% Confidence Interval**	
		(x 10^{-3})	**(x 10^{-3})**		**Lower Bound (x 10^{-3})**	**Upper Bound (x 10^{-3})**
10	30	0.058*	0.0009	0.000	0.056	0.060
	50	0.119*	0.0009	0.000	0.117	0.121
30	10	-0.058*	0.0009	0.000	-0.060	-0.056
	50	0.061*	0.0009	0.000	0.059	0.063
50	10	-0.119*	0.0009	0.000	-0.121	-0.117
	30	-0.061*	0.0009	0.000	-0.063	-0.059

*. The mean difference is significant at the .05 level. The error term is Mean Square(Error) = 1.870E-11.

Table 6.6. Fisher's least significant difference (LSD) post hoc test comparing discussion scenarios; showing Mean difference, Standard Error (SE), significant's value (*p*) and confidence intervals

Discussion	Discussion	Mean Difference ($\times 10^{-3}$)	SE ($\times 10^{3}$)	*P*	95% Confidence Interval	
					Lower Bound ($\times 10^{-3}$)	Upper Bound ($\times 10^{-3}$)
10	30	0.000	0.0009	.814	-0.002	0.002
	50	0.002	0.0009	.092	0.000	0.003
30	10	0.000	0.0009	.814	-0.002	0.002
	50	0.002	0.0009	.056	0.000	0.004
50	10	-0.002	0.0009	.092	-0.003	0.000
	30	-0.002	0.0009	.056	-0.004	0.000

*. The mean difference are not significant at the .05 level. The error term is Mean Square(Error) = 1.870E-11.

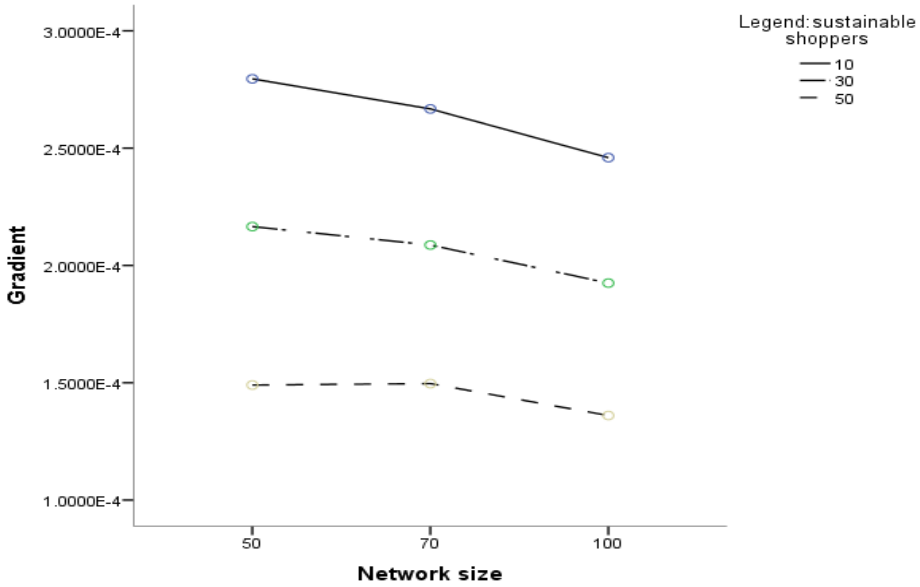


Figure 6.5. Interaction between network size and sustainable shoppers

Notes. Values presented are treatment mean values derived from the MANOVA outputs. Gradient refers to analysed gradients of the lines fitted to the response curves derived from model output; they therefore indicate the rate of spread of sustainable behaviour.

Table 6.7. Gradients of the lines fitted to different sections of the curves describing the spread of sustainable consumer behaviour, derived from model outputs, organised by network size and sustainable shoppers. Values are means (M) and standard errors (SE) of the gradients of the lines, determined by regression analysis.

Network size	Sustainable shoppers	Gradient sections	Mean ($\times 10^{-3}$)	SE ($\times 10^{-3}$)
50	10	Ticks 0-1000	0.623	0.0023
		Ticks 1001-2000	0.178	0.0014
		Ticks 2001-3499	0.037	0.0005
	30	Ticks 0-1000	0.483	0.0013
		Ticks 1001-2000	0.138	0.0011
		Ticks 2001-3499	0.028	0.0003
	50	Ticks 0-1000	0.330	0.0082
		Ticks 1001-2000	0.097	0.0006
		Ticks 2001-3499	0.020	0.0002
70	10	Ticks 0-1000	0.517	0.0030
		Ticks 1001-2000	0.213	0.0016
		Ticks 2001-3499	0.069	0.0002
	30	Ticks 0-1000	0.405	0.0013
		Ticks 1001-2000	0.167	0.0013
		Ticks 2001-3499	0.054	0.0004
	50	Ticks 0-1000	0.291	0.0012
		Ticks 1001-2000	0.120	0.0000
		Ticks 2001-3499	0.038	0.0004
100	10	Ticks 0-1000	0.415	0.0013
		Ticks 1001-2000	0.223	0.0013
		Ticks 2001-3499	0.100	0.0001
	30	Ticks 0-1000	0.325	0.0013
		Ticks 1001-2000	0.174	0.0013
		Ticks 2001-3499	0.079	0.0003
	50	Ticks 0-1000	0.228	0.0022
		Ticks 1001-2000	0.125	0.0013
		Ticks 2001-3499	0.055	0.0003

N = 15 in each cell

6.4. Discussion

According to the ABM developed here, our results show that the spread of sustainable shopping behaviour demonstrates a curvilinear response over time, which indicates a threshold effect. Other researchers have similarly described the occurrence of tipping points (Gladwell, 2002) or acceleration phases (Rotmans, Kemp & van Asselt, 2001) in the spread of sustainable behaviour. Similar patterns of response have been found in previous research focussing on the spread of behaviour in social networks. For example, both Centola (2010) and Onnela and Reed-Tsochas (2010) found similar curvilinear responses to those reported here when investigating the influence of social networks on the uptake of health behaviours. Further, we showed that the proportion of initial sustainable consumers within the network and the size of the social network significantly influenced the rate of spread of behaviour. Results indicated that the smaller the social network and the smaller the initial percentage of sustainable consumers within the network, the higher the rate of spread of behaviour.

The findings related to social network size are consistent with theory. Social Identity Theory (Tajfel & Turner, 1979; 2004) and its extension, Self-Categorization Theory (Turner et al., 1987) suggests that people distinguish themselves and the in-group (i.e. an individual's social network) from the out-group through social norms (i.e. descriptive norms) made salient on the basis of self-categorization. The larger the social network, the more likely it is that social norms are less clear or diluted. Hence the descriptive norm of being a sustainable consumer will be strongest in a small social network, with fewer competing descriptive (shopping) norms. The finding that behaviour spreads more rapidly within relatively small networks may reflect the fact that in small networks connections or paths are shorter, networks are more clustered and therefore behaviour spreads more quickly. This is supported by analysis of the spread of health behaviours through online social networks, where behaviour was found to spread more rapidly in clustered networks (Centola, 2010). The findings that a smaller initial percentage of sustainable shoppers encourage a faster spread of behaviour, on the other hand, may be because there are more consumers available for behaviour change when the starting value is lower.

This ABM was grounded in psychological (i.e. TPB, NAM and Habit theory) and social network theory and applied empirical evidence to calibrate the factors (i.e., Klöckner, 2013; Schubert et al., 2015). However, the model is nevertheless based on a number

of assumptions, which should clearly be borne in mind when interpreting the results. Unlike the relationships of the psychological factors, which are based on decades of environmental psychology research and are derived from a meta-analysis (Klöckner, 2013), the social network characteristics data were based on findings from a single study (Schubert et al., 2015). These data may have limited applicability to other behaviour contexts or domains. An additional assumption was the inclusion of only those psychological factors that had been shown to be influenced by social network factors in previous research. This resulted in the exclusion of some other important predictors of behaviour, such as perceived behavioural control (i.e. how able one feels to shop for sustainable products). Since the ABM is based on the relationships included in the model, a different outcome might be obtained with the inclusion of other predictors.

A further key assumption was that once an agent had become a sustainable consumer, they were unable to revert to unsustainable behaviour. Reason for this assumption was that the model explored uptake of behaviour based on social network factors rather than barriers or reversal of behaviour. In the real world, such reversion could potentially occur, for example if the incentive for a change in sustainable behaviour were removed (Davies, Fahy & Rau, 2014; Dobson, 2007). Additionally, food shopping is considered to be a very habitual behaviour (Fischer & De Vries, 2008; Thogersen et al., 2012) and therefore it is probable that people are likely to adhere to their behaviour unless there are drastic changes in their circumstances (Verplanken & Roy, 2016). Further research is required to elucidate this issue in the context of sustainable shopping behaviour.

It should also be noted that the model described here focused explicitly on analysis of social network factors, and excluded the spread of behaviour directly from one agent to another. Such peer-to-peer communication can potentially have a significant influence on behaviour change, as has recently been demonstrated in the health sector (Myneni, Cobb, Cohen, 2016). A spread of behaviour mediated entirely by direct peer-to-peer interactions could potentially have a very different pattern of response than one mediated through social network structure. Research focusing on the diffusion of innovation or technology has frequently identified a sigmoidal or S-shaped response curve (Geels, 2005; Rotmans et al., 2001; Rogers, 2010), which can arise when diffusion occurs through peer-to-peer interactions. Such interactions provide a mechanism for the initial phase of exponential increase observed in sigmoidal patterns of response, through a process of positive feedback. Such a process does not occur when a spread of behaviour is mediated solely by social network characteristics, as examined here, as behaviour change of an individual is dependent on the overall

characteristics of the network in which the individual is embedded. This explains the curvilinear, rather than sigmoidal response curve presented here, and in other studies of spread via social networks (Centola, 2010; Onnela & Reed-Tsochas, 2010). Potentially, the ABM presented here could be modified to include direct peer-to-peer transmission, which then produce sigmoidal response curves. However, further research is required to determine the relative importance of social network characteristics and peer-to-peer transmission in influencing behavioural change in relation to sustainable consumption.

The current results could potentially have implications for understanding how development of a sustainable or green economy (Newton & Cantarello, 2014) might be achieved in practice. Specifically, sustainable food shopping behaviour could potentially spread via social networks, for example through the influence of an individual's friends, and the friends of friends. The consumer behaviour of an individual in such situations may be analogous to the spread of voting behaviour via Facebook (Aral, 2012) or health behaviour change achieved through the influence of online social networks (Centola, 2011). Results could potentially have implications for the design of policy interventions aimed at supporting shifts towards sustainable behaviour (Davies et al., 2014; Dobson, 2007). If the current results are generally applicable, they imply that 'bottom up' approaches targeting relatively small social networks with relatively few sustainable consumers might stand a higher chance of success than large scale top-down approaches. Such 'bottom up' interventions to change food purchasing behaviour might focus on promoting sustainable food through social network sites related to food such as recipe exchange sites, food- and cookery-orientated blog communities and on-line social networks. Examples of a successful 'bottom up' approach in the sustainable food sector include that of East Anglia Food Link (EAFL), which was a small sustainable food NGO that started promoting locally sourced organic food in schools and hospitals in 1999. This strategy, although initially somewhat successful, did not fully gain momentum until 2005 when the UK government made policy changes that encouraged local, freshly made organic food in public sector catering (Seyfang & Smith 2007). This example suggests that both 'bottom-up' and 'top-down' approaches may be required to achieve large-scale behaviour change, perhaps at different times, as has been recognised previously by transition research/research focussing on the spread of behaviour (Geels, 2011; Geels & Schot, 2007). In the case of shifts in food purchasing behaviour, identification of the relative effectiveness of 'bottom-up' versus 'top-down' approaches requires further elucidation, as does the relative impacts of interventions focusing on social media compared to alternative types of social networks.

6.5. References

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Chapter 7: General Discussion

Chapter overview

This final chapter will briefly revisit the reasons and theoretical groundings to discuss the findings of the thesis in relation to the main research aim and research question (Section 7.1.). Thesis findings are critically evaluated in Section 7.2. and implications (Section 7.3) are discussed in terms of theoretical contributions (Section 7.3.1.) and practical implications focussing on intervention strategies (Section 7.3.2.). Strength of the thesis (Section 7.4.1.), limitations and future research suggestions are discussed (Sections 7.4.) and final conclusions drawn (Section 7.5.).

7.1. Thesis aim and main research question revisited

The historical overview of the development of environmental policies and strategies for sustainable development, presented in the first chapter of this thesis, highlighted the fact that although substantial progress has been made in these areas, researchers and policy makers need to make a concerted effort to understand how a societal transition in sustainable consumer behaviour can be reached through individual consumer behaviour change. The main framework of the thesis, developed in chapter 2, identified one of the main shortcomings of the main psychological theories of sustainable behaviour change (i.e. the Theory of Planned Behaviour, the Norm Activation Model and habit theories), to be the lack of details of the social influence in sustainable behaviour change in the theories. To address this shortcoming social network characteristics were included in addition to factors from the main sustainable behaviour change theories in the theoretical framework of the thesis. The thesis focus was, in particular, on factors influencing sustainable food purchasing and consumption behaviour which is one major facet of sustainable consumer behaviour and a key aspect of sustainable development.

Therefore, the main aim of this PhD thesis was: *to investigate relationships between social network characteristics, psychological predictors and sustainable consumer behaviour.* Based on the main aim and the research framework (Figure 7.1.), developed from the theories, the main research question of the thesis was: *How*

important are social network characteristics for explaining and changing sustainable consumer behaviour? This question included three sub-questions:

(a) Do social network characteristics explain sustainable consumer behaviour directly, or, indirectly, via important psychological predictors (Chapter 3 and 5)?

(b) Can we usefully segment groups of consumers in important social network characteristics to encourage sustainable behaviour change (Chapter 4)?

(c) How could the use of social network characteristics help to spread sustainable consumer behaviour through social networks (Chapter 6)?

Investigating how social network characteristics explain sustainable consumer behaviour will help researchers and practitioners to use social networks in an effective way to encourage behaviour change towards sustainable consumption within society.

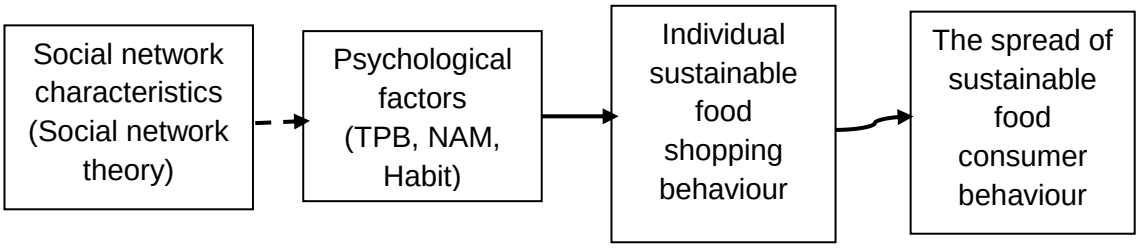

Figure 7.1. Theoretical framework showing established relationships (solid lines), theorized relationships explored with a survey and experiments (dashed line) and relationships explored through social simulation (wavy line) (repeat from Chapter 2, Figure 2.1.).

7.2. Thesis findings

Results of the different studies undertaken during this PhD showed consistently that social network characteristics are important when trying to understand the underlying mechanisms of sustainable shopping behaviour (Chapter 3) as well as sustainable behavioural choices directly (Chapter 5). Social network characteristics were also useful to profile consumers into useful segments to promote sustainable behaviour

change (Chapter 4). Finally, some specific social network characteristics can help to speed up/spread the uptake of sustainable consumer behaviour within one's network hereby helping to understand how behaviour can spread through social networks embedded in society. These main results provided useful angles for understanding how to develop interventions which focus on changing sustainable consumer behaviour.

Below is a summary table of all the social network characteristics investigated in this thesis, the hypothesized relationship, the research method applied to investigate the relationships, the findings and if they supported the hypotheses, explanation of the findings, conclusions and future research suggestions (Table 7.1.). This provides a clear overview of the achievements of this thesis and clearly highlights the findings and conclusions in context.

Table 7.1. Summary of social network characteristics investigated tested relationships with psychological predictors and sustainable food purchasing behaviour, explanation of findings, conclusions and suggestions for future research directions

Social network characteristic (SNC)	Definition of SNC	Mediating psychological predictor	Dependent variable	Research method	Findings supported hypothesis	Explanation of findings	Conclusion/ Future research
Sustainability degree	Number of sustainable shoppers in the network	Descriptive norms (DN) towards sustainable food purchasing	Self-report sustainable food purchasing behaviour	Survey	Supported, The larger the number of sustainable shoppers in the social network (SN) the stronger the DN	DN most clearly perceived with large group in SN performing the target behaviour (Tajfel & Turner, 1979)	Intervention: make relevant DN salient by highlighting network members sustainable food purchases
		DN towards sustainable food purchasing	Self-report sustainable food purchasing behaviour	Survey, Testing same SEM as above for high, medium and low sustainable shopper segments	Supported, High/Medium/Low segments: The more sustainable shoppers in SN the stronger the DN *Note:* Medium segment SEM model fit not acceptable	High/Medium/Low segments: DN are most clearly perceived with large numbers of people performing the target behaviour (Tajfel & Turner, 1979)	Intervention: make relevant DN salient by highlighting network members sustainable food purchases
		DN towards sustainable food purchasing	Simulated sustainable food purchasing behaviour	ABM	Supported, The behaviour spread faster in networks with fewer sustainable shoppers	Behaviour spreads faster with fewer initial adopters as more people are available to adopt it. Late adopters have different adoption criteria as earlier adopters (Rogers, 2010)	Future research: Test under what circumstances sustainable consumer behaviour might spread faster with fewer initial adopters
		DN towards sustainable food purchasing	Actual organic food	Experiment	Rejected, The number of sustainable	DN were not made salient in the discussion between SN member or	Future research: Test if sustainability

			consumption choices		shoppers in the personal network did not predict organic consumption choices	strangers (Kallgren, Reno & Cialdini, 2000)	degree influences actual sustainable consumption if DN made salient
		Perceived behavioural control (PBC) towards sustainable food purchasing	Self-report sustainable food purchasing behaviour	Survey	Supported, The more sustainable shoppers the higher the perceived behavioural control	Vicarious learning (Bandura, 1977), seeing others successfully perform a behaviour, leads to increased PBC	Intervention: Make sustainable consumer behaviour of SN members more visible to increase PBC
		PBC towards sustainable food purchasing	Self-report sustainable food purchasing behaviour	Survey, Testing same SEM as above for high, medium and low sustainable shopper segments	Partially supported, High segment: The more sustainable shoppers the higher the PBC Medium/Low segment: No relationship found *Note:* Medium segment SEM model fit not acceptable	High segment: Vicarious learning (Bandura, 1977), Medium/Low segment: No relationship between PBC and sustainability degree could be due to low within segment variation (i.e. standard error, *SE*)	Future research: Investigate whether low variation in the medium and low behaviour segments is related to people not being aware of whether SN members perform target behaviour.
Degree	Number of personal (ego) network members	DN towards sustainable food purchasing	Self-report sustainable food purchasing behaviour	Survey, Structural equation model for full sample	Supported, The smaller the network the stronger the DN	DN are perceived most clearly in small networks with less diverse behaviour (i.e. DN) (Tajfel & Turner, 1979)	Intervention: DN can be increased more successful in smaller SN rather than larger ones
		DN towards sustainable food purchasing	Self-report sustainable food purchasing behaviour	Survey, Testing same SEM as above for high, medium and low sustainable	Partially supported, High: The smaller the network the stronger the DN Medium/Low: No relationship found	High segment: DN are most clearly perceived in smaller networks. (Tajfel & Turner, 1979) Medium/Low segment: No relationship could be due to low within	Future research: Explore where the threshold between 24-30 close network members lies where DN is not

				shopper segments	*Note:* Medium segment SEM model fit not acceptable	segment variation (i.e. *SE*). The threshold seems to lie somewhere between 24 – 30 network members.	perceived as clear anymore.
		DN but as part of the decision process	Simulated food purchasing behaviour	ABM	Supported, The smaller the network the faster the spread of behaviour	In small networks paths are shorter and more clustered and therefore behaviour spreads faster (Centola, 2011)	Future research: Test if behaviour spreads faster in small personal networks if DN are made salient.
		DN towards sustainable food purchasing	Actual organic food consumption choices	Experiment	Rejected, Network size did not predict organic consumption choices made	DN were not made salient in the discussion between SN member or strangers (Kallgren et al., 2000)	Future research: Test if network size influences actual sustainable consumption if DN made salient
Food discussion degree	Number of SN members person discusses food matters with	DN towards sustainable food purchasing	Self-report sustainable food purchasing behaviour	Survey	Supported, The more network members a person discusses food matters with the higher the DN	Discussing food matters with SN members makes DN 'visible' (Tajfel & Turner, 1979) Could reflect homophiliy, (Lazarsfeld & Merton, 1954)	Future research: Explore if food discussions related to homophiliy which could aid behaviour change (Centola, 2011)
		DN towards sustainable food purchasing	Self-report sustainable food purchasing behaviour	Survey, Testing same SEM as above for high, medium and low sustainable shopper segments	Rejected, High/Medium/Low segment: No relationship between DN and food discussion degree *Note:* Medium segment SEM model fit not acceptable	High/Medium/Low: No relationship could be due to low within segment variation (i.e. *SE*)	Future research: Investigate whether increasing food discussion members in the segments leads to an increase in DN

		DN but as part of the decision process	Simulated food purchasing behaviour	ABM	Rejected, No speed difference in spread of behaviour between different numbers of food discussion members	The number of food discussion members was the least influential factor in the design and the influence on DN was too small to detect threshold differences in the uptake of behaviour	Future research: Test if there is a threshold effect for the influence of the food discussion degree on sustainable food purchasing uptake
		DN and Injunctive norms (IN) towards sustainable food purchasing	Actual organic food consumption choices	Experiment	Supported, Discussing attitudes towards sustainable food purchasing with a SN member vs. a stranger predicted organic food consumption choices	Both DN and IN were made salient. The IN of discussion partners (SN members vs. strangers) were made salient when attitudes towards sustainable food shopping were discussed and DN was made salient during the observation of choices from the discussion partner. Together, IN and DN influenced organic food consumption choices as people conform to in-group norms and distinguish themselves from out-group norms (Tajfel & Turner, 1979)	Future research: Homophilic tendencies could not be ruled out complety and thus should be further investigated (Lazarsfeld & Merton, 1954)
Shopping influence degree	Number of SN members directly influencing	Personal norms (PN) towards sustainable food purchasing	Self-report sustainable food purchasing behaviour	Survey	Supported, The higher the number of network members influencing a person's food	Having a baby has been found to increase sustainable food purchasing (Schäfer, Herde, & Kropp, 2010) suggesting increased	Future research: Test if the increased responsibility leads to an increase in PN

	food purchasing				purchasing decisions the higher the PN	responsibility leading to increased PN	(e.g. birth of a child)
		PN towards sustainable food purchasing	Self-report sustainable food purchasing behaviour	Survey, Testing same SEM as above for high, medium and low sustainable shopper segments	Partially supported, High/Medium segments: No relationship found Low segment: The higher the number of people influencing shopping decisions the higher PN *Note:* Medium segment SEM model fit not acceptable	High/Medium segment: No relationship could be due to low within segment variation (i.e. *SE*). Low segment: This could be related to increased responsibility leading to increased PN (Schäfer, Herde, & Kropp, 2010)	Future research: Test if the increased responsibility leads to an increase in PN (e.g. birth of a child) and if this could be induced for all the segments
Relationship lengths	Average network relationship length	Habits of purchasing sustainable food	Self-report sustainable food purchasing behaviour	Survey	Supported The newer the relationships in the network the stronger the habits	New relationships may indicate changes in lifestyle or events leading to change in habits (Verplanken & Roy, 2016) and/or new relationships developed due to similarities in attitudes, believes or behaviour (i.e. homophily) explaining the strengthening of habits (Centola, 2011)	Future research: Explore underlying mechanisms for the relationship between relationship length and habits.
		Habits of purchasing sustainable food	Self-report sustainable food purchasing behaviour	Survey, Testing same SEM as above for high, medium and low sustainable shopper segments	Rejected, High/Medium/Low segments: No, relationship between habits and relationship length *Note:* Medium segment SEM model fit not acceptable	High/Medium/Low segments: No relationship could be due to low within segment variation (i.e. *SE*).	Future research: Explore this relationship with higher sample size in the different segments

Food consumption degree	Number of network members a person cooks/eats with	DN towards sustainable food purchasing	Self-report sustainable food purchasing behaviour	Survey	Rejected, No relationship found between food consumption degree and DN	DN is less likely to be made salient during food consumption as people talk about a variety of topics (Aukrust & Snow, 1998)	Future research: Explore other situations during which relevant DN may be naturally elicited
Density	Ties (i.e. links) among network members	DN towards sustainable food purchasing	Self-report sustainable food purchasing behaviour	Survey	Rejected, No relationship was found between density and DN	It could be that density is not related to DN or that this relationship is only relevant for sustainable shoppers in the SN	Future research: Test if the relationship between DN with density is only relevant for sustainable shoppers in the SN
Social context diversity	Number of social contexts' network members are known from to the person	DN towards sustainable food purchasing	Self-report sustainable food purchasing behaviour	Survey	Rejected, No relationship was found between social context diversity and DN	It could be that this relationship is only relevant for sustainable shoppers in the SN	Future research: Test if the relationship of DN with social context diversity is only relevant for sustainable shoppers in the SN
Emotional closeness	Emotional closeness of network	DN towards sustainable food purchasing	Self-report sustainable food purchasing behaviour	Survey	Rejected, No relationship found between emotional closeness and DN	It could be that this relationship is non-linear or only significant for sustainable shoppers in the SN	Future research: Test if the relationship between DN and emotional closeness is non-linear or only relevant for sustainable shoppers in the SN

As can be seen in Table 7.1. five out of the nine social network characteristics investigated in this thesis were found to be significant for understanding sustainable consumer behaviour and its antecedent psychological predictors. These significant social network characteristics were the number of sustainable shoppers in the network (i.e. sustainability degree), network size (i.e. degree), the number of network members that a person discusses food matters with (i.e. food discussion degree), the number of network members that directly influence food purchasing decisions (i.e. shopping influence degree) and relationship length. Three out of the five significant social network characteristics were cross-validated through the different research methods applied and will be discussed first. Additionally, I will discuss the findings for the two further significant social network characteristics that have not yet been cross-validated through the help of different research methods and replications and the non-significant social network characteristics.

7.2.1. Number of sustainable shoppers in the network

The strongest social network characteristic, the number of sustainable shoppers in the network, indirectly affected sustainable food consumer behaviour via descriptive norms and perceived behavioural control. In relation to the survey data, having explored linear (SEM, Chapter 3) and non-linear relationships (segmenting consumers into high, medium and low sustainable shoppers, Chapter 4), the relationship of the number and percentage of sustainable shoppers within one's personal network was strong and positively related to buying sustainable food and its antecedent characteristics. As the number of sustainable shoppers increased, so did the descriptive norm (perception of others buying sustainable food) and the perceived behavioural control (the feeling of being able to perform the behaviour, i.e. buy sustainable food. The results of chapter 4 (segmentation chapter) further validated the importance of this factor in understanding sustainable shopping behaviour in different consumer segments. The findings of the fourth chapter showed that having a larger number of sustainable shoppers in the network was related to increased descriptive norms in all three behaviour segments (high, medium and low) showing that the number of sustainable shoppers in the network is a significant social network characteristic in explaining sustainable food purchasing behaviour.

The reasons for finding strong and positive relationships between the number of sustainable shoppers, descriptive norm and perceived behavioural control are twofold. Firstly, in line with Social Identity Theory (Tajfel & Turner, 1979; 2004) and its extension, Self-Categorization Theory (Turner, Hogg, Oakes, Reicher & Wetherell, 1987), group norms (descriptive norms) are made salient as one identifies with the in-group (social network). Descriptive norms are most strongly perceived if a large group of people (in the social network) performs a certain behaviour such as sustainable shopping (i.e. high percentage of sustainable shoppers). Seeing other people perform a behaviour (i.e. shop sustainably) also increases a person's perceived behavioural control, thus how able they feel to perform the behaviour themselves (Bandura, 1977).

Secondly, it might be that the reason for the strong relationships between the number of sustainable shoppers, behaviour and its antecedent factors is that people that are similar in attitudes, values, demographics and other factors seem to have a tendency to interact and connect with each other (i.e. homophily, Lazarsfeld, & Merton, 1954). This interaction in turn could lead to a display of similar behaviour (see reviews of e.g. McPherson, Smith-Lovin & Cook, 2001; Huston & Levinger, 1987). To explore this argument of homophily vs. social influence through social networks further I ran an experiment. Throughout this discussion I will return to this argument to highlight the findings.

In the experiment (Chapter 5), the percentage of sustainable shoppers did not significantly influence organic food consumption choices when controlled for, hereby rejecting the assumption that the percentage of sustainable shoppers is important for making actual organic consumption decisions. However, this result was likely down to the experiment design. In the experiment, I investigated the influence of food discussions with a social network member (vs. a stranger) on actual organic consumption behaviour, while controlling for the percentage of sustainable shoppers and network size. However, during the food discussion, participants were asked to focus on the frequency and attitude towards sustainable shopping of the discussion member. Therefore, although the percentage of sustainable shoppers in the network was measured through a survey question, this in-group (social network) descriptive norm (of how many people actually shop sustainably) was not made salient at any point during the discussion or the rest of the experiment which could be the reason that it did not influence behaviour (i.e. Social Identity Theory, Tajfel & Turner, 1979, 2004). Alternatively, since the dependent variable in chapter 4 (sustainable food purchasing) varied from chapter 5 (organic consumption choices) it is possible that the sustainability

degree (i.e. the number of sustainable shoppers in the network) is more important for explaining purchasing behaviour rather than consumer behaviour without any monetary consequences, as applied in the experiment. Therefore, it could either be that social network characteristics (here sustainability degree) need to be made salient in order to directly influence sustainable consumer behaviour or that different social network characteristics are important for explaining/influencing different sustainable consumer behaviour. Hence, whether different discussion topics with social network members (vs. strangers) will lead to different outcomes depends on what factors are made salient or different social network characteristics need to be made salient in order to influence different sustainable behaviours, remains to be seen and should be further explored in future research.

The influence of the percentage of sustainable shoppers on sustainable food consumption choices was also explored in the ABM (Chapter 6). The ABM investigated how the speed of the spread of sustainable behaviour varied depending on the initial percentage of sustainable shoppers in the network. Results showed that the percentage of sustainable shoppers influenced the spread of sustainable consumer behaviour. Indeed, the findings showed that a smaller initial percentage of sustainable shoppers encourage a faster spread of behaviour. This faster spread with less initial sustainable shoppers in the network may be because there are more consumers available for behaviour change with lower initial adopters. These findings might reflect the difference in adoption criteria between the different adopter categories (i.e. innovators, early adopters, early majority, late majority and laggards) described in the Diffusion of Innovations Theory (Rogers, 2010) where some people have lower threshold for the adoption of behaviour based on their adoption criteria (i.e. innovators) compared to later adopters (i.e. early adopters and early majority). Similar findings have been found in other studies investigating the spread of behaviour via social networks (Centola, 2011; Onnela & Reed-Tsochas, 2010). Future research could investigate under what circumstances sustainable consumer behaviour might spread faster with fewer initial adopters of the behaviour.

Overall results from the survey and ABM showed that the percentage of sustainable shoppers is a significant factor for explaining sustainable consumer behaviour and its antecedent factors. Results from the survey showed that the larger the number of sustainable shoppers in the network the higher the descriptive norm and perceived behavioural control. However, ABM results showed the lower the number of sustainable shoppers the faster the spread of sustainable behaviour in a network. Although both findings seem to contradict each other, they *are* probably indicating two

different processes. The survey results, the larger the number of people performing the target behaviour the stronger the descriptive norm and perceived behavioural control and ultimately the more frequent the target behaviour, could indicate that when homophilic tendencies are present that this bi-directional influence between social influence and already present similarity (i.e. the homophilic tendencies) strengthen each other as suggested by Centola (2011). When, however, very few people are performing the behaviour in the network then the behaviour could spread a lot faster (after a certain threshold/tipping point has been reached) as described in the Diffusion of Innovation Theory and found in the ABM. Future research is needed to investigate these suggestions and to ascertain the specific circumstances that might bring about these different mechanisms.

7.2.2. Network size

The second social network factor found to be significant in explaining sustainable food purchasing behaviour and its predictor variables was network size (i.e. degree). Survey results showed that the relationship between one's personal network size and sustainable food purchasing behaviour was mediated by descriptive norms (Chapter 3). This relationship with descriptive norms was negative, showing that with increasing network size people are less able to perceive the in-groups norm in relation to sustainable food purchasing behaviour. Social Identity Theory (Tajfel & Turner, 1979; 2004) suggests that people take on group norms (descriptive norms) as they identify themselves with the in-group. However, if social networks are large, people might be less likely to clearly perceive a group norm if different sustainable shopping behaviours are displayed.

Findings from the segmentation chapter (Chapter 4) only partially support the findings from chapter 3 as the relationship between network size (i.e. degree) and descriptive norms was only significant in the highest behaviour segment and not in the medium and low segment. The reason for this difference could be that descriptive norms in relation to sustainable food purchasing in the medium and lower segments were not very strong (due to lower prevalence of sustainable food shopping behaviour in the network) and that network size played no role because of the low variance in descriptive norms. Alternatively, differences might indicate that there is a threshold at which descriptive norms are perceived less clearly depending on network size. Network

size in the medium and lower segment varied between 2-24, while in the higher segment the variation was much greater (between 3-30 network members). Therefore, there appears to be a threshold between 24-30 network members at which descriptive norms are perceived less clearly. Further research should explore where exactly this threshold lies, however, in the meantime interventions could target smaller personal networks with sizes up to 24 people.

Furthermore, results from the experiment did not establish a direct relationship between network size and organic consumption behaviour (Chapter 5). One major disadvantage of experiments is the focus on the influence of one factor (food discussion in this experiment) on another (the uptake of organic consumption behaviour vs. non.-organic consumption) thus not being able to observe the influence of a multitude of factors. Since I was unable to measure a large amount of psychological predictor variables in addition to the three network factors measured, I was unable to establish whether the relationship between network size and sustainable consumption behaviour is purely mediated by descriptive norms, as found in the survey. However, the dependent variables for the survey (sustainable food purchasing behaviour, Chapter 3) and the experiment (organic consumer choices, Chapter 5) were different so it is possible that different social network characteristics explain/influence different sustainable consumer behaviour. Therefore it is possible that the relationship between network size (i.e. degree) and sustainable food shopping behaviour is mediated by psychological factors, namely descriptive norms (as in Chapter 3) or not important for consumer behaviour with non-monetary consequences.

ABM findings (Chapter 6), on the other hand, supported the results of the survey (Chapter 3) by showing that network size is an important determinant for explaining sustainable consumer behaviour. Specifically the ABM focused on a different dependent variable, the speed of the uptake of sustainable consumer behaviour and how this is influenced by social network characteristics via psychological predictors. The findings showed that sustainable food consumption behaviour spreads fastest in smaller networks compared to larger ones. These findings are consistent with Identity Theory (Tajfel & Turner, 1979; 2004), and its extension, Self-Categorization Theory (Turner et al., 1987) and other research findings investigating the spread of behaviour in social networks. As explained above, Social Identity Theory and Self-Categorization Theory suggest that in-group norms are made salient on the basis of self-categorization and that these norms are perceived more clearly when networks are small. Hence the descriptive norm of being a sustainable consumer will be strongest in a small social network, with fewer competing descriptive (shopping) norms. In addition,

behaviour has been found to spread more rapidly within small networks as connections or paths are shorter, networks are more clustered and therefore behaviour spreads more quickly. This is supported by analysis of the spread of health behaviours through online social networks, where behaviour was found to spread more rapidly in clustered networks (Centola, 2010).

Overall, network size has been shown to be an important social network characteristic in explaining sustainable food purchasing and influencing the speed of the uptake of sustainable consumer behaviour, both of which via descriptive norms. There appears to be a threshold at which network size is related to a less clear perception of descriptive norms (between 24-30 network members) but further research is needed to explore this findings further.

7.2.3. Food discussion with network members

The third significant social network factor found to influence sustainable food purchasing and consumption behaviour and its antecedent factors was the number of food discussion partners people indicated to have in their personal network (i.e. the number of people they talked to about food matters). Survey results revealed that the more social network members a person discusses food matters with the higher their descriptive norm (Chapter 3). In other words, people were more likely to perceive that sustainable shopping is the normative behaviour in their social network when they talked with them about food matters.

However, this relationship between the number of food discussion members and descriptive norms disappeared when I looked at different behaviour segments in the survey sample (i.e. high, medium and low sustainable shoppers, Chapter 4). There was no significant relationship between the number of sustainable shoppers and descriptive norms in the high, medium or low segment. A reason for the lack of finding this relationship, between descriptive norms and the number of food discussion members, once the sample was segmented, could be that the effect was not very strong to start with (this was the weakest factor to explain descriptive norm) and therefore disappeared with smaller segment numbers.

However, findings from the experiment study (Chapter 5) found a causal relationship between food discussions and organic consumption choices, indicating that this

specific social network characteristics is important for explaining organic consumption choices with non-monetary consequences. More specifically, I found that having food discussions (focussing on attitude towards sustainable shopping) with a social network member compared to a stranger, significantly predicted whether a person chose organic consumable products over non-organic consumables. These findings are in line with Social Identity Theory (Tajfel & Turner, 1979; 2004) and Self-Categorization Theory (Turner et al., 1987) showing that people distinguish themselves from the out-group by taking on in-group norms as social network members that discussed sustainable food issues displayed more organic (and similar) choices than those paired with a stranger (i.e. less organic and less similar choices). During the experiment both descriptive (seeing a network member choose food items) and injunctive norms (discussing attitudes towards sustainable food shopping) were made salient and thus I was not able to distinguish which norms were responsible for the effect. It is also possible that one or both norms, having been made salient at the same time, were responsible for the significant group differences between social network members and strangers organic consumption choices (i.e. Theory of Normative Conduct, Cialdini, Reno & Kallgreen, 1990). However, it is also possible that homophilic tendencies (i.e. the tendency of similar people to interact and bond, Lazarsfeld, & Merton, 1954) played a role in the similarity of behaviour being displayed by the group of paired social network members. Although there were no group differences in previous sustainable consumer behaviour between the strangers and the social network members group homophilic tendencies could not be ruled out completely. Nevertheless, the main survey results (Chapter 3) indicate that the influence of descriptive norms underpin the relationship between social networks and sustainable consumer behaviour and it is very likely that this same relationship between norms (descriptive and/or injunctive) was at least in part responsible (besides homophilic tendencies) for the experiment results as suggested by a study that found that homophily aids social influence (Centola, 2011). Indeed, I suggest that in line with Centola's findings homophily and social influence don't necessarily have to work in one direction only but having homophilious relationships can increase social influence as people are more likely to be influenced by in-group members rather than out-group members (i.e. as suggested by the Self-Categorization Theory, Turner et al., 1987). Further research is needed to investigate how descriptive or injunctive norms or both, if made salient, can most successfully influence choices in actual sustainable consumption decisions and how this influence might be aided through homophilic tendencies in social networks to further increase their effect.

Finally, the ABM chapter (Chapter 6) investigated the effect of different percentages of food discussion members in the network on the speed of the spread of sustainable consumer behaviour in social networks embedded in society. Results showed that there was no significant difference in the speed of the spread of behaviour based on different percentages of discussion members in the network. A reason for not finding a significant difference in the speed of the uptake of sustainable consumer behaviour between the different percentages of discussion members might have been down to the fact that this social network characteristic's relationship with descriptive norms (the ABM modelled the influence of social network characteristics on sustainable consumer behaviour via psychological factors as found in the survey) was modelled as having a smaller impact on descriptive norms as the other social network characteristics modelled. The relationships between the social network characteristics and descriptive norms were modelled as found in the survey and it is possible that in combination with other more important social network characteristics modelled (i.e. the percentage of sustainable shoppers and network size) this factor's influence was not important enough to show a difference in the speed in the uptake of sustainable consumer behaviour.

Overall, food discussions with social network members have been found to be important for explaining sustainable food purchasing behaviour via descriptive norms and organic consumption choices. More research is needed into understanding how food discussions in social networks could make salient descriptive and/or injunctive norms to influence actual sustainable consumption decisions. In addition to exploring further how homophilic tendencies in social networks can strengthen this normative effect.

7.2.4. Number of network members directly influencing purchasing decisions

The survey (Chapter 3) results also showed a relationship between the number of food shopping influencers that directly influenced food purchasing decisions and personal norms. This relationship was positive, indicating that the more people influenced a person's food shopping decisions within one's social network, the stronger one's personal norm (i.e. one's perceived moral obligation) in favour of purchasing sustainable food. People who consider the opinion of a larger number of others when

making shopping decisions could either be part of a family household or people caring for others. Previous research has shown that having a baby or small children increases the sustainable food purchasing of the family (Schäfer, Herde, & Kropp, 2010). This could be linked to feeling of increased responsibility for the wellbeing of those others and might lead to feeling morally responsible (i.e. increased personal norm) to doing the right thing (i.e. to buy sustainable food). Doing the right thing could be expressed through choosing products that might be healthier for those they shop for (e.g. organic) or the planet (e.g. buying products that are local, less packaged, organic or animal friendly), thus more sustainable products.

Additionally, analysing the same survey data in the segmentation chapter (Chapter 4) showed that the relationship, between the number of food shopping influencers and personal norms, was only significant in the low behaviour segment, but not in the medium or high segment. These findings could indicate that the number of shopping influencers is not relevant for explaining personal norms in the higher behaviour segment but that for the low segment this would be a useful intervention angle. However, these results were not further validated with different research methods and therefore additional research should explore its usefulness as an intervention strategy in this segment.

7.2.5. Relationship length

The survey (Chapter 3) results revealed that the length of relationships between the social network members and ego (the person reporting on their social network) and sustainable shopping habits were negatively related. In other words, the shorter the average relationships of a person with their social network members the higher their sustainable shopping habits. This seems to show that people might evaluate their sustainable shopping habits when meeting new people. However, it could also indicate that people are attracted to like-minded others (e.g. other sustainable shoppers) which could lead to the formation of new relationships as suggested in the homophily literature (e.g. McPherson, Smith-Lovin & Cook, 2001). Habit research suggests that opportunities of habit change might arise when people have major changes in their lives such as starting a family (Thøgersen & Schrader, 2012), changing job or moving (Verplanken & Wood, 2006; Wood, Tam & Witt, 2005). These windows of change for

breaking habits might also be linked to meeting new people that are similar in behaviour and attitude to one's current practices (i.e. indicating a homophilic relationship) and thus strengthen current sustainable food purchasing practises revealing stronger habits (Centola, 2011). However, these findings could not be supported through the re-analysis of this data in the segmentation chapter (Chapter 4) which is likely to indicate that the effect size for this relationship is rather small and thus it usefulness as an intervention strategy is debatable at this point and needs further investigation.

7.2.5. Non-significant social network characteristics: Food discussion degree, density, social context diversity and emotional closeness

Finally, no significant relationships could be established between four social network characteristics and descriptive norms explored. These were food consumption degree (i.e. the number of people that a person consumes food with or cooks for), social context diversity (i.e. the number of diverse social context people are known to him/her from) and density (i.e. the number of relational ties between network members other than the one with ego). Reasons for the insignificant relationships between these social network characteristics and descriptive norms can only be speculated about at this point.

Firstly, in relation to the non-significant relationship between food consumption degree (i.e. the number of network members a person cooks for or consumes food with) I suggest that unlike hypothesized food consumption situations do not make salient descriptive norms in relation to sustainable food purchasing as conversations over cooking or eating food are less likely to focussed on food shopping or sustainable issues but revolve around other topics (e.g. Aukrust & Snow, 1998), if conversations even take place during mealtimes (e.g. Contento, Williams, Michela & Franklin, 2006; Wansink & Kleef, 2014).

Secondly the non-significant relationships between social context diversity (i.e. the number of social contexts prevalent in a social network) and descriptive norms may be explained in the following way. Word of Mouth marketing had found that diversity of networks positively influenced message spread because people 'heard the message' or 'saw the behaviour being performed' by a number of different network members from

different sides in the network (Groeger & Buttle, 2014). However, this would only work if the target behaviour was already prevalent and being performed in the network. It is likely that people's social networks display a variety of consumer behaviour (sustainable and non-sustainable) and thus only the behaviour of sustainable shoppers in the network may influence the descriptive norms of ego. Therefore only the social context diversity of sustainable shoppers may be related to the strength of descriptive norms in relation to sustainable food consumer behaviour. Future studies could therefore investigate if the social context diversity of sustainable shoppers in the network play a role in the uptake of descriptive norms.

Thirdly, the non-significant relationship between density (i.e. the number of relationship ties among network members) and descriptive norms may be explained in a similar way. In that only the density of sustainable shoppers in the network will influence the strength of descriptive norms in relation to sustainable food purchasing behaviour. Therefore, future research should investigate whether the relationship between density and descriptive norms is only important for the sustainable shoppers in the network.

Fourthly, the relationship between network closeness and behaviour (and its antecedent factors) could be curvilinear rather than linear. A curvilinear relationship between popularity levels and online purchase decisions has been found where moderately popular friends were more likely to be influenced by their friends shopping decisions than those at the lower and higher spectrum end of popularity (Iyengar, Han & Gupta, 2009). Future research could explore whether a non-linear relationship between descriptive norms and emotional closeness are present. It is also possible that the relationship between social network closeness and descriptive norms is only relevant for those people that already purchase sustainable food which future research could investigate. The next section will highlight what theoretical and practical implications all the findings of this thesis have.

7.3. Implications

As pointed out in the introductory chapter 2 and throughout the thesis, previous studies investigating the social context in addition to psychological predictors of sustainable food consumer behaviour change, had so far been missing from the research literature. This thesis filled this knowledge gap by systematically investigating the relationship between nine social network characteristics, the most commonly researched

psychological predictors of sustainable consumer behaviour (i.e. intention, habit, perceived behavioural control, attitudes, personal, descriptive and injunctive norms) and sustainable food consumer behaviour (self-report sustainable food purchasing, actual organic food consumption behaviour and modelled sustainable consumer behaviour).

This thesis explored sub-question (a) (Do social network characteristics explain sustainable consumer behaviour directly, or, indirectly, via important psychological predictors) in chapter 3 and 5. Through this exploration I was able to establish that there is a relationship between five of the included nine social network characteristics (number of network members (i.e. degree), number of sustainable shoppers in the network (i.e. sustainability degree), number of food discussion members in the network (i.e. food discussion degree), number of shopping influencers in the network (i.e. shopping influencers degree) and network relationship lengths and sustainable food purchasing behaviour via four psychological factors (habit, perceived behavioural control, descriptive and personal norms). The thesis also showed food discussions can directly influence organic consumption choices with non-monetary consequences. Although the exact mechanisms of this influence or not completely clear at this point, I speculated that the underlying mechanism of influence of the discussion with social network members on organic consumption choices happened was the making salient of descriptive and/or injunctive norms. These findings therefore answered the first part of the main research question (*How important are social network characteristics for explaining and changing sustainable consumer behaviour?)* which focussed on explaining the relationship between social network characteristics and sustainable consumer behaviour*.*

Sub-question (b) (Can social network characteristics and psychological predictors usefully explain different sustainable food consumer segments in society) was answered in chapter 4. Thesis findings, in relation to sub-question (b) clearly showed that these mediated relationships of the five social network characteristics with sustainable food purchasing behaviour via norms, perceived behavioural control and habits varied according to the sustainable consumer behaviour segment (i.e. high, medium and low). Therefore the thesis clearly showed that sustainable food consumer segments can be explained by different social network characteristics and psychological predictors, leading to clear intervention suggestions of interventions that could be policy relevant.

Finally, sub-question (c) (How could the use of social network characteristics help to spread sustainable consumer behaviour through social networks?) was explored in chapter 6. The thesis findings in relation to sub-question (c) clearly showed that manipulating two social network characteristics, the percentage of sustainable shoppers in the network and network size (out of the three explored, i.e. the percentage of food discussion members was not significant) lead to an increase in the uptake of sustainable consumer behaviour in social networks embedded in society. Therefore giving an indication of how social network characteristics could be manipulated to increase the speed of the spread of sustainable consumer behaviour in society.

The next section will put these findings into context in terms of theoretical (Section 7.3.1.) and practical policy relevant implications (7.3.2.).

7.3.1. Theoretical implications

The findings of this multi-disciplinary thesis inform both the social network literature, in relation to diffusion and contagion processes, and the psychological literature, focussing on sustainable consumer behaviour change.

The social network literature has been enriched by providing novel evidence about the underlying mechanisms through which personal networks (i.e. ego networks) affect behaviour. Specifically, four psychological factors have been found to mediate the relationship of social networks with sustainable consumer behaviour, namely descriptive and personal norms, perceived behavioural control and habits. Through testing a large set of social network characteristics (degree, sustainability degree, food discussion degree, food consumption degree, shopping influence degree, density, social context diversity, emotional closeness and relationship length) I was able to narrow down which SN characteristics are important for understanding this mediated relationship further. This in turn helped to understand how these important and often investigated psychological variables derived from the TPB (Ajzen, 1991), NAM (Schwartz, 1977; Schwartz & Howard, 1981) and habit theories (e.g. Neal, Wood, Labrecque & Lally, 2012) are developed to some extent by social influence. This understanding is important for the development of these key psychological

determinants if the aim is to manipulate these psychological factors to increase sustainable consumer behaviour.

Furthermore, the thesis was able to shed further light onto the homophily (i.e. the tendency of similar people to interact and bond) vs. social influence (i.e. contagion) discussion by indicating that this does not have to be an “either-or”- decision. Previous research found that similarity in attitudes, values and demographic variables, meant that people were more likely to interact and form bonds with each other (i.e. homophily, Lazarsfeld & Merton, 1954). However, that this relationship can also provide a good foundation for social influence on behaviour (Centola, 2011). Centola (2011) found that when people were put together in an artificial network based on demographic homophilious factors they influenced each other significantly more in the uptake of a health related diet than those that were just put in a random networks. My experiment findings were similar and revealed that people that are network members (compared to strangers) are more likely to make similar sustainable food consumption choices than those that were with strangers, leading to an increase in the desired behaviour in the social network group. I argue that homophily and influence do not necessarily have to work in one direction only, but having homophilious relationships can increase social influence as people are more likely to be influenced by in-group members rather than out-group members (i.e. as suggested by the Self-Categorization Theory, Turner et al., 1987). In addition, as I argued above, the different results in the survey regarding the number of sustainable shoppers in the network on descriptive norms (the more the stronger the norm) could also indicate an interplay between homophilic tendencies and social influence strengthening each other. Therefore, rather than focussing further research energy on the chicken and egg argument (i.e. what came first social influence or homophiliy?) we should maybe take this bi-directional relationship for granted and incorporate its benefit into behaviour change interventions. In other words, as evidenced by this thesis, in particular the experiments (Chapter 5 and 6), social networks strengthen behaviour change strategies and therefor such strategies should include the social surrounding in the form of personal/ego networks (i.e. the immediate social group surrounding a person) when attempting to change sustainable behaviour.

My findings also informed main psychological literature in relation to sustainable consumer behaviour change in several ways. In respect to the psychological research literature on sustainable consumer behaviour change the thesis added to the literature by firstly, comprehensively investigating the relationship that external social influence factors could play in explaining sustainable consumer behaviour. The thesis provided clear evidence that social network characteristics play an important role in explaining

underlying mechanisms of sustainable consumer behaviour change via descriptive, injunctive and personal norms, perceived behavioural control and habit (the later needing further exploration).

However, secondly, it also showed that the nine social network characteristics tested in this thesis only explained a maximum of 20% of variance in descriptive norms in the survey results. Future research is therefore necessary to explore what else explains descriptive norms. In the Theory of Planned Behaviour the underlying factors influencing descriptive (and injunctive) norms are called normative beliefs (Ajzen, 2006). However, there is no clear indication of what normative beliefs actually consist off and although research has been successful in showing that influencing descriptive (and injunctive) norms has a strong impact on sustainable behaviour (e.g. Cialdini, Demaine, Sagarin, Barrett, Rhoads, Winter, 2006; Goldstein, Cialdini & Griskevicius, 2008; Schultz et al., 2007) the question of the underlying structure of these norms is still partly unanswered. Because of this lack of clarity and the strength of descriptive (and injunctive) norms to influence sustainable consumer behaviour future research should investigate what influences descriptive norms, besides the number of people performing the target behaviour (i.e. sustainable shoppers in the network), network size, (the number of) food discussions (members), more clearly.

Thirdly, the thesis was able to test how well a model including the main psychological predictors of sustainable consumer behaviour (i.e. intention, habit, perceived behavioural control, attitudes personal, descriptive and injunctive norms), with the addition of the social network characteristics, explained sustainable food purchasing behaviours. The model tested indeed explained a substantial amount of sustainable food purchasing behaviours (i.e. 55%) and more than sustainable consumption models only focussing on psychological factors (i.e. ca. 40%, Klöckner, 2013), however there is still a large amount of unexplained sustainable consumer behaviour that needs further investigating.

Fourthly, the thesis was able to show that descriptive, injunctive and personal norms are specifically and uniquely important when explaining sustainable consumption behaviour. When exploring past sustainable purchasing behaviours a clear mediating relationship between sustainable purchasing behaviour and social network characteristics via descriptive norms could be seen. These findings are in line with the literature. Social Identity Theory (Tajfel & Turner, 1979; 2004) and its extension, Self-Categorization Theory (Turner, Hogg, Oakes, Reicher & Wetherell, 1987), suggest that group norms (descriptive norms) are made salient as one identifies with the in-group

(social network). These theories also support the second finding that when norms are being made salient, like in the experiments, they predict actual sustainable consumption choices. In the experiment, descriptive and injunctive norms were made salient through the observation of consumption choices (i.e. descriptive norms) and the discussion of attitudes towards sustainable food purchasing (i.e. injunctive norms). Although a causal relationship between descriptive and injunctive norms with organic consumption choices could not be clearly established (i.e. homophilic tendencies could not be ruled out completely), the findings suggest that injunctive norms (i.e. perceptions of what others expect), in addition to descriptive norms, are important in explaining sustainable consumption as found in previous research (Cialdini et al., 2006). Both norms where made salient in different situations (i.e. descriptive norms in explaining current behaviour and injunctive in predicting future consumption choices) and their effect could not be separated the next step should focus on establishing how this combination of norms could be most successfully applied in intervention strategies with social network members. Finally, the thesis also showed clearly that although personal norms seem to a large extent be mainly explained by descriptive norms, they are not just internalised descriptive norms (e.g. Thøgersen & Olander, 2006) but that they uniquely add to the explanation of sustainable food purchasing behaviour through mediating different social network processes.

Fifthly, this thesis clearly showed the need for tailored intervention and explanatory routes with different combinations of psychological and social network factors for diverse consumer segments. When consumers were divided into high, medium and low food purchasing behaviour segments the model clearly showed that for each segment different sets of factors explained behaviour with a clear indication for different intervention strategies. The next section will highlight how these findings may be applied and make policy relevant intervention suggestions.

7.3.2. Practical implications: Intervention strategies

Based on the findings of this thesis some policy relevant suggestions can be drawn up in relation to how social networks may be utilised to stimulate behaviour change in society. The main finding of the thesis is that social networks successfully add to the model of sustainable food purchasing behaviour by explaining underlying mechanisms of behaviour. These findings need to be considered when planning interventions and

behaviour change strategies at a national level. Findings provide evidence that rather than implementing general interventions strategies that target behaviour change in consumption on a societal level behaviour change strategies (e.g. as policy strategies) should aim to support local, small-scale interventions focussing on existing social network structures.

Therefore the first behaviour change strategy suggestion reads:

1. Behaviour change strategies should aim to support local, small-scale interventions focussing on existing social network structure rather than larger scale societal interventions.

Behaviour change strategies in social network structures could specifically aim to manipulate five social network characteristics. Which social network characteristic is manipulated depends on the overall aim of the intervention.

Strengthening descriptive/injunctive norms in relation to sustainable food purchasing

If interventions are aimed at changing descriptive (and/or injunctive) norms, through social influence, then the thesis results suggest that it would be most useful to manipulated the following three social network characteristics, the number of sustainable shoppers, (the number of) food discussion (members) and network size. Firstly, although interventions may not be able to manipulate the number of sustainable shoppers itself they could aim to increase the visibility of already performed sustainable food purchasing in the network in general. Highlighting how many people are already purchasing some sustainable food products will thus make the descriptive norms that this is a behaviour that is commonly performed in the social network more salient. Segmentation findings suggest that this social network characteristic, the number of sustainable shoppers in the network, is a useful characteristic to target at every level of current sustainable food purchasing of the person. In other words, whether you are a low, medium or high sustainable food shopper ‘seeing’ that other people in your network purchase sustainable food makes you perceive the common behaviour and thus the descriptive norm is to purchase sustainable food as higher. Consequently, making sustainable food purchasing visible should be a useful intervention strategy at every level of current consumption.

Therefore the second behaviour change strategy reads:

2. Interventions aiming to strengthen descriptive norms in relation to sustainable food purchasing, through social influence, can usefully focus on making sustainable consumption behaviour in social networks visible.

Secondly, food discussions about current sustainable food shopping practices and attitude towards sustainable food issues among social network members are a useful way of making descriptive and injunctive norms visible, as the thesis results have shown. Activities such as quizzes or group competitions where small networks can join up to compete against other groups (thus strengthening the in-group sustainable food consumption descriptive norm) would be a good way to start discussions about sustainable food issues. Although,the thesis findings did not find a clear relationship between the number of food discussion members and descriptive norms in the high, medium or low sustainable food purchasing segments, stimulating food discussions with social network members (vs. strangers) influenced organic consumption choices.

Therefore the third behaviour change strategy reads:

3. Interventions aiming to strengthen descriptive (and/or injunctive) norms in relation to sustainable food purchasing, through social influence, can usefully focus on increasing food discussions in social networks.

Thirdly, because descriptive norms are perceived more clearly when groups/network sizes are smaller rather than bigger it would be most useful to keep the target social network group (for which the sustainable food purchasing behaviour is made visible and or groups discussions/competitions etc. are organised) relatively small. The thesis findings seem to suggest that this threshold of when descriptive norms (in relation to sustainable food purchasing) are not perceived clearly anymore lies somewhere between 24-30 network members. However more research is needed to validate this finding.

Therefore the fourth behaviour change strategy reads:

4. Interventions aiming to strengthen descriptive norms in relation to sustainable food purchasing, through social influence, can usefully target small social network groups.

Strengthening personal norms in relation to sustainable food purchasing

If intervention strategies are aimed at strengthening personal norms (i.e. the feelings of moral obligation to purchase sustainable food), through social influence, then the thesis findings show that one social network characteristic in particular could be very useful for strengthening these, namely the number of network members that directly influence food purchasing. The number of network members directly influencing food purchasing was only significantly related to personal norms in the low sustainable food consumer segment. This indicates that, specifically for people in the low sustainable food consumer segment, the more people influence the food purchasing decisions the stronger the feelings of moral obligation to purchase sustainable food (i.e. personal norm to purchase sustainable food). This link, I speculated, is likely to indicate that an increased feeling of responsibility in this segment leads to a stronger feeling of moral obligation to purchase sustainable food that is seen as more healthy (e.g. organic food), better for the community (e.g. local food) and better for the planet (e.g. less packaging) to name a few benefits. Consequently, a useful intervention strategy, specifically focused on the low sustainable food consumers, could be to remind people of their caring responsibilities, if not at home but then to the neighbourhood or to those in the wider community and thus making personal norms more salient.

Therefore the fifth behaviour change strategy reads:

5. Interventions aiming to strengthen personal norms in relation to sustainable food purchasing, through social influence, can usefully remind people of their caring responsibility, in the home, neighbourhood or wider community, in particularly for the low sustainable consumers.

Strengthening perceived behavioural control in relation to sustainable food purchasing

Intervention strategies aiming to increase feelings of perceived behavioural control (i.e. feeling able to perform the target behaviour), through social influence, could focus on the number of sustainable food shoppers in the network. The thesis results showed a clear link between the number of sustainable shoppers and the feeling of perceived behavioural control. Since increasing the number of sustainable shoppers in the network might not be a feasible strategy making others behaviour more ‘visible’ and thus increasing the perceived amount of sustainable food purchasing behaviour in the network could affect people’s feelings of perceived behavioural control. This strategy

might work particularly well in the high sustainable consumer segment where it might push consumers to even higher levels of sustainable consumer behaviour.

Therefore the sixth behaviour change strategy reads:

6. Interventions aiming to strengthen perceived behavioural control in relation to sustainable food purchasing, through social influence, can usefully make sustainable food purchasing in the network more 'visible', particularly for high sustainable consumers.

Strengthening habits in relation to sustainable food purchasing

Although the thesis has found a link between relationship lengths and sustainable food purchasing mediated via habits, this relationship is not properly understood at this point and needs further exploration. Therefore no interventions strategies can be suggested that aim to change habits through social influence focussing on relationship length, at this point.

Interventions based on consumer profiling: high, medium and low sustainable consumers

The findings additionally provide useful intervention angles at three different levels of sustainable purchasing behaviour; high, medium and low sustainable shoppers. The thesis results show that different strategies are necessary for each segment. These strategies will be described in the next sections.

High sustainable consumers

The high consumer segment, contains shoppers that purchase food from the six food categories measured (i.e. organic, fairtrade, local food, with little or no packaging, fish from sustainable sources and animal produce that are classed as freedom or free-range food) very regularly to almost always. The most frequently bought sustainable food in this behaviour segment were free-range/freedom food animal produce and locally produced food. They expressed that they are willing to purchase more from food from the sustainable food categories in the future and they also feel able to do so, thus not needing any further information or assistance. In particular, the high segment is most willing to increase food purchases of local food and least willing to purchase more

organic food (the category that they also currently purchase least frequently). In this behaviour segment two social network characteristics (i.e. the number of sustainable shoppers and network size) had a positive relationship with descriptive norms and perceived behavioural control. These findings suggest that consumers in this segment are highly in tune with group norms (i.e. possibly even indicating a homophilic relationship) and that this relationship might be even stronger with smaller networks rather than larger ones. The most useful strategy for this segment is therefore one that focusses on highlighting the descriptive norms of sustainable food purchasing already present in the social networks to increase descriptive norms and also perceived behavioural control. This in turn will influence personal norms which are mainly internalised descriptive norms. Both personal norms and perceived behavioural control are likely to strengthen habits (the strongest explanatory factor of sustainable food purchasing behaviour) and intentions. This target group, as mentioned above, is most likely to respond to interventions which target food categories in relation to animal welfare or local food issues. Therefore local groups/organisations that support issues like these such as Sustainable Cities Networks which focus on promoting local food and animal issues, amongst other things, is where this segment is likely to meet like-minded others. As mentioned previously, behaviour and attitudes among like-minded people often bi-directionally gets strengthened through social influence and homophilic tendencies. Accordingly, sharing of sustainable practises should be encouraged in this segment. Behaviour change strategies might usefully support bottom-up strategies such as Sustainable Cities Networks and other local initiatives through funding and other support.

Therefore the behaviour change strategy suggestion focussed on the high segment reads:

7. Behaviour change strategies should support programmes that encourage high sustainable consumers to share their sustainable consumption practices within their networks, in particular through networks/organisations that focus on animal welfare and supporting local food.

Medium sustainable consumer

The medium behaviour segment includes consumers whose frequency of purchasing food from the six sustainable food categories varies between sometimes to often. Like the high consumers they also most frequently purchase sustainable food that is either

free-range/freedom food animal produce or locally produced food. They reported that they are somewhat willing to purchase more sustainable food from the categories but are unclear about being able to do so by expressing an ambivalence (neither agree nor disagree about knowing where to buy the food or if they feel able to). These findings, suggest that this segment might be in need of further information about what foods are available and where. They might also need further practical assistance. Both of these factors highlight possible intervention angles.

When analysing the segment's social network and psychological characteristics in relation to their sustainable food purchasing behaviour results revealed that the model did not adequately explain sustainable food purchasing. In fact, intention, the only significant direct explanatory factor of behaviour only explained 4% of sustainable food purchasing behaviour in this segment. Therefore research into what explains sustainable food purchasing behaviour in this medium segment is urgently needed. I suggest that until research has found other explanatory factors for sustainable consumer behaviour in this segment it might be advisable to not focus interventions on this segment as a successful outcome is less likely. However, if interventions are determined to include the medium segment then the following suggestions could be taken into account. Findings showed that this segment, like the high segment, is most willing to increase food purchases of local food and least willing to purchase more organic food. In some ways this segment is very much like the high behaviour segment. The model investigating social network and psychological characteristics in relation to sustainable food purchasing revealed that this segment is not very well explained by any of the factors (i.e. the structural equation model fit was not acceptable). Indeed the relationship between the number of sustainable shoppers and descriptive norms, is a lot weaker than in the high segment. It is also the only social network characteristic to show a significant relationship with any of the psychological predictors of sustainable food purchasing behaviour. Nevertheless, it offers an intervention route which might be successful. An intervention strategy in this segment could further engage this segment by encouraging them to share their own behaviour through campaigns that lie at the heart of this segment (e.g. animal welfare or supporting the local economy). By providing this segment with information to encourage others to purchase products that support animal welfare and local food products, they gain information themselves and share this with others. Providing information about the how and where to get this food to their local network and they also inadvertently strengthening this segments perceived behavioural control.

Therefore the behaviour change strategy suggestion focussed on the medium segment reads:

8. Engage medium sustainable consumers further by encouraging them to share their sustainable food purchasing practises in relation to animal welfare and local food issues. Behaviour change strategies should focus on providing further information and encourage the spread of information amongst social network members.

However, further research needs to explore what other factors could explain the already encouraging results of sustainable food purchasing in this segment as the currently popular psychological factors and newly added social network factors (applied in this thesis) are not an adequate fit.

Low sustainable consumers

The low segment, sometimes but mainly seldom purchase food from the sustainable categories measured in this thesis. This segment is still mainly unengaged and are unsure where to buy such products or unable to do so. If they buy any sustainable products then it tends to be those that are related to animal welfare (e.g. freedom food or fee-range). In future they would be most willing to purchase products with reduced packaging. This segment showed a strong link between two social network characteristics (i.e. the number of sustainable shoppers and the number of shopping influencers) and descriptive and personal norms, respectively. In addition, personal norms (including internalised descriptive norms) partially explain intentions, the main and only factor to explain behaviour in this segment. It appears that this segment has a larger caring role than the medium and high segment as indicated by the relationship between the number of shopping influencers and personal norms. In addition they show concern for the environment (i.e. willing to increase the purchase of products with reduced packaging) and animal welfare concerns. Interventions could therefore most usefully provide further information to this segment about positive impacts of purchasing sustainable products, in particular those that support animal welfare and reduced packaging. It also appears that like, in the other segments, the best approach to deliver this information would be through social network members.

Therefore the behaviour change strategy suggestion focussed on the low segment reads:

9. Provide information to low sustainable shoppers on products that improve animal welfare and are reduced in packaging. Ideally this should be delivered through engaged social network members of this segment.

7.4. Strength and limitations

7.4.1. Strength of thesis

To answer the research question I combined three different research methods (i.e. survey, experiment and agent-based modelling) to compliment the strength and weaknesses of these approaches (Creswell, Plano Clark, Gutmann, & Hanson, 2003, Singleton, Straits & Straits, 1993). First, I collected data via an online survey which meant that I could collect a large amount of ego-network information (network data that people report about their social network), psychological variables and self-report sustainable food purchasing behaviour from a representative UK sample. The main advantage of collecting data in this way is the large amount of data that can be collected in a short amount of time. The main disadvantages are that data is cross-sectional so no causal inferences can be made about the factors (Creswell et al., 2003; Singleton et al., 1993). Furthermore, behaviour data collected is self-reported and refers to past behaviour which can be subject to biases (Singleton et al., 1993). Finally, not all sections of the population are online thus those parts of the population that are not online will not be reached through this method (Fricker & Schonlau, 2002). To overcome those disadvantages I took several measures.

Firstly, I applied some strategies whilst collecting and analysing my data to strengthen the validity of my findings. I distributed my online survey via a data collection agency (Maximiles, http://www.maximiles.co.uk/) to ensure that all demographic segments of the UK population were reached within different areas of the UK. Carefully checking my sample I felt satisfied that this had been achieved. Additionally, researchers have argued that causality may not just be established through the data collection method (i.e. longitudinal vs. cross-sectional) or the research method applied (experimental vs.

survey) but also by applying a model strategy that is structural such as the structural equation modelling (SEM) which I applied to the survey data in this thesis (e.g. Wunsch, Russo & Mouchart, 2010; Russo, Wunsch & Mouchart, 2011). Field (2000) points out, however that the causality can only be drawn from the SEM based on the constructed model but not from the model test statistics. Moreover, I analysed the survey data in two different ways validating and extending the findings. I first investigated linear relationships between social network characteristics, sustainable food purchasing behaviour and its predictor variables using structural equation modelling (Chapter 3). Secondly, I explored non-linear relationships by segmentation three different levels of sustainable shoppers evaluating the applicability of the model tested in chapter 2 with the SEM. These within-method validation strategies added to the validity of my findings.

In addition to the within-method validation strategies I applied two different research methods to strengthen and deepen the findings of the online survey. I ran an experimental study, collecting data on social network characteristics, whilst manipulating one social network factor (i.e. food discussions with a social network member vs. a stranger), and collected actual sustainable food consumption data. By running an experiment to collect data in this way I could make inferences about the causality of the social network factor (whilst controlling for the effect of others) on actual sustainable behaviour which I had not been able to do with the survey data. In addition, I repeated the experiment, by running it twice in two consecutive years, and replicated the findings which further validated the results. The advantage of experimental studies is that single factors can be isolated (i.e. social network characteristics, e.g. food discussions with network members) to study their influence on other factors such as organic consumption behaviour (Lilienfeld et al., 2011). However, isolating a factor, such as the food discussion with network members (vs. a stranger) can distort the importance of the influence of this isolated factor on for example organic consumption behaviour (in my experiment). Indeed it could be that outside the controlled laboratory environment, where other factors can influence organic consumption behaviour, the isolated social network factor might have a less strong influence on behaviour or the influence might be mediated by other factors. However, since I also collected a large amount of cross-sectional survey data which showed that the social network factor manipulated (i.e. the discussion with network members) was important, I am able to rule out this disadvantage.

Furthermore, having established the usefulness of social network characteristics in explaining psychological antecedents of sustainable consumer behaviour through the

survey and experiment, I then used experimental manipulations of social network characteristics to explore strategies that might be applied in interventions. The strategies I explored through the experiments and agent-based model focused on how social network characteristics may be usefully applied to influence antecedent factors of sustainable consumer behaviour leading to an increase of such behaviour in society; the main aim of this thesis.

Agent-based modelling (ABM) is a technique through which one can explore the interaction of multiple combination of different micro factors and how they influence macro phenomena like changes in consumption behaviour (e.g. towards sustainability). This allowed me to run a multitude of simulation experiments to explore how social network characteristics might influence the spread of sustainable consumer behaviour in society. Without the use of simulation methods like this it would be impossible to examine such complex combinations of factors and their interactions in real life or controlled experiments (Delre, Jager, Bijmolt, & Janssen, 2010).

However, ABM findings are not always easy to validate. One reason for this is that ABMs involving human agents, such as the one built in this thesis, involve factors that might be difficult to quantify and calibrate due to the fact that human behaviour can be irrational and their decision making process is not fully understood (Axelrod & Tesfatsion, 2006). Thus, with complex phenomena such as transitions in consumer behaviour, there is no empirical evidence so far that can validate the results. Additionally, it is sometimes difficult to get the level of complexity right between the model and real life without making it too difficult to be able to validate and understand the findings but keeping the model complex enough to answer the research question (Axelrod & Tesfatsion, 2006). Keeping these factors in mind I tried to develop a model that was simple yet able to answer my main research question (i.e. included micro (individual psychological factors) and meso-level factors (social network characteristics) as well as some randomness in the factors based on the main findings of behaviour change theories and empirical evidence. Results from the ABM experiments seemed to support findings from the online survey and experimental study. The initial findings of this ABM will be discussed below however, the advantage of my model is that it can be further developed hereby increasing the understanding of in sustainable consumer behaviour.

Finally, by combining different research methods I was able to validate the findings of my survey, experiment and ABM which with their different advantages and disadvantages complimented each other. How the findings were validated through the

different research methods will be highlighted within the context of the findings of each study/chapter below.

7.4.2. Limitations and future research

The strength of this PhD clearly lies in the cross-validation of findings with the three different types of research methods; survey, experiment and agent-based modelling. The results of the three studies evidently show that social network characteristics are important for understanding the underlying mechanisms that drive sustainable food consumption behaviour. Nevertheless, this research has some limitations which should be borne in mind when drawing conclusions about the findings.

First, two chapters of this thesis focus on cross-sectional survey data which, as discussed in the beginning of this chapter, is linked to limitations about causality and self-report behaviour to mention the main two. However, as also discussed, I took a number of within-method measures to ensure the validity of my findings. The within-method measures meant that I analysed the data in two different ways, first exploring linear relationships with structural equation modelling (Field, 2000; Wunsch et al., 2010; Russo et al., 2011) and second investigating non-linear relationships with cluster analysis and segmentation of different sustainable behaviour groups.

Nevertheless, since this is the first research exploring the influence of social networks on sustainable food purchasing and consumption behaviour future research needs to validate the findings further. It is necessary to conduct additional experiments to explore the causality, in particular exploring the ways different social network characteristics (e.g. number/percentage of sustainable shoppers in the network) can be made salient to investigate which factor might have the most prominent effect in changing behaviour long term.

Conducting further experiments would also aid the validation and further development of the ABM. Although the ABM has a strong grounding in psychological theory (i.e. TPB, NAM and habit theory) and social network theory and factors were calibrated based on empirical findings (i.e., Klöckner, 2013; Schubert, de Groot, Newton & Lubbers, 2015, Chapter 3) further validation in the form of empirical findings is needed to confirm the findings from the ABM. Specifically, experimenters may want to explore the influence of social network group sizes and the number of sustainable shoppers in

the groups on consumption behaviour. The findings of such experiments would not only verify the findings of the ABM but would aid in the development of intervention strategies to change consumer behaviour through the influence of social networks.

Naturally, the effectiveness of the intervention strategies suggested in this thesis, to change sustainable food shopping behaviour in individuals and their social networks, need to be tested further. Whilst testing these, research should investigate whether interventions strategies solely based on 'bottom-up' approaches are the most successful to changing sustainable behaviour on a large scale. Researchers have suggested that maybe a combination of 'bottom-up' and 'top-down' approaches may be required to achieve large-scale behaviour change applying both at different times (Geels, 2011; Geels & Schot, 2007).

Although food shopping is considered to be a very habitual behaviour in the developed world (Fischer & De Vries, 2008; Thøgersen, Jorgensen, & Sandager, 2012) people have been found to be more likely to change during major events in their life or a shift of circumstances (Verplanken & Wood, 2006; Wood, Tam & Witt, 2005). Therefore, the durability of changes made during an intervention needs to be evaluated with longitudinal research.

Finally, since I decided to focus on sustainable food consumer behaviour in my thesis rather than a wider context of sustainable consumer behaviour (i.e. including transport or energy consumption) the findings of my thesis are not necessarily generalizable to other sustainable consumer behaviour contexts. Therefore how applicable the findings of this thesis are to different sustainable consumer contexts needs to be explored in further research. In addition it is also necessary to explore whether the influence of social networks is different in high cost consumer behaviour (e.g. such as purchasing expensive items such as cars) than the low cost consumer behaviour chosen in this thesis (i.e. food consumption). Furthermore, future research should explore the difference in public sphere behaviour rather than a private sphere behaviour, arguably food consumer behaviour would most likely fall into public sphere behaviour.

7.5. Conclusion

This thesis has made important contributions to the literature in environmental psychology, consumer and social network research. It contains the first studies that investigated the relationship between social network characteristics, sustainable food purchasing behaviour and its antecedent factors. Therein, across social network characteristics were identified by mapping the relationships between social network characteristics, psychological factors and sustainable behaviour. Profiling consumers based on high, medium and low sustainable consumer behaviour lead to how intervention strategies may be tailored to different consumer segments based on social network characteristics and psychological factors. Additionally I explored how social network characteristics could be manipulated to influence actual organic consumption choices and the speed of the uptake of sustainable consumer behaviour with an experimental study and ABM. The experimental study and ABM explored how social networks may be utilized to bring about individual behaviour change to stimulate a sustainable consumer behaviour change through social networks in society. The thesis shows that social network characteristics are useful in understanding underlying mechanism of sustainable consumer behaviour and for changing sustainable consumer behaviour.

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Appendix I: Descriptive data for the participant sample

Table 1 Frequency data (frequency count, percentage and cumulative percentage) for gender, number of children, education level, employment status, political affiliation, ethnicity and household income

Variables	Categories	Behaviour			Intention		
		Frequency	%	Cumulative %	Frequency	%	Cumulative %
Gender	Male	202	42.6	42.6	197	44.1	44.1
	Female	272	57.4	100.0	250	55.9	100.0
	Total	474	100.0		447	100.0	
Children	No	184	38.8	38.8	168	37.6	37.6
	Yes	290	61.2	100.0	279	62.4	100.0
	Total	474	100.0		447	100.0	
Number of children	0	184	38.8	39.5	168	37.6	37.6
	1	82	17.3	56.1	80	17.9	55.5
	2	138	29.1	85.2	127	28.4	83.9
	3	47	9.9	95.1	47	10.5	94.4
	4	14	3.0	98.1	16	3.6	98.0
	5	5	1.1	99.2	5	1.1	99.1
	7	1	.2	99.4	1	.2	99.3
	Missing	3	.6	100.0	3	.7	100.0
	Total	474	100.0		447	100.0	
Education level	No qualifications	29	6.1	6.1	26	5.8	5.8
	Other qualifications	10	2.1	8.2	11	2.5	8.3
	Qualifications at NVQ level 1 and below	16	3.4	11.6	15	3.4	11.6
	GCSE/O Level Grade A*-C, NVQ level 2 & equivalents	109	23.0	34.6	104	23.3	34.9
	A levels, vocational level 3 & equivalents	91	19.2	53.8	89	19.9	54.8

	Other higher education below degree level	47	9.9	63.7	44	9.8	64.7
	Degree or degree equivalent, and above	172	36.3	100.0	158	35.3	100.0
	Total	474	100.0		447	100.0	
Employment status	Full time education (may also work part-time)	16	3.4	3.4	13	2.9	2.9
	Full time housewife/husband	36	7.6	11.0	36	8.1	11.0
	Part-time employed	67	14.1	25.1	64	14.3	25.3
	Full-time employed	160	33.8	58.9	150	33.6	58.8
	Self-employed	25	5.3	64.1	25	5.6	64.4
	Currently unemployed	33	7.0	71.1	30	6.7	71.1
	Retired	115	24.3	95.4	109	24.4	95.5
	Other	13	2.7	98.1	12	2.7	98.2
	Prefer not to answer	9	1.9	100.0	8	1.8	100.0
	Total	474	100.0		447	100.0	
Political affiliation	Labour	109	23.0	23.0	110	24.6	24.6
	Conservative	94	19.8	42.9	91	20.4	45.0
	Liberal Democrat	36	7.6	50.5	34	7.6	52.6
	Green Party	19	4.0	54.5	13	2.9	55.5
	Other	37	7.8	62.4	36	8.1	63.6
	None	135	28.5	90.9	120	26.8	90.4
	Prefer not to answer	43	9.1	100.0	42	9.4	99.8
	Missing	473	99.8		1	.2	100.0
	Total	1	0.2		447	100	
Ethnicity	English / Welsh / Scottish / Northern Irish / British	409	86.3	86.3	380	85.0	85.0
	Irish	3	0.6	86.9	4	0.9	85.9

	Any other White background	21	4.4	91.4	21	4.7	90.6
	White and Black Caribbean	4	0.8	92.2	4	0.9	91.5
	White and Black African	1	0.2	92.4	2	0.4	91.9
	White and Asian	2	0.4	92.8	1	0.2	92.2
	Any other Mixed / multiple ethnic background	5	1.1	93.9	5	1.1	93.3
	Indian	7	1.5	95.4	7	1.6	94.9
	Pakistani	4	0.8	96.2	4	0.9	95.7
	Bangladeshi	3	0.6	96.8	3	0.7	96.4
	Chinese	6	1.3	98.1	6	1.3	97.8
	Other Asian / Asian British	3	0.6	98.7	4	0.9	98.7
	African	2	0.4	99.2	2	0.4	99.1
	Caribbean	2	0.4	99.6	2	0.4	99.6
	Arab	1	0.2	99.8	1	0.2	99.8
	Any other ethnic group	1	0.2	100.0	1	0.2	100.0
	Total	474	100.0		447	100.0	
Household income	Less than 20,000 per year	144	30.4	30.4	131	29.3	29.3
	20,000 to 39,999 per year	168	35.4	65.8	165	36.9	66.2
	40,000 to 59,999 per year	61	12.9	78.7	58	13.0	79.2
	60,000 to 79,999 per year	24	5.1	83.8	24	5.4	84.6
	80,000 to 99,999 per year	6	1.3	85.0	6	1.3	85.9
	More than 100,000 per year	11	2.3	87.3	11	2.5	88.4
	Prefer not to answer	60	12.7	100.0	52	11.6	100.0
	Total	474	100.0		447	100.0	

Appendix II: Survey document

Survey on grocery shopping and social networks

Welcome to this survey, which is being undertaken as part of a research project into consumer behaviour by researchers from Bournemouth University.

We are interested in your grocery shopping behaviour, and would therefore prefer that this survey was completed by **adults who most often do the grocery shopping in their household.**
In particular we are interested in sustainable food purchasing. This refers to items with labels such as 'organic', 'fair trade', or 'locally sourced', and/or those items with little or no packaging. Additionally this means selecting fish and seafood from sustainable sources (e.g. with the Marine Stewardship Council (MSC) logo), and/or animal products that are labelled as 'free range', 'freedom foods', or similar.

We are interested in your answers regardless of whether you actually buy such products or not.
We are also interested in finding out about the influence of social networks on grocery shopping behaviour, and therefore we will ask you some questions about your friends, family, colleagues, neighbours etc.

This survey should take about 30 minutes to complete. Please note that there are no right or wrong answers. You are free to withdraw your participation at any time in the survey by not completing it further. This means we will not analyze your results. The information that you provide to us will be treated in the strictest confidence and you will not be identified in any way, in line with the British Psychological Society's Code of Conduct. The information will be stored confidentially on a password protected computer.

Thank you for taking part. Please use the arrows below on the right to start the survey once you have read and understood the consent form below.

- I confirm that I have read and understood the information about the project above.
- I understand that my participation is voluntary and that I am free to stop participating at any point while completing the study, without having to give a reason and without any consequences.
- I understand that I can stop participating while completing the study and that any information I have provided will not be used.
- I understand that any information recorded in the investigation will remain confidential and no information that identifies me will be made publicly available.
- I consent to being a participant in the project

o I consent to taking part in this study.

[Part 1: Social network characteristics]

Q1.1 First we would like to ask you some questions about yourself. This will help us understand your views better.

Q1.2 What was your age on your most recent birthday?
[text box]

[Filter out age below 18]
Q1.3 Who normally does the grocery and household shopping in your household? You can choose more than one option.

Me
My partner
My Mother/Father
My Flat/Housemate
others, namely.....

[Filter out if 'Me' is not chosen]

Q1.6 We would like to ask you about your social network of friends, family, neighbours, colleagues and acquaintances. This information will not be used for any other purposes than to understand your social network in relation to questions asked in this survey.

Q 1.6.1 **Who belongs to your closest circle of friends and family?** Can you please list all the names of relevant people you think belong to this group. This could be people who you spent a lot of time with or you go to for advice for example. Please do not give their full name but nicknames or their initials. You will be asked some more questions about them later. This information will only help us understand your social network of friends, family and others. We will not contact these people without your permission.

For example you can write: Jane or J.T.

Q1.6.2 **Now think about people who you frequently eat with, cook for/with or who cook for you.** Below again is the list of all the people that you have mentioned. Please take a moment to think about which of these people you frequently eat with, cook for/with or who cooks for you. Can you please tick them all the ones that apply to this.

Q1.6.2.1. **Please add any other names of people who you frequently eat with, cook for/with or who cook for you.**

[text boxes]

Q1.6.3 **Who do you talk to about food shopping matters?** Below are the people that you have mentioned already. Can you please tick the ones which you talk to about food shopping matters. Are there any others that you talk to about this that are not listed yet? Again you don't have to give their full name. For example you can write: Jane or J.T.

Q1.6.3.1. **Are there any others that you talk to about this that are not listed yet?**
[text boxes]

Q1.6.4 **Who in your social network [friends, family, neighbours, colleagues, acquaintances etc.] purchases sustainable food products and who does not?** Below are the people that you have mentioned already. Which of those purchase sustainable food products and which do not?

'Buys sustainable food products' (1)
'Does not buy sustainable food products' (2)
'Don't know' (3)
Q1.6.4.1. **Are there any other people that you know that buy sustainable food products? Is there anybody else in your network that does not buy any sustainable products that you have not listed?** Again you could use nicknames or initials so you can refer back to them. For example you can write: Jane or J.T.

'Buys sustainable food product's (1)
'Does not buy sustainable food product's (2)
'Don't know' (3)

Q1.6.5 **Who influences your food shopping decisions? Please tick all that apply. [**Follow up question about **how they think they influenced their shopping decisions**]

Q1.7 **How close are you to people that you have mentioned?** Please rate how close you are to each of the people you have listed, using the scale below.

'I don't feel close at all' (1)
'I don't feel very close' (2)
'I feel reasonably close' (3)
'I feel close' (4)
'I feel very close' (5)

Q1.8 a **How do you know the people in your social network?** E.g. family, friends, colleagues, neighbour, acquaintances from school/university, sports clubs/leisure activities, other areas of your life

Q1.8 b **How long have you known people for?** E.g. most my life, several years, several months.
[In the same question as 1.8 a, 2 columns of text boxes]

Q1.9 **Which of your friends are likely to have contact with each other independent of you? Put an X for those connected.**

[Matrix of answers to click links]

[Part 2: Psychological constructs]

Q.2 The following questions will ask you about your shopping behaviour.

This refers to items with labels such as 'organic', 'fair trade', or 'locally sourced', and/or those items with little or no packaging. Additionally this means selecting fish and seafood from sustainable sources (e.g. with the Marine Stewardship Council (MSC) logo), and/or meat products that are labelled as 'free range', 'freedom foods', or similar.[sustainable product definition button]

Q2.1 [Behaviour] [includes N/A options online]

	Please choose						
	Never	Almost never	Seldom	Sometimes	Often	Almost always	Always
1) I buy fair-trade products. (1)							
2) I buy products for which the producer gets a fair price. (1)							
3) I buy organic food. (2)							
4) I buy food that is grown without the use of herbicides, pesticides, or chemicals. (2)							
5) I buy products in refillable packages.(3)							
6) I buy food with little or no packing around them. (3)							
7) I buy locally sourced food. (4)							
8) I buy food produced in other countries (e.g. bananas, coffee, chocolate) (R)							
9) I buy fish and seafood with a sustainable logo such as the Marine Stewardship Council logo.(6)							
10) I buy any fish and seafood. Logos indicating that it is sustainably sourced are not important. (R)							
11) I buy animal products (e.g. meat and eggs) that are labeled as ‘free range’, ‘freedom food’ or similar.							
12) I buy any animal products (e.g. meat and eggs) whether they are ‘free range’, ‘freedom food’ (or similar) or not. (R)							

Q2.1.1 Why did you select 'Not applicable' for any of the food options? You can select multiple reasons.

I am a vegetarian. (1)
I am a vegan. (2)
I don't eat meat, fish or other animal products for health or dietary reasons. (3)
I don't eat meat, fish or other animal products for sustainability reasons. (4)
Other reasons... Please explain. [Text option] (5)

Q2.2 [Intention] [includes N/A options online]

In the future, I intend to buy more food products which are:	Please choose						
	Very unlikely (1)	Unlikely (2)	Somewhat unlikely (3)	Neither likely nor unlikely (4)	Somewhat likely (5)	Likely (6)	Very likely (7)
1)Organic	○	○	○	○	○	○	○
2)Fair trade	○	○	○	○	○	○	○
3)Locally sourced	○	○	○	○	○	○	○
4)No or little packing	○	○	○	○	○	○	○
5)Fish/Seafood from sustainable sources (such as with the Marine Stewardship Council (MSC) logo)	○	○	○	○	○	○	○
6)Animal products labeled as 'free range', 'Freedom food' or similar	○	○	○	○	○	○	○

Q2.3 [Perceived behavioural control]

	Please choose						
	Strongly disagree (1)	Disagree (2)	Disagree somewhat (3)	Neither agree nor disagree (4)	Agree somewhat (5)	Agree (6)	Strongly agree (7)
1) I know where I can buy sustainable food products.	○	○	○	○	○	○	○
2) It is not difficult for me to buy sustainable food products.	○	○	○	○	○	○	○
3) I feel able to buy sustainable food products.	○	○	○	○	○	○	○

Q.2.4 [Habit]

Sustainable food shopping is something that...

	Please choose						
	Strongly disagree (1)	Disagree (2)	Disagree somewhat (3)	Neither agree nor disagree (4)	Agree somewhat (5)	Agree (6)	Strongly agree (7)
1) I do frequently	○	○	○	○	○	○	○
2) I do without having to consciously	○	○	○	○	○	○	○
remember	○	○	○	○	○	○	○
3) that makes me feel weird if I do not do it	○	○	○	○	○	○	○
4) I do without thinking	○	○	○	○	○	○	○

Q2.5 [Personal Norm]

	Please choose						
	Strongly disagree (1)	Disagree (2)	Disagree somewhat (3)	Neither agree nor disagree (4)	Agree somewhat (5)	Agree (6)	Strongly agree (7)
1) I feel morally obliged to buy sustainable food products.	○	○	○	○	○	○	○
2) I feel good when I buy sustainable food products.	○	○	○	○	○	○	○
3) I feel guilty when I fail to buy sustainable food products.	○	○	○	○	○	○	○

Q2.6 [Descriptive and Injunctive Norm] [Injunctive norm items 1-3, Descriptive Norm – items 4-6]

	Please choose						
	Strongly disagree (1)	Disagree (2)	Disagree somewhat (3)	Neither agree nor disagree (4)	Agree somewhat (5)	Agree (6)	Strongly agree (7)
1) My friends expect me to buy sustainable food products.	○	○	○	○	○	○	○
2) My family members expect me to buy sustainable food products.	○	○	○	○	○	○	○
3) Other people who are important to me expect me to buy sustainable food products.	○	○	○	○	○	○	○
4) I think my friends buy sustainable food products.	○	○	○	○	○	○	○
5) I think members of my family buy sustainable food products.	○	○	○	○	○	○	○
6) I think other people who are important to me buy sustainable food products.	○	○	○	○	○	○	○

Q2.7 [Attitude]

	Please choose						
	Very unimportant (1)	Unimportant (2)	Somewhat unimportant (3)	Neither important nor unimportant (4)	Somewhat important (5)	Important (6)	Very important (7)
1) For me to buy sustainable food products would be:	○	○	○	○	○	○	○

	Please choose						
	Very inappropriate (1)	Inappropriate (2)	Somewhat inappropriate (3)	Neither appropriate nor inappropriate (4)	Somewhat appropriate (5)	Appropriate (6)	Very appropriate (7)
2) For me to buy sustainable food products would be:	○	○	○	○	○	○	○

	Please choose						
	Very bad (1)	Bad (2)	Somewhat bad (3)	Neither good nor bad (4)	Somewhat good (5)	Good (6)	Very good (7)
3) For me to buy sustainable food products would be:	○	○	○	○	○	○	○

[Part 3: Demographic information]

Q3 We would now like to know a bit more about you.

Q3.1 Are you:

Female (1)
Male (2)

Q3.2 What is the highest educational qualification that you hold, including any that you have gained since leaving school? Please select from the dropdown menu

Degree or degree equivalent, and above (1)
Other higher education below degree level (2)
A levels, vocational level 3 & equivalents (3)
GCSE/O Level Grade A*-C, NVQ level 2 & equivalents (4)
Qualifications at NVQ level 1 and below (5)
Other qualifications (6)
No qualifications (7)

Q3.3 Do you have any children?

Yes (1)
No (2)
If Yes then 2 follow on questions

Q3.3.1 How many children do you have?
[text box]

Q3.3.2 How old are they?
[text box]

Q3.4 How many people live in your household?
[text field]

3.5 To which job category do you belong? If you have more than one job, please answer for your main job or the one at which you spend the most time. Please select from the dropdown menu

Full time education (may also work part-time) (1)
Full time housewife/husband (2)
Part-time employed (3)
Full-time employed (4)
Self-employed (5)
Currently unemployed (6)
Retired (7)
Other (8)
Prefer not to say (9)

Q 3.6 On average, what is your household income per year before tax and other deductions are removed? Please select from the dropdown menu

Less than 20,000 per year (1)
20,000 to 39,999 per year (2)
40,000 to 59,999 per year (3)
60,000 to 79,999 per year (4)
80,000 to 99,999 per year (5)
More than 100,000 per year (6)
Prefer not to say (7)

Q3.7 How would you describe your ethnic group?

English / Welsh / Scottish / Northern Irish / British (1)
Irish (2)
Gypsy or Irish Traveller (3)
Any other White background, (4) _____
White and Black Caribbean (5)
White and Black African (6)
White and Asian (7)
Any other Mixed / multiple ethnic background, (8) _____
Indian (9)
Pakistani (10)
Bangladeshi (11)
Chinese (12)
Any other Asian background, (13) _____
African (14)
Caribbean (15)
Any other Black / African / Caribbean background, (16) _____
Arab (17)
Any other ethnic group (18) _____

Q3.8 Which political party best represents your views?

Labour (1)
Conservative (2)
Liberal Democrat (3)
Green Party (4)
Other (5)
None (6)
Prefer not to say (7)

Thank you very much for completing this study! If you have any further questions you can contact me (Iljana Schubert) via my email: ischubert@bournemouth.ac.uk.

Appendix III: Coding for social context diversity variable

Question 1.8a: How do you know the people in your social network? E.g. family, friends, colleagues, neighbour, acquaintances from school/university, sports clubs/leisure activities, other areas of your life

Assigned coding categories and values:

1 – Biological parents
2 – Non-biological parents
3 – Biological children
4 – Non-biological children
5 – Biological Siblings
6 – Non-biological siblings
7 – Grandparents
8 – Grandchildren
9 – Siblings' partners and partners' siblings
10 – Children's partners
11 – Parents In-law and partners' parents
12 – Other extended family members
13 – Partners
14 – Ex-partners
15 – Friends
16 – Close, good and very good friends
17 – Best friends
18 – School/University
19 – Work
20 – Ex/Old work colleague
21 – Recreational
22 - Neighbours
23 – Ex/Old Neighbours
24 – Acquaintances and others
25 – Family and Friends of others (Alters of alters)

Old Value	Description	New Value Label
Category 1 – biological parents		
dad	104 dad	1
Dad	105 Dad	1
father	179 father	1
Father	180 Father	1
FATHER	181 FATHER	1
he's my dad	291 he's my dad	1
mam	331 mam	1
mom	348 mom	1
Mom	349 Mom	1
mother	352 mother	1

Mother	353 Mother	1
MOTHER	354 MOTHER	1
mum	365 mum	1
Mum	366 Mum	1
my dad	382 my dad	1
my Dad	383 my Dad	1
My dad	384 My dad	1
my mother	391 my mother	1
my mum	392 my mum	1
My mum	393 My mum	1
my.mum	400 my.mum	1
parent	436 parent	1
Parent	437 Parent	1
parents	438 parents	1
parnet	439 parnet	1
she's my mum	484 she's my mum	1
Category 2 - non-biological parents		
step dad	532 step dad	2
Step dad	533 Step dad	2
step mother	536 step mother	2
Step mum	537 Step mum	2
stepdad	539 stepdad	2
stepfather	542 stepfather	2
Category 3 - biological children		
child	75 child	3
Child	76 Child	3
CHILD	77 CHILD	3
daughter	112 daughter	3
Daughter	113 Daughter	3
DAUGHTER	114 DAUGHTER	3
daugter	133 daugter	3
Doughter	142 Doughter	3
kid	318 kid	3
kids	319 kids	3
Mine	347 Mine	3
my daughter	385 my daughter	3
My daughter	386 My daughter	3
my son	397 my son	3
My son	398 My son	3
Som	510 Som	3
son	511 son	3
Son	512 Son	3
SON	513 SON	3
son and DIL	514 son and DIL	3
son`	519 son`	3
Category 4 - non-biological children		
Adopted Son	11 Adopted Son	4
partners son	447 partners son	4

Partners son	448	Partners son	4
step daughter	534	step daughter	4
Step Daughter	535	Step Daughter	4
step son	538	step son	4
stepdaughter	540	stepdaughter	4
Stepdaughter	541	Stepdaughter	4
stepson	543	stepson	4
Stepson	544	Stepson	4
STEPSON	545	STEPSON	4
Category 5 – Biological Siblings			
big sister	2	big sister	5
Bro	57	Bro	5
brother	59	brother	5
Brother	60	Brother	5
BRother	61	Brother	5
BROTHER	62	BROTHER	5
bruv	73	bruv	5
he's my brother	290	he's my brother	5
my brother	376	my brother	5
my sister	395	my sister	5
she's my sister	485	she's my sister	5
sibling	487	sibling	5
Sibling	488	Sibling	5
sis	489	sis	5
Sis	490	Sis	5
sister	491	sister	5
Sister	492	Sister	5
twin	566	twin	5
Category 6 – non-biological siblings			
dad stepson	108	dad stepson	6
HALF/SISTER	288	HALF/SISTER	6
Category 7 - Grandparents			
Grandad	271	Grandad	7
grandma	278	grandma	7
Grandma	279	Grandma	7
grandparent	280	grandparent	7
nan	407	nan	7
Category 8 - Grandchildren			
g-daughter	259	g-daughter	8
grandaughter	272	grandaughter	8
Grandaughter	273	Grandaughter	8
grandchild	274	grandchild	8
granddaughter	275	granddaughter	8
Granddaughter	276	Granddaughter	8
grandson	281	grandson	8
Grandson	282	Grandson	8

Category 9 – Sibling's partners and partner's siblings			
B in Law	29	B in Law	9
b-i-l	30	b-i-l	9
Bother in law	49	Bother in law	9
boyfriends sister	56	boyfriends sister	9
bro in law	58	bro in law	9
Brother I law	63	Brother I law	9
brother in law	64	brother in law	9
Brother in law	65	Brother in law	9
Brother in Law	66	Brother in Law	9
BROTHER IN LAW	67	BROTHER IN LAW	9
Brother in law,	68	Brother in law,	9
brother n law	69	brother n law	9
brother wife	70	brother wife	9
brother-in-law	71	brother-in-law	9
brothers girl	72	brothers girl	9
Husband's sister	308	Husband's sister	9
married to brother	337	married to brother	9
my sister in law	396	my sister in law	9
she's my brother's girlfriends	483	she's my brother's girlfriends	9
sister in law	493	sister in law	9
Sister in law	494	Sister in law	9
Sister in Law	495	Sister in Law	9
SISTER IN LAW	496	SISTER IN LAW	9
sister in laws	497	sister in laws	9
sister inlaw	498	sister inlaw	9
sister-in -law	500	sister-in –law	9
sister-in-law	501	sister-in-law	9
Sister-in-law	502	Sister-in-law	9
Sister-in-Law	503	Sister-in-Law	9
Category 10 – Children's partners			
Adopted Daughter -in=law	10	Adopted Daughter -in=law	10
daugetin law	111	daugetin law	10
daughter fiance	115	daughter fiancé	10
daughter in law	116	daughter in law	10
daughter in law	117	daughter in law	10
Daughter in law	118	Daughter in law	10
Daughter in Law	119	Daughter in Law	10
DAUGHTER IN LAW	120	DAUGHTER IN LAW	10
daughter inlaw	121	daughter inlaw	10
daughter partner	123	daughter partner	10
daughter-in-law	124	daughter-in-law	10
Daughter's BF	125	Daughter's BF	10
Daughter's Boyfriend	126	Daughter's Boyfriend	10
Daughter's fiancé	127	Daughter's fiancé	10
daughters bf	130	daughters bf	10
daughters husband	131	daughters husband	10
daughters partner	132	daughters partner	10
son in law	515	son in law	10
Son in law	516	Son in law	10
son inlaw	517	son inlaw	10
Son-in Law	520	Son-in Law	10
son-in-law	521	son-in-law	10

Son-in-law	522	Son-in-law	10
son's goirlfriend	523	son's goirlfriend	10
Sons partner	524	Sons partner	10
Sons wife	525	Sons wife	10
Category 11 - Parents In-law or partner's parents			
boyfriends dad	54	boyfriends dad	11
boyfriends mum	55	boyfriends mum	11
d-i-law	103	d-i-law	11
dad in law	107	dad in law	11
Farther in law	177	Farther in law	11
father in law	182	father in law	11
Father in law	183	Father in law	11
Father in Law	184	Father in Law	11
Father In Law	185	Father In Law	11
fiances dad	193	fiances dad	11
fiances mum	194	fiances mum	11
future mother in law	258	future mother in law	11
Husband's mum	307	Husband's mum	11
in law	311	in law	11
In law	312	In law	11
in-law	313	in-law	11
inlaw	314	inlaw	11
mom in law	350	mom in law	11
mother in law	355	mother in law	11
Mother in law	356	Mother in law	11
Mother in Law	357	Mother in Law	11
Mother In Law	358	Mother In Law	11
MOTHER IN LAW	359	MOTHER IN LAW	11
Mother on law	360	Mother on law	11
mother-in-law	361	mother-in-law	11
Mother-in-law	362	Mother-in-law	11
mther in law	364	mther in law	11
mum in law	367	mum in law	11
mum in law (step)	368	mum in law (step)	11
Partners mum	445	Partners mum	11
Category 12 – Other extended family members			
Aunt	23	Aunt	12
AUNT	24	AUNT	12
Aunt-in-law	25	Aunt-in-law	12
Auntie	26	Auntie	12
aunty	27	aunty	12
Aunty	28	Aunty	12
bf nan	46	bf nan	12
cousin	97	cousin	12
Cousin	98	Cousin	12
cousin wife	99	cousin wife	12
Cousin's hubby	100	Cousin's hubby	12
cousine	101	cousine	12
cousins husband	102	cousins husband	12
dad girl	106	dad girl	12
dads partner	109	dads partner	12

Ditto	135	Partner’s relative	12
extended family	165	extended family	12
fam	167	fam	12
Famiky	168	Famiky	12
famil	169	famil	12
family	170	family	12
Family	171	Family	12
FAMILY	172	FAMILY	12
fanily	176	fanily	12
fasmily	178	fasmily	12
God Daughter	266	God Daughter	12
Godson	267	Godson	12
Granddaughter in law	277	Granddaughter in law	12
Grandson in law	283	Grandson in law	12
grandsons partner	284	grandsons partner	12
great nan	285	great nan	12
great-niece	286	great-niece	12
Married to Relative	340	Married to Relative	12
mums bloke	371	mums bloke	12
my cousin	379	my cousin	12
My cousin	380	My cousin	12
My cousin's wife	381	My cousin's wife	12
neice	408	neice	12
Neice	409	Neice	12
nephew	416	nephew	12
Nephew	417	Nephew	12
nephew in law	418	nephew in law	12
niece	420	niece	12
Niece	421	Niece	12
Niece husband	422	Niece husband	12
niece's partner	423	niece's partner	12
partner's cousin	444	partner's cousin	12
Partners relative	446	Partners relative	12
related	464	related	12
relation	465	relation	12
Relation	466	Relation	12
relative	467	relative	12
Relative	468	Relative	12
RELATIVE	469	RELATIVE	12
relitive	471	relitive	12
uncle	567	uncle	12
Uncle	568	Uncle	12
Category 13 – Partners			
botfriend	48	botfriend	13
boyfriend	52	boyfriend	13
Boyfriend	53	Boyfriend	13
ditto	134	wife	13
fiance	188	fiance	13
Fiance	189	Fiance	13
Fiancé	190	Fiancé	13
fiancee	191	fiancee	13
Fiancee	192	Fiancee	13
frequented same pub and glf	208	frequented same pub and glf	13

FRIEND & LOVER	214	FRIEND & LOVER	13
gf	261	gf	13
girl friend	262	girl friend	13
girlfriend	263	girlfriend	13
Girlfriend	264	Girlfriend	13
he's my boyfriend	289	he's my boyfriend	13
hubby	301	hubby	13
Hubby	302	Hubby	13
husband	303	husband	13
Husband	304	Husband	13
HUSBAND	305	HUSBAND	13
mar	333	mar	13
married	334	married	13
Married	335	Married	13
Married to	336	Married to	13
my eife	388	my eife	13
my boyfriend	375	my boyfriend	13
my husband	390	my husband	13
my partner	394	my partner	13
partner	440	partner	13
Partner	441	Partner	13
PARTNER	442	PARTNER	13
spoude	529	spoude	13
spouse	530	spouse	13
Spouse	531	Spouse	13
together	576	together	13
wife	590	wife	13
Wife	591	Wife	13
WIFE	592	WIFE	13
Category- 14 Ex-partners			
Ex Husband	153	Ex Husband	14
Ex Partner	155	Ex Partner	14
ex wife	157	ex wife	14
Ex wife	158	Ex wife	14
ex-boyfriend	161	ex-boyfriend	14
ex	163	ex	14
SEPERATED WIFE	481	SEPERATED WIFE	14
Category 15 - Friends			
VERY WELL	1	VERY WELL	15
school friend	3	school friend	15
a friend	6	a friend	15
buddy	74	buddy	15
Colleague / friend	92	Colleague / friend	15
colleague/friend	93	colleague/friend	15
family friend	173	family friend	15
Family friend	174	Family friend	15
Family Friend	175	Family Friend	15
Ffiend	187	Ffiend	15
firend	195	firend	15
Fr	199	Fr	15
freind	200	freind	15

Freind	201	Freind	15
FREIND	202	FREIND	15
Fremd	203	Fremd	15
frend	204	frend	15
Frend	205	Frend	15
Frend work	206	Frend work	15
friebd	209	friebd	15
friemd	210	friemd	15
friend	211	friend	15
Friend	212	Friend	15
FRIEND	213	FRIEND	15
friend & neighbour	215	friend & neighbour	15
Friend & neighbour	216	Friend & neighbour	15
friend 48	217	friend	15
friend and neighbour	218	friend and neighbour	15
Friend from school	220	Friend from school	15
Friend from school and lives in the village I grew up in	221	Friend from school and lives in the village I grew up in	15
Friend from uni	222	Friend from uni	15
friend from work	223	friend from work	15
Friend from work	224	Friend from work	15
Friend through work/Uni	229	Friend through work/Uni	15
Friend, ex-colleague	230	Friend, ex-colleague	15
Friend/ colleague	232	Friend/ colleague	15
friend/ fellow grad student	233	friend/ fellow grad student	15
friend/colleague	234	friend/colleague	15
Friend/colleague	235	Friend/colleague	15
friend/colleague/former lecturer	236	friend/colleague/former lecturer	15
Friend/fellow-PhD	237	Friend/fellow-PhD	15
Friend/former colleague	238	Friend/former colleague	15
Friend/former manager	239	Friend/former manager	15
Friend/former teacher	240	Friend/former teacher	15
friend/hairdresser	241	friend/hairdresser	15
friend/neighbours	242	friend/neighbours	15
friend/parent of Grace's	243	friend/parent of Grace's	15
friends	244	friends	15
Friends	245	Friends	15
FRIENDS	246	FRIENDS	15
Friends with my mum and myself and from the village I grew up in	249	Friends with my mum and myself and from the village I grew up in	15
he's one of my friends	292	he's one of my friends	15
Holiday friend	296	Holiday friend	15
holiday group	297	holiday group	15
local friend	327	local friend	15
long time friend	330	long time friend	15
mate	341	mate	15
Mutual friend	372	Mutual friend	15
my friend	389	my friend	15
Neighbour and friend	415	Neighbour and friend	15
ok	428	ok	15
Penfriend	449	Penfriend	15
QUITE WELL	461	QUITE WELL	15
recent friend	463	recent friend	15

well	587	well	15
Well	588	Well	15
Category 16 – close, good and very good friends			
close friend	83	close friend	16
Close friend	84	Close friend	16
close frind	85	close frind	16
good friend	269	good friend	16
GOOD friend	270	GOOD friend	16
Met at work now good friend	344	Met at work now good friend	16
my close friend	377	my close friend	16
my close friend/family	378	my close friend/family	16
Perfect	450	Perfect	16
v gd friend	577	v gd friend	16
v well	578	v well	16
very close friend	579	very close friend	16
Category 17 – Best Friends			
Best freind	33	Best friend	17
Best Frend	34	Best Frend	17
best friend	35	best friend	17
Best friend	36	Best friend	17
Best Friend	37	Best Friend	17
BEST FRIEND	38	BEST FRIEND	17
best friend school	39	best friend school	17
best mate	42	best mate	17
my best fiend	373	my best fiend	17
my best friend	374	my best friend	17
more than a friend	351	more than a friend	17
she's one of my best friends	486	she's one of my best friends	17
Category 18 – School/University			
at college with her	22	at college with her	18
During master's	145	During master's	18
During master's/from church	146	During master's/from church	18
During PhD	147	During PhD	18
fellow student	186	fellow student	18
classmate	243	classmate	18
from school	252	from school	18
FROM SCHOOL	253	FROM SCHOOL	18
From secondary school	254	From secondary school	18
From university	255	From university	18
school	475	school	18
School	476	School	18
SCHOOL	477	SCHOOL	18
school friend	478	school friend	18
School friend	479	School friend	18
secondary school	480	secondary school	18
through uni	563	through uni	18
uni	569	uni	18

Uni	570	Uni	18
university	571	university	18
University	572	University	18
primary school	455	primary school	18
Category 19 – Work			
20rk (typo)	4	work	19
boss	47	boss	19
colleague	89	colleague	19
Colleague	90	Colleague	19
COLLEAGUE	91	COLLEAGUE	19
college	94	college	19
College	95	College	19
collegue	96	collegue	19
Employment/Training Service	149	Employment/Training Service	19
From current job	250	From current job	19
from work	256	from work	19
From Work	257	From Work	19
Manager	332	Manager	19
Proffesional	456	Proffesional	19
work	596	work	19
Work	597	Work	19
WORK	598	WORK	19
work associate	599	work associate	19
work assosiate	600	work associate	19
work colleague	601	work colleague	19
Work colleague	602	Work colleague	19
work collegue	603	work collegue	19
work for her	604	work for her	19
work for him	605	work for him	19
work friend	606	work friend	19
Work friend	607	Work friend	19
work mate	608	work mate	19
Work Mate	609	Work Mate	19
WORK MATE	610	WORK MATE	19
work with her	611	work with her	19
WORK/SOCIALLY	612	WORK/SOCIALLY	19
Workmate	613	Workmate	19
WORKMATE	614	WORKMATE	19
Category 20 – Ex/Old work colleague			
ex colleague	152	ex colleague	20
ex work colleague	159	ex work colleague	20
ex workmate	160	ex workmate	20
ex-colleague	162	ex-colleague	20
from previous job	251	from previous job	20
Old Boss	429	Old Boss	20
use to work with her	573	use to work with her	20
use to work with him	574	use to work with him	20
x work colleague	615	x work colleague	20

Category 21 – Recreational			
aerobic class	14	aerobic class	21
Aerobic class	15	Aerobic class	21
BADMINTON	31	BADMINTON	21
BOWL TEAM	50	BOWL TEAM	21
BOWLS TEAM	51	BOWLS TEAM	21
church	78	church	21
Church	79	Church	21
Church mentor	80	Church mentor	21
Church, mum of a friend	81	Church, mum of a friend	21
church, old work colleague	82	church, old work colleague	21
club	86	club	21
CLUB	87	CLUB	21
Clubs	88	Clubs	21
darts	110	darts	21
drinking partner	143	drinking partner	21
ESAMD	150	Ex-Armed Forces Association	21
Evening class	151	Evening class	21
FOOTBALL	197	FOOTBALL	21
frequented same pub	207	frequented same pub	21
society	208	society	21
gaming	260	gaming	21
golf club	268	golf club	21
gym	287	gym	21
hobby	294	hobby	21
Hockey	295	Hockey	21
Leisure	321	Leisure	21
leisure activity	322	leisure activity	21
Line dance teacher	324	Line dance teacher	21
met at club	343	met at club	21
met on holiday	345	met on holiday	21
met through a chat line	346	met through a chat line	21
Online forum	434	Online forum	21
Pilates teacher	451	Pilates teacher	21
play bridge	452	play bridge	21
play bridge and bowls	453	play bridge and bowls	21
politics	454	politics	21
project	457	project	21
pub	458	pub	21
Pub	459	Pub	21
PUB	460	PUB	21
Rogers bingo and facebook	472	Rogers bingo and facebook	21
RUNNING CLUB	473	RUNNING CLUB	21
SAME (checked)	474	Bowling club	21
service provider	482	service provider	21
social	504	social	21
Social Club	505	Social Club	21
social network	506	social network	21
socialising	508	socialising	21
SOCIALLY	509	SOCIALLY	21
Sport clubs	526	Sport clubs	21
Sports	527	Sports	21
Sports Club	528	Sports Club	21

Throudh playing music in orchestras.	552	Throudh playing music in orchestras.	21
through a group	554	through a group	21
travelling	565	travelling	21
Used to be one of my scouts	575	Used to be one of my scouts	21
Used to be scout leaders	576	Used to be scout leaders	21
via this	580	via this	21
Vicar	581	Vicar	21
WALKING DOGS	582	WALKING DOGS	21
Wargames Club	583	Wargames Club	21
We walk our dogs regularly and have coffee often	586	We walk our dogs regularly and have coffee often	21
Category 22 - Neighbours			
Nabour	405	Nabour	22
naigbour	406	naigbour	22
neigbour	410	neigbour	22
Neighbor	411	Neighbor	22
neighbour	412	neighbour	22
Neighbour	413	Neighbour	22
NEIGHBOUR	414	NEIGHBOUR	22
Category 23 – Old/Ex neighbour			
above	7	ex neighbour	23
area	20	area	23
ex neighbour	154	ex neighbour	23
Old neighbour	430	Old neighbour	23
Old Neighbour	431	Old Neighbour	23
Category 24 – Acquaintances and others			
acquaintance	8	acquaintance	24
Acquaintance	9	Acquaintance	24
Aquaintance	17	Aquaintance	24
aquiantance	18	aquiantance	24
aquiatance	19	aquiatance	24
Bank Manager	32	Bank Manager	24
executor	164	executor	24
facebook and local town	166	facebook and local town	24
flatmate	196	flatmate	24
Former landlady	198	Former landlady	24
home	298	home	24
house sharer	299	house sharer	24
housemate	300	housemate	24
Illness	310	Illness	24
LIFE	323	LIFE	24
live with	325	live with	24
LIVED WITH	326	LIVED WITH	24
LOCAL SHOP OWNER	328	LOCAL SHOP OWNER	24
lodger	329	lodger	24

MS	363	illness	24
nurse	427	nurse	24
Social worker	507	Social worker	24
Support worker	547	Support worker	24
teacher	548	teacher	24
TEACHER	549	TEACHER	24
Was a friend	584	Was a friend	24
Category 25 Family and Friends of Others (Friends, relatives)- alters of alters			
adrian daighter	12	adrian daughter	25
adrian wife	13	adrian wife	25
alan	16	alan	25
at a friends	21	at a friends	25
best friends hubby	40	best friends hubby	25
Best friends partner	41	Best friends partner	25
bf best friend	43	bf best friend	25
bf best friends wife	44	bf best friends wife	25
bf mate	45	bf mate	25
Daughter of a friend and church	122	Daughter of a friend and church	25
Daughter's friend	128	Daughter's friend	25
Daughter's friend's Partner	129	Daughter's friend's Partner	25
Emma	148	Emma	25
ex sister in law	156	ex sister in law	25
friend cousine	219	friend cousine	25
FRIEND OF ALAN	225	FRIEND OF ALAN	25
Friend of former housemate's	226	Friend of former housemate's	25
friend of friend	227	friend of friend	25
friend of my sister	228	friend of my sister	25
Friend's former partner	231	Friend's former partner	25
Friends brother	247	Friends brother	25
Friends brothers partner	248	Friends brothers partner	25
girlfriend of friend	265	girlfriend of friend	25
his partner	293	ex-husband’s partner	25
Husband's friend	306	Husband's friend	25
husbands best friend	309	husbands best friend	25
jodies husband	317	jodies husband	25
leahs husband	320	leahs husband	25
Married to FR	338	Married to FR	25
married to friend	339	married to friend	25
mum's fri	369	mum's fri	25
Mum's friend	370	Mum's friend	25
my daughters friends mother	387	my daughters friends mother	25
my sons friend mother	399	my sons friend mother	25
New husband of Joan	419	New husband of Joan	25
Partner to jan	443	Partner to jan	25
one of best friend's mum	432	one of best friend's mum	25
one of my best friend's dad	433	one of my best friend's dad	25
relative of friend	470	relative of friend	25
Sister of a friend and church	499	Sister of a friend and church	25
son of friend	518	son of friend	25
Sue's daughter	546	Sue's daughter	25

through a friend	553	through a friend		25
Through friends	555	Through friends		25
through her daughter	556	through her daughter		25
through her husband Dave	557	through her husband Dave		25
through lemoy	558	through lemoy		25
through my brother	559	through my brother		25
through ricky	560	through ricky		25
Through the kids	561	Through the kids		25
Through the kids, friend of a friend and church	562	Through the kids, friend of a friend and church		25
tracys husband	564	tracys husband		25
Widow of friend	589	Widow of friend		25
waynes partner	585	waynes partner		25
wife of colleague	593	wife of colleague		25
WIFES FRIEND	594	WIFES FRIEND		25
Not identified terms and/or deleted				
dk	136	dk	missing	
DK	137	DK	missing	
do not	138	do not	missing	
dog	139	dog- take out	checked	missing
don't	140	don't	missing	
dont	141	dont	missing	
its not a person	315	its not a person	missing	
j	316	j	checked	missing
N	401	N	checked	missing
n/a	402	n/a	checked	missing
na	403	na	checked	missing
Na	404	Na	checked	missing
no	424	no	checked	missing
none	425	none	checked	missing
NOYB	426	NOYB	checked	missing
r	462	r	checked	missing
This is niot a person	550	This is niot a person	checked	missing
This is not a person	551	This is not a person	checked	missing

Appendix IV: Tests of normality and Homoscedasticity

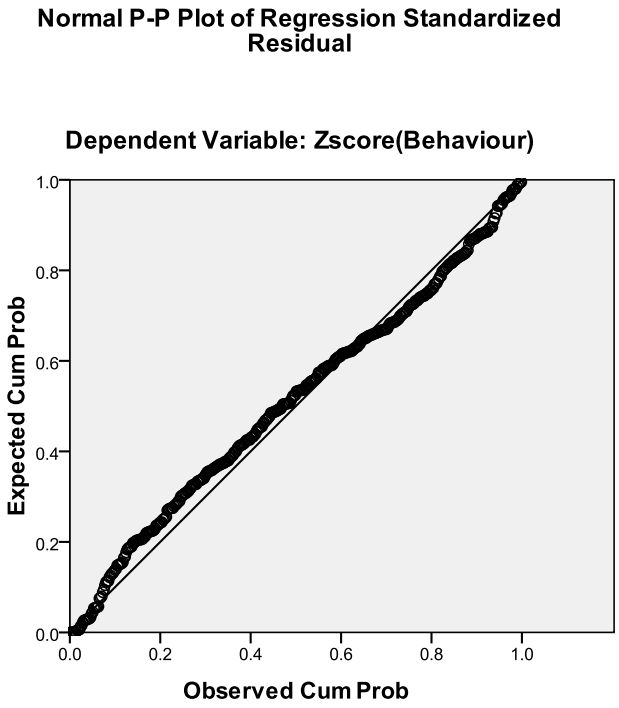
1. Normality and homoscedasticity testing of the standardized residuals of behaviour (DV) and all predictor variables

Table 1 Shapiro –Wilk test of Normality for standardized residuals of behaviour as dependent variable

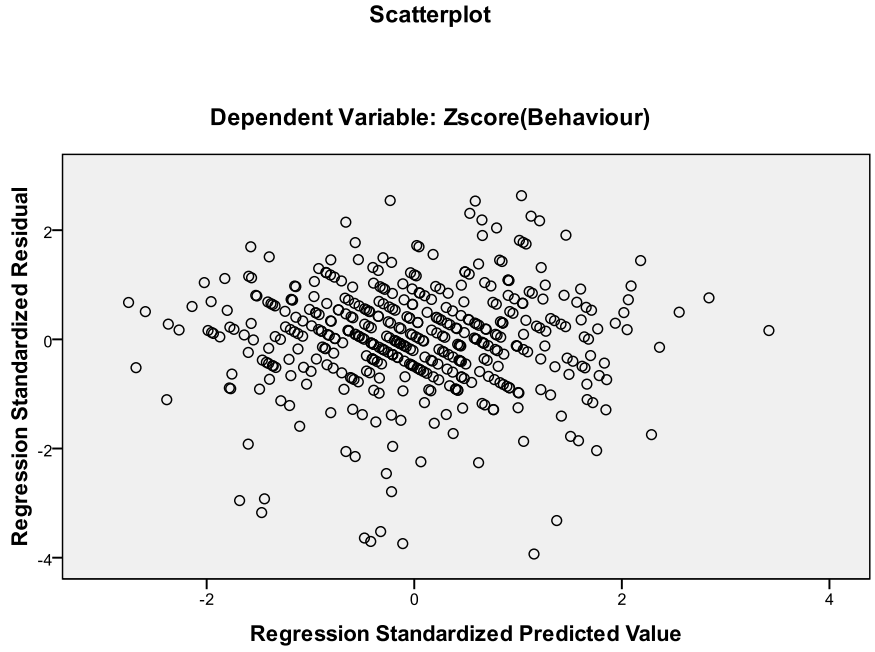
	Shapiro-Wilk		
	Statistic	df	Sig.
Standardized Residual	.957	453	.000

Table 2 Assessment of normality in AMOS, skewness, kurtosis and critical ratio (c.r.)

Variable	skew	c.r.	kurtosis	c.r.
Behaviour_Free_a	-.224	-2.002	-.247	-1.101
Behaviour_Local_a	-.327	-2.921	.616	2.751
Behaviour_Packaging_b	-.365	-3.254	1.226	5.471
Behaviour_Organic_b	-.134	-1.195	-.031	-.139
Behaviour_Fair_a	-.195	-1.740	.138	.614
Intention_Free	-.443	-3.823	.276	1.190
Intention_Packaging	-.646	-5.574	.797	3.439
Intention_Local	-.677	-5.846	.823	3.551
Intention_Fair	-.517	-4.466	.330	1.423
Intention_Organic	-.313	-2.704	-.338	-1.459
IN_a	-.060	-.536	-.342	-1.524
IN_c	-.189	-1.683	-.458	-2.045
PBC_a	-.552	-4.926	.272	1.213
PBC_b	-.295	-2.635	.024	.107
PBC_c	-.465	-4.150	.224	1.001
PN_a	-.278	-2.484	-.547	-2.443
PN_c	-.175	-1.561	-.558	-2.488
DN_a	-.515	-4.595	.449	2.004
DN_b	-.354	-3.163	.118	.526
DN_c	-.501	-4.469	.443	1.977
Habit_b	-.303	-2.706	-.638	-2.846
Habit_d	-.271	-2.415	-.634	-2.831
Attitude_a	-.607	-5.422	.701	3.129
Attitude_b	-.113	-1.010	.339	1.515
Attitude_c	.028	.249	-.408	-1.819
Multivariate			260.882	80.727



Graph 1 Normal P-P plot of regression standardized residuals of behaviour (DV) and all predictor variables



Graph 2 Scatterplot of regression standardized residuals and predicted values (DV Behaviour)

Appendix V: Multiple Group Method (MGM) and non-parametric correlations

This document contains correlation scores for the Multiple Group Method which is a form of Confirmatory Factor Analysis. Firstly parametric (Table 1) correlation results are reported with item variables corrected for self-correlation with corresponding scales (with 'corrected item-total correlations'). Additionally Spearman's rho non-parametric correlations were run to confirm parametric test results. However, item-construct correlations could not be corrected for self-correlations in the non-parametric test as this is a parametric validity analysis. Correlation scores in bold indicate correlations with own scales. Highlighted correlation scores indicate problematic correlations either due to low correlations (below .5) with their own scale or high correlations with other scales (above .7). Participant numbers in Italic highlight high numbers of missing data due to N/A answers.

Table 1 Multiple Group Method: Pearson's correlation results of all items with all constructs (corrected for item-total correlations)

Variables items		Current Behaviour	Intention	PBC	Personal Norm	Habit	Injunctive Norm	Descriptive Norm	Attitude
Current Behaviour: Fair-trade item 1	Pearson Correlation	**.692****	.568**	.490**	.513**	.582**	.531**	.543**	.485**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000
	N	498	492	498	498	498	498	498	498
Current Behaviour: Fair-trade item 2	Pearson Correlation	**.656****	.522**	.499**	.511**	.578**	.487**	.515**	.480**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000
	N	490	484	490	490	490	490	490	490
Current Behaviour: Organic food item 1	Pearson Correlation	**.646****	.555**	.378**	.525**	.571**	.538**	.472**	.433**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000
	N	499	493	499	499	499	499	499	499
Current Behaviour: Organic food item 2	Pearson Correlation	**.716****	.544**	.468**	.541**	.629**	.550**	.514**	.487**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000
	N	488	483	488	488	488	488	488	488

Variable items		Current Behaviour	Intention	PBC	Personal Norm	Habit	Injunctive Norm	Descriptive Norm	Attitude
Current Behaviour: Reduced packaging item 1	Pearson Correlation	**.472****	.379**	.316**	.367**	.404**	.377**	.394**	.294**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000
	N	493	487	493	493	493	493	493	493
Current Behaviour: Reduced packaging item 2	Pearson Correlation	**.529****	.467**	.357**	.336**	.409**	.285**	.357**	.341**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000
	N	499	493	499	499	499	499	499	499
Current Behaviour: Locally sourced food item 1	Pearson Correlation	**.656****	.551**	.465**	.451**	.535**	.432**	.466**	.445**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000
	N	500	494	500	500	500	500	500	500
Current Behaviour: Locally sourced food (reversed) item 2	Pearson Correlation	**-.254***	-.211**	-.232**	-.103*	-.081	-.051	-.172**	-.176**
	Sig. (2-tailed)	.035	.000	.000	.021	.071	.258	.000	.000
	N	498	492	498	498	498	498	498	498
Current Behaviour : Sustainable fish/seafood item 1	Pearson Correlation	**.583****	.508**	.448**	.466**	.512**	.419**	.426**	.449**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000
	N	*459*	*454*	*459*	*459*	*459*	*459*	*459*	*459*
Current Behaviour: Sustainable fish/seafood (reversed) item 2	Pearson Correlation	**-.165***	-.126**	-.091*	-.064	-.036	-.105*	-.102*	.011
	Sig. (2-tailed)	.042	.005	.041	.151	.420	.019	.023	.804
	N	502	496	502	502	502	502	502	502
Current Behaviour: 'Free range', animal products item 1	Pearson Correlation	**.632****	.538**	.452**	.442**	.491**	.378**	.420**	.481**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000
	N	495	490	495	495	495	495	495	495
Current Behaviour: 'Free range', animal products (reversed) item 2	Pearson Correlation	**.103****	.097*	.067	.176**	.176**	.086	.024	.155**
	Sig. (2-tailed)	.000	.031	.138	.000	.000	.055	.598	.001
	N	498	493	498	498	498	498	498	498
Intention item: Organic	Pearson Correlation	.585**	**.657****	.402**	.536**	.547**	.513**	.445**	.499**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000
	N	493	494	494	494	494	494	494	494

Variable items		Current Behaviour	Intention	PBC	Personal Norm	Habit	Injunctive Norm	Descriptive Norm	Attitude
Intention item: Fair-trade	Pearson Correlation	.600**	**.826****	.473**	.546**	.556**	.470**	.514**	.548**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000
	N	492	493	493	493	493	493	493	493
Intention item: Locally sourced produce	Pearson Correlation	.571**	**.821****	.474**	.510**	.502**	.407**	.430**	.543**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000
	N	495	496	496	496	496	496	496	496
Intention item: Reduced packing	Pearson Correlation	.520**	**.713****	.394**	.455**	.416**	.353**	.408**	.482**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000
	N	495	496	496	496	496	496	496	496
Intention item: Sustainable fish/seafood	Pearson Correlation	.650**	**.850****	.516**	.596**	.579**	.477**	.529**	.589**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000
	N	453	454	454	454	454	454	454	454
Intention item: 'Free range' animal products	Pearson Correlation	.607**	**.839****	.500**	.567**	.567**	.467**	.528**	.565**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000
	N	487	488	488	488	488	488	488	488
PBC item 1	Pearson Correlation	.575**	.509**	**.690****	.538**	.621**	.514**	.568**	.503**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000
	N	503	498	507	507	507	507	507	507
PBC item 2	Pearson Correlation	.402**	.359**	**.731****	.465**	.559**	.482**	.469**	.350**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000
	N	503	498	507	507	507	507	507	507
PBC item 3	Pearson Correlation	.557**	.523**	**.735****	.583**	.645**	.575**	.627**	.519**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000
	N	503	498	507	507	507	507	507	507
Personal Norm item 1: Moral obligation	Pearson Correlation	.544**	.550**	.555**	**.787****	.724**	.714**	.609**	.607**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000
	N	503	498	507	507	507	507	507	507

Variable items		Current Behaviour	Intention	PBC	Personal Norm	Habit	Injunctive Norm	Descriptive Norm	Attitude
Personal Norm item 2: Feel Good	Pearson Correlation	.560**	.612**	.575**	**.708****	.641**	.581**	.614**	.617**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000
	N	503	498	507	507	507	507	507	507
Personal Norm item 3: Guilt	Pearson Correlation	.548**	.508**	.485**	**.760****	.725**	.735**	.592**	.526**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000
	N	503	498	507	507	507	507	507	507
Habit item 1: Frequently	Pearson Correlation	.737**	.637**	.690**	.761**	**.887****	.763**	.742**	.634**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000
	N	503	498	507	507	507	507	507	507
Habit item 2: Subconsciously	Pearson Correlation	.646**	.544**	.641**	.681**	**.847****	.705**	.650**	.544**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000
	N	503	498	507	507	507	507	507	507
Habit item 3: Strange	Pearson Correlation	.585**	.545**	.573**	.766**	**.815****	.815**	.686**	.530**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000
	N	503	498	507	507	507	507	507	507
Habit item 4: Without thinking	Pearson Correlation	.639**	.537**	.646**	.679**	**.872****	.756**	.698**	.541**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000
	N	503	498	507	507	507	507	507	507
Injunctive Norm item 1: Friends	Pearson Correlation	.519**	.498**	.534**	.729**	.777**	**.854****	.696**	.450**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000
	N	503	498	507	507	507	507	507	507
Injunctive Norm item 2: Family	Pearson Correlation	.532**	.480**	.556**	.697**	.771**	**.815****	.698**	.487**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000
	N	503	498	507	507	507	507	507	507
Injunctive Norm item 3: Important others	Pearson Correlation	.517**	.478**	.572**	.702**	.751**	**.843****	.723**	.483**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000
	N	503	498	507	507	507	507	507	507

Variable items		Current Behaviour	Intention	PBC	Personal Norm	Habit	Injunctive Norm	Descriptive Norm	Attitude
Descriptive Norm item 1: Friends	Pearson Correlation	.528**	.507**	.581**	.636**	.682**	.679**	**.767****	.446**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000
	N	503	498	507	507	507	507	507	507
Descriptive Norm item 2: Family	Pearson Correlation	.534**	.496**	.575**	.586**	.671**	.683**	**.742****	.512**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000
	N	503	498	507	507	507	507	507	507
Descriptive Norm item 3: Important others	Pearson Correlation	.520**	.480**	.554**	.614**	.688**	.693**	**.819****	.483**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000
	N	503	498	507	507	507	507	507	507
Attitude item 1: Unimportant-Important	Pearson Correlation	.589**	.603**	.469**	.644**	.620**	.533**	.513**	**.758****
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000
	N	503	498	507	507	507	507	507	507
Attitude item 2: Inappropriate-Appropriate	Pearson Correlation	.570**	.552**	.508**	.594**	.573**	.480**	.497**	**.859****
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000
	N	503	498	507	507	507	507	507	507
Attitude item 3: Bad-Good	Pearson Correlation	.498**	.814**	.458**	.550**	.476**	.378**	.453**	**.814****
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000
	N	503	498	507	507	507	507	507	507

All item correlations were corrected for their own scale. **. Correlation is significant at the 0.01 level (2-tailed). *. Correlation is significant at the 0.05 level (2-tailed).

PBC = Perceived behavioural control

Below are correlation results of non-parametric correlations (Spearman's rho) of all items with all construct variables. Item correlations with corresponding construct variables could not be corrected for self-correlation of item with scale. Item and own construct correlations are in bold. Highlighted correlations indicate problematic high correlations with other scales (above .7) or low

correlations with own scale (below .5). Participant numbers in Italic indicate high numbers of missing data due to N/A answers. Besides the non-parametric correlations showing slightly lower overall correlations with other scales and higher correlations with own scales (due to not being corrected for item scale correlations) there are no differences between parametric and non-parametric correlation findings.

Table 2 Spearman's rho correlation results for items and construct variables

Variable items		Behaviour	Intention	PBC	Personal Norm	Habit	Injunctive Norm	Descriptive Norm	Attitude
Current Behaviour: Fair-trade item 1	Spearman's Correlation	**.806****	.570**	.496**	.511**	.599**	.558**	.533**	.476**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000
	N	498	492	498	498	498	498	498	498
Current Behaviour: Fair-trade item 2	Spearman's Correlation	**.776****	.539**	.488**	.509**	.598**	.513**	.497**	.478**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000
	N	490	484	490	490	490	490	490	490
Current Behaviour: Organic food item 1	Spearman's Correlation	**.732****	.566**	.367**	.523**	.564**	.472**	.534**	.434**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000
	N	499	493	499	499	499	499	499	499
Current Behaviour: Organic food item 2	Spearman's Correlation	.773**	.551**	.450**	.537**	.620**	.496**	.533**	.484**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000
	N	488	483	488	488	488	488	488	488
Current Behaviour: Reduced packaging item 1	Spearman's Correlation	**.625****	.387**	.285**	.342**	.416**	.370**	.357**	.293**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000
	N	493	487	493	493	493	493	493	493
Current Behaviour: Reduced packaging item 2	Spearman's Correlation	**.655****	.447**	.359**	.325**	.436**	.371**	.303**	.344**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000
	N	499	493	499	499	499	499	499	499

Variable items		Behaviour	Intention	PBC	Personal Norm	Habit	Injunctive Norm	Descriptive Norm	Attitude
Current Behaviour: Locally sourced food item 1	Spearman's Correlation	**.741****	.548**	.461**	.459**	.547**	.481**	.425**	.444**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000
	N	500	494	500	500	500	500	500	500
Current Behaviour: Locally sourced food (reversed) item 2	Spearman's Correlation	**-.258****	-.154**	-.200**	-.082	-.070	-.159**	-.021	-.156**
	Sig. (2-tailed)	.000	.001	.000	.066	.120	.000	.648	.000
	N	498	492	498	498	498	498	498	498
Current Behaviour : Sustainable fish/seafood item 1	Spearman's Correlation	**.762****	.524**	.444**	.472**	.532**	.440**	.435**	.465**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000
	N	*459*	*454*	*459*	*459*	*459*	*459*	*459*	*459*
Current Behaviour: Sustainable fish/seafood (reversed) item 2	Spearman's Correlation	**-.235****	-.117**	-.076	-.083	-.052	-.100*	-.112*	.011
	Sig. (2-tailed)	.000	.009	.090	.064	.242	.025	.012	.806
	N	502	496	502	502	502	502	502	502
Current Behaviour: 'Free range', animal products item 1	Spearman's Correlation	**.687****	.535**	.424**	.433**	.493**	.411**	.358**	.464**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000
	N	495	490	495	495	495	495	495	495
Current Behaviour: 'Free range', animal products (reversed) item 2	Spearman's Correlation	**.062**	.129**	.083	.178**	.167**	.043	.095*	.166**
	Sig. (2-tailed)	.168	.004	.063	.000	.000	.339	.035	.000
	N	498	493	498	498	498	498	498	498
Intention item: Organic	Spearman's Correlation	.607**	**.783****	.416**	.556**	.551**	.453**	.517**	.526**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000
	N	493	494	494	494	494	494	494	494
Intention item: Fair-trade	Spearman's Correlation	.605**	**.882****	.480**	.537**	.559**	.522**	.467**	.560**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000
	N	492	493	493	493	493	493	493	493
Intention item: Locally sourced produce	Spearman's Correlation	.569**	**.850****	.468**	.530**	.518**	.449**	.401**	.571**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000
	N	495	496	496	496	496	496	496	496

Variable items		Behaviour	Intention	PBC	Personal Norm	Habit	Injunctive Norm	Descriptive Norm	Attitude
Intention item: Reduced packing	Spearman's Correlation	.527**	**.796****	.395**	.475**	.456**	.423**	.353**	.503**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000
	N	495	496	496	496	496	496	496	496
Intention item: Sustainable fish/seafood	Spearman's Correlation	.667**	**.887****	.498**	.604**	.590**	.532**	.472**	.592**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000
	N	453	454	454	454	454	454	454	454
Intention item: 'Free range' animal products	Spearman's Correlation	.605**	**.874****	.488**	.571**	.582**	.541**	.466**	.567**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000
	N	487	488	488	488	488	488	488	488
PBC item 1	Spearman's Correlation	.540**	.506**	**.842****	.507**	.608**	.559**	.465**	.505**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000
	N	503	498	507	507	507	507	507	507
PBC item 2	Spearman's Correlation	.376**	.356**	**.868****	.451**	.566**	.451**	.461**	.341**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000
	N	503	498	507	507	507	507	507	507
PBC item 3	Spearman's Correlation	.551**	.535**	**.891****	.585**	.658**	.616**	.551**	.537**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000
	N	503	498	507	507	507	507	507	507
Personal Norm item 1: Moral obligation	Spearman's Correlation	.539**	.565**	.549**	**.902****	.692**	.587**	.668**	.617**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000
	N	503	498	507	507	507	507	507	507
Personal Norm item 2: Feel Good	Spearman's Correlation	.533**	.607**	.562**	**.821****	.613**	.574**	.532**	.621**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000
	N	503	498	507	507	507	507	507	507
Personal Norm item 3: Guilt	Spearman's Correlation	.550**	.531**	.465**	**.890****	.686**	.580**	.700**	.521**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000
	N	503	498	507	507	507	507	507	507

Variable items		Behaviour	Intention	PBC	Personal Norm	Habit	Injunctive Norm	Descriptive Norm	Attitude
Habit item 1: Frequently	Spearman's Correlation	.758**	.664**	.702**	.737**	**.922****	.744**	.732**	.645**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000
	N	503	498	507	507	507	507	507	507
Habit item 2: Subconsciously	Spearman's Correlation	.648**	.552**	.650**	.652**	**.904****	.653**	.676**	.544**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000
	N	503	498	507	507	507	507	507	507
Habit item 3: Strange	Spearman's Correlation	.599**	.567**	.557**	.735**	**.877****	.666**	.793**	.514**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000
	N	503	498	507	507	507	507	507	507
Habit item 4: Without thinking	Spearman's Correlation	.655**	.554**	.654**	.644**	**.919****	.695**	.739**	.540**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000
	N	503	498	507	507	507	507	507	507
Injunctive Norm item 1: Friends	Spearman's Correlation	.529**	.498**	.569**	.587**	.668**	**.864****	.654**	.438**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000
	N	503	498	507	507	507	507	507	507
Injunctive Norm item 2: Family	Spearman's Correlation	.548**	.519**	.572**	.559**	.675**	**.888****	.655**	.517**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000
	N	503	498	507	507	507	507	507	507
Injunctive Norm item 3: Important others	Spearman's Correlation	.554**	.499**	.547**	.590**	.690**	**.902****	.663**	.479**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000
	N	503	498	507	507	507	507	507	507
Descriptive Norm item 1: Friends	Spearman's Correlation	.547**	.504**	.507**	.691**	.750**	.672**	**.927****	.425**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000
	N	503	498	507	507	507	507	507	507
Descriptive Norm item 2: Family	Spearman's Correlation	.565**	.495**	.543**	.678**	.764**	.698**	**.919****	.470**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000
	N	503	498	507	507	507	507	507	507

Variable items		Behaviour	Intention	PBC	Personal Norm	Habit	Injunctive Norm	Descriptive Norm	Attitude
Descriptive Norm item 3: Important others	Spearman's Correlation	.539**	.484**	.560**	.661**	.743**	.707**	**.917****	.460**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000
	N	503	498	507	507	507	507	507	507
Attitude item 1: Unimportant-Important	Spearman's Correlation	.594**	.637**	.504**	.654**	.639**	.553**	.514**	**.924****
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000
	N	503	498	507	507	507	507	507	507
Attitude item 2: Inappropriate-Appropriate	Spearman's Correlation	.573**	.578**	.512**	.621**	.603**	.528**	.476**	**.937****
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000
	N	503	498	507	507	507	507	507	507
Attitude item 3: Bad-Good	Spearman's Correlation	.477**	.554**	.470**	.561**	.495**	.471**	.361**	**.923****
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000
	N	503	498	507	507	507	507	507	507

Table 3 Missing data of behaviour items

		Behaviour: Fair-trade item 1	Behaviour: Fair-trade item 2	Behaviour: Organic food item 1	Behaviour: Organic food item 2	Behaviour: Reduced packaging item 1	Behaviour: Reduced packaging item 2	Behaviour: Locally sourced food item 1	Behaviour: Locally sourced food (reversed) item 2	Behaviour: Sustainable fish/seafood item 1	Behaviour: Sustainable fish/seafood (reversed) item 2	Behaviour: 'Free range', animal products item 1	Behaviour: 'Free range', animal products (reversed) item 2
N	Valid	498	490	499	488	493	499	500	498	459	464	495	493
	Missing	9	17	8	19	14	8	7	9	48	43	12	14

Table 4 Missing data of intention items

		Int1	Int2	Int3	Int4	Int5	Int6
N	Valid	492	491	494	494	452	486
	Missing	13	14	11	11	53	19

Appendix VI: Measurement model

Step 1: Initial behaviour measurement model (N=478)

This model includes one behaviour item (i.e. variable) for each of the sustainable behaviours measured excluding a sustainable fish/seafood item due to high numbers of missing data. Items are shopping question variables referring to organic (B1.1), fair-trade (B2.2), reduced packaging (B3.2), locally produced (B4.1) and free-range/freedom food animal products (B6.1). Additionally the measurement model includes the full set of items for each other psychological construct; attitude, perceived behavioural control (PBC), habit, personal norm (PN), descriptive norm (DN) and injunctive norm (IN).

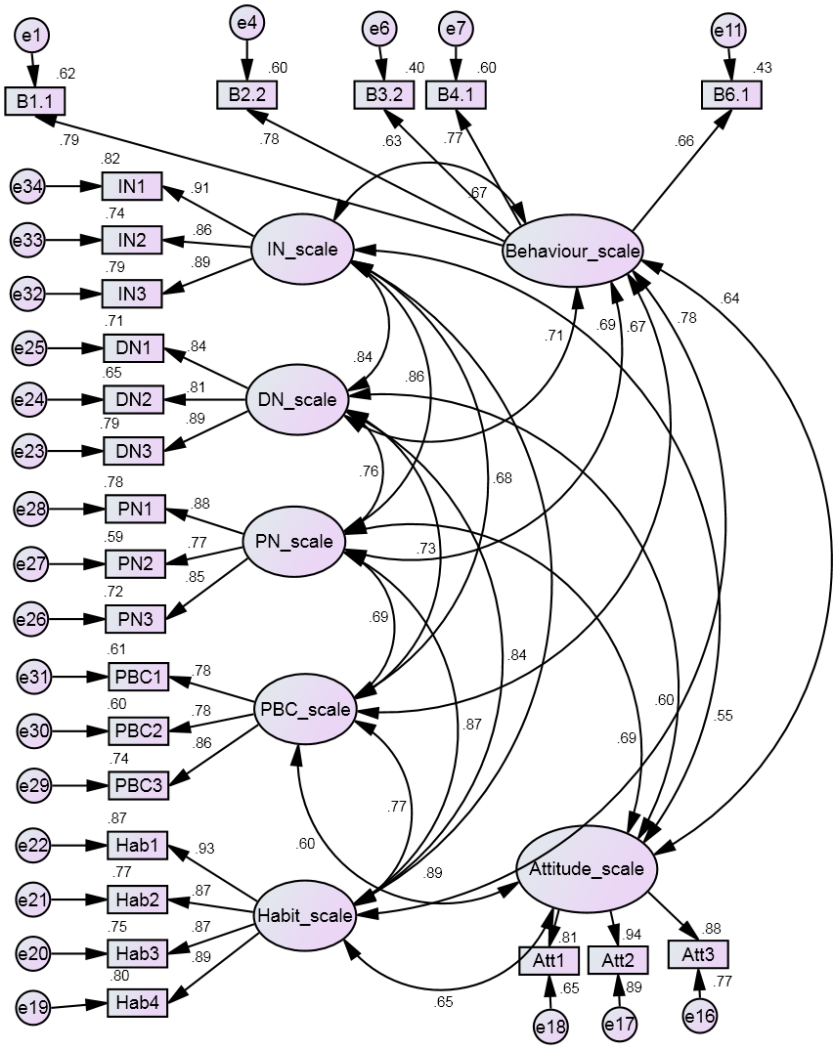


Figure 1 Behaviour measurement model (1) created in AMOS depicting psychological constructs with corresponding items and residuals. Model depicts item-construct correlations, residuals - item correlations and construct covariances.

Construct abbreviations are: DN_scale – Descriptive Norm, IN_scale – Injunctive Norm, PBC_scale – Perceived behavioural control; PN_scale – Personal Norm

The measurement model showed a relatively poor fit: $\chi 2$ (231)= 834.877, p<.0001, $\chi 2$/df = 3.61, RMSEA=.074, SRMR = .0479, CFI=.939.
The next step will address discriminant and convergent validity issues which are expected to improve the overall fit of the model.

Step 2: Addressing discriminant and convergent validity issues with Modification Indices (MI) and correlation tables in Appendix III.

In this second step I checked the MIs produced in AMOS (Table 1) which indicate the drop in overall $\chi 2$ should the parameter be freely estimated in the next model (Byrne 2013). Table 1 shows covariances for residuals with other residuals or psychological construct scales (variables). MI scores can be taken as an indicator of the magnitude of the covariance between scores. The Par change refers to the expected parameter change in magnitude and direction should the parameter be freely estimated in the next model. Again this is another indicator of the magnitude of covariances between residuals and scales.

The MIs were considered together with the Multiple Group Method correlations (Appendix III). In table 1 residuals e24-e33 covaried and e20 with e26 and IN covaried moderately. Residuals e24 (DN2) with e33 (IN2) showed the highest MI score (48.641) followed by 38.756 (e20 (Habit3) with Injunctive Norm) and 36.799 (e20 (Habit3) with e26 (PN3) 24. Correlation results (Appendix III) also showed that these items correlated extremely highly with the scales of which the residuals are part of. Based on Habit item 3's high correlation with other scales (IN =.815, PN=.766) it was decided to remove this item from further analysis. Additionally IN2 and DN2 based on the MI scores showed a high covariance indicating if one of them was removed to improve the fit of the model. Both variables measure perceived norms in relation to family members, IN measuring whether the participant believes that their family members would want them to buy more sustainable products and DN measuring whether the participant perceives their family members to be sustainable shoppers. Since both question are asking about their perception of norms their family members might hold, although with slight variation this concept might be too similar to be distinguishable by questionnaire. It was thus decided to remove the IN 2 item from further analysis.

Table 1 Covariances of residuals with residuals or constructs

Residuals		Constructs or residuals	M.I.	Par Change
e34	<-->	Attitude_scale	4.455	-.052
e33	<-->	Habit_scale	5.237	.054
e32	<-->	Habit_scale	6.414	-.054
e31	<-->	PBC_scale	6.219	-.089
e31	<-->	Behaviour_scale	4.641	.074
e30	<-->	PBC_scale	14.468	.135
e30	<-->	DN_scale	9.420	-.093
e30	<-->	Habit_scale	4.415	.057
e30	<-->	Attitude_scale	6.644	-.085
e30	<-->	Behaviour_scale	9.867	-.108
e29	<-->	DN_scale	5.363	.061
e29	<-->	Habit_scale	7.583	-.065
e29	<-->	e32	6.715	.075
e29	<-->	e31	13.139	-.125
e29	<-->	e30	6.013	.084
e27	<-->	PBC_scale	9.900	.113
e27	<-->	DN_scale	10.483	.095
e27	<-->	Attitude_scale	4.845	.070
e27	<-->	IN_scale	16.695	-.115
e27	<-->	e33	4.921	-.079
e26	<-->	PBC_scale	10.654	-.116
e26	<-->	Attitude_scale	6.478	-.080
e26	<-->	IN_scale	12.750	.099
e26	<-->	e34	7.227	.080
e26	<-->	e30	4.679	-.086
e26	<-->	e29	4.419	-.073
e25	<-->	PN_scale	5.487	.062
e25	<-->	Attitude_scale	7.924	-.075
e25	<-->	e27	10.431	.105
e24	<-->	PN_scale	5.369	-.071
e24	<-->	Attitude_scale	5.375	.071
e24	<-->	e34	9.886	-.091
e24	<-->	e33	48.641	.240
e24	<-->	e30	4.560	-.083
e24	<-->	e25	9.555	-.094
e23	<-->	e33	21.498	-.128
e23	<-->	e32	15.564	.097
Residuals		**Constructs or residuals**	**M.I.**	**Par Change**
e22	<-->	Attitude_scale	4.039	.046
e22	<-->	Behaviour_scale	11.016	.078
e22	<-->	IN_scale	15.522	-.078
e22	<-->	e33	6.515	-.065
e21	<-->	Habit_scale	8.848	.067
e20	<-->	PBC_scale	6.296	-.078
e20	<-->	PN_scale	15.741	.110
e20	<-->	Habit_scale	16.928	-.091
e20	<-->	IN_scale	38.756	.152
e20	<-->	e34	21.622	.121
e20	<-->	e33	4.321	.064
e20	<-->	e31	5.024	-.078
e20	<-->	e27	4.100	-.068

e20	<-->	e26	36.799	.202
e20	<-->	e25	9.363	-.086
e20	<-->	e23	5.528	.061
e20	<-->	e22	9.966	-.074
e19	<-->	PN_scale	15.173	-.103
e19	<-->	Habit_scale	6.569	.053
e19	<-->	e33	15.896	.118
e19	<-->	e30	7.923	.094
e19	<-->	e29	4.993	-.065
e19	<-->	e26	11.351	-.107
e19	<-->	e21	11.605	.096
e18	<-->	PBC_scale	6.454	-.086
e18	<-->	PN_scale	6.092	.074
e18	<-->	Habit_scale	6.818	.064
e18	<-->	Attitude_scale	16.889	-.122
e17	<-->	PN_scale	9.584	-.062
e16	<-->	Habit_scale	4.088	-.036
e16	<-->	IN_scale	8.286	-.055
e16	<-->	e34	7.107	-.054
e16	<-->	e27	14.514	.100
e16	<-->	e26	6.843	-.068
e16	<-->	e21	5.312	-.054
Residuals		**Constructs or residuals**	**M.I.**	**Par Change**
e11	<-->	Attitude_scale	4.758	.086
e11	<-->	IN_scale	4.199	-.072
e11	<-->	e34	11.188	-.124
e11	<-->	e27	5.056	.108
e11	<-->	e23	7.438	-.102
e11	<-->	e22	5.353	.079
e7	<-->	e17	4.897	-.049
e6	<-->	Behaviour_scale	5.863	.078
e6	<-->	IN_scale	9.104	-.084
e6	<-->	e32	6.624	-.080
e6	<-->	e18	4.566	-.077
e6	<-->	e17	5.097	.054
e6	<-->	e7	22.671	.164
e4	<-->	IN_scale	6.548	.075
e4	<-->	e34	4.229	.064
e4	<-->	e25	17.030	-.138
e1	<-->	e25	9.600	.102
e1	<-->	e21	4.019	-.070

Construct abbreviations are: DN_scale – Descriptive Norm, IN_scale – Injunctive Norm, PBC_scale – Perceived behavioural control; PN_scale – Personal Norm

After removing Habit 3 and IN2 and their corresponding residuals I retested the model. The model showed an ok fit, $\chi 2$ (168)= 571.272, p<.0001, $\chi 2/df$ = 3.04, RMSEA=.065 (.001) , SRMR = .0462, CFI=.955.

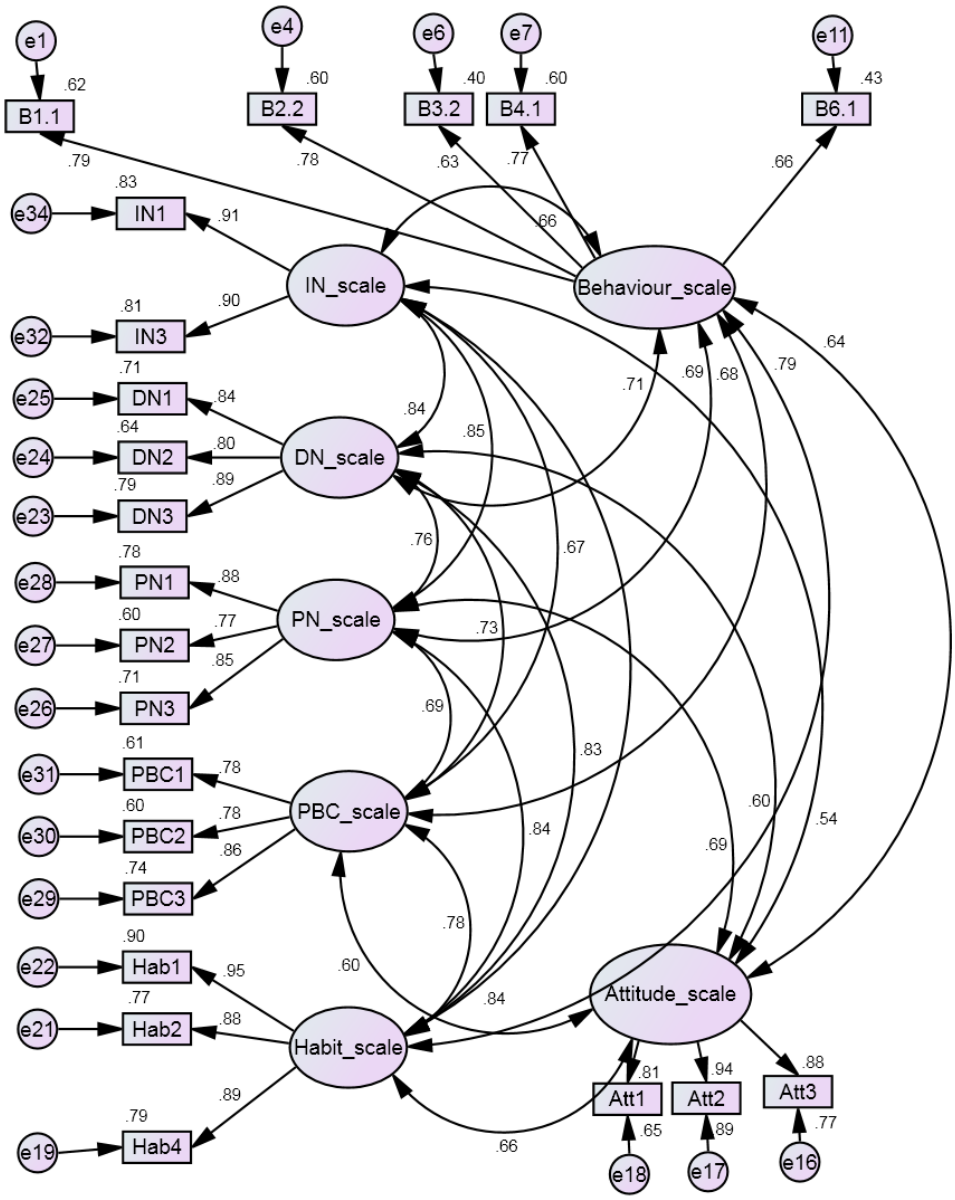


Figure 2 Behaviour measurement model (2) Model depicts item-construct correlations, residuals - item correlations and construct covariances.

Construct abbreviations are: DN_scale – Descriptive Norm, IN_scale – Injunctive Norm, PBC_scale – Perceived behavioural control; PN_scale – Personal Norm

Step3: Checking composite reliabilities (CR) and Average variance extracted (AVE) and discriminant validity of the measurement model

Table 2 scores show a good fit between items and corresponding scales with good CR values (>.6 = acceptable) and ok AVE scores (>.5) and Beta weights (Fornell 1982). AVE and CR scores were calculated based on a formula proposed by Fornell and Larcker(1981). Looking at discriminant validity in table 3 which compares AVE scores in bold with squared correlations between constructs of the measurement model one can see two issues arising from non-optimal discrimination between constructs. The AVE for behaviour (0.729) is lower than squared correlation calculated for habit (0.792). Additionally the AVE for Personal Norm (0.834) is lower than the scores for habit (0.845) and injunctive norm (0.848).

In order to remedy these discriminant validity issues I re-checked MGM correlation scores (Appendix III). Habit item 1 (referring to the frequency of the behaviour) correlates highly with behaviour (.737) and PN (.761). It was therefore decided to remove the item in order to resolve discriminant validity issues. Additionally I checked correlations between PN and IN. PN 3 and PN1 correlated highly with IN (.735) and (.714). I therefore decided to take out the factor with the higher cross loading, i.e. PN 3 to check whether this would resolve discriminant validity issues.

Table 2 Standardized regression weights (Beta), composite reliabilities (CR) and average variance extracted (AVE) for measurement model

Psychological constructs	Items	Beta	CR	AVE
Behaviour	Behaviour_Fair_1	.788	0.849	0.531
	Behaviour_Organic_2	.776		
	Behaviour_Packaging_2	.631		
	Behaviour_Local_1	.774		
	Behaviour_Free_1	.660		
Attitude	Attitude_1	.808	0.909	0.770
	Attitude_2	.941		
	Attitude_3	.878		
Habit	Habit_1	.948	0.931	0.818
	Habit_2	.877		
	Habit_4	.887		
Descriptive norm	DN_1	.845	0.883	0.716
	DN_2	.802		
	DN_3	.890		
Personal norm	PN_1	.882	0.873	0.696
	PN_2	.772		
	PN_3	.845		
Perceived behavioural control	PBC_1	.782	0.848	0.651
	PBC_2	.775		

	PBC_3	.860		
Injunctive norm	IN_1	.910	0.899	0.817
	IN_3	.898		

Table 3 Discriminant validity of measurement model with AVE (bold scores in diagonal line) and squared correlations scores

	IN scale	**Behaviour scale**	**Attitude scale**	**Habit scale**	**DN scale**	**PN scale**	**PBC Scale**
Injunctive norm (IN)	**0.904**						
Behaviour	0.661	**0.729**					
Attitude	0.535	0.636	**0.877**				
Habit	0.844	0.792	0.657	**0.905**			
Descriptive norm (DN)	0.839	0.706	0.597	0.831	**0.846**		
Personal norm (PN)	0.848	0.691	0.694	0.845	0.764	**0.834**	
Perceived behavioural control (PBC)	0.668	0.675	0.596	0.778	0.730	0.693	**0.807**

Highlighted scores indicate non-optimal discrimination between the behaviour and habit scales; and between the personal norm (PN) scales and habit and injunctive norm (IN) scales.

Step 4: Finalising the behaviour measurement model

The final model showed acceptable fit statistics: $\chi 2$ (149)= 462.453, p<.0001, $\chi 2/df$ = 3.10, RMSEA=.066 (.000) , SRMR = . 0445, CFI=.956.

Discriminant validity issues improved between the PN, habit and IN scales after excluding the last set of items from the analysis (Habit 1 and PN 3) (Table 5). Although these scales still correlated highly their squared correlations (Habit = .817, IN = .824) are still below the AVE score for PN (.827). However, there are still discriminant validity issues between the behaviour and habit scale with habit (.742) showing a higher squared correlation than the AVE score for behaviour (.729). The reason for this high correlation might simply be that if habits are strong they highly correlate with behaviour due to the frequency and nature of the habitual behaviour. Convergent validity scores shown in table 4 remained similar to the ones in the previous analysis and not issues where found. Since the fit of the rest of the model is acceptable and being mindful of the danger of over fitting the model by deleting further items (Byrne 2013) I have decided to continue my analysis with the items and constructs as they are in this final model.

Table 4 Standardized regression weights (Beta), composite reliabilities (CR) and average variance extracted (AVE) for measurement model

Psychological constructs	Items	Beta	CR	AVE
Behaviour	Behaviour_Fair_1	.788	0.849	0.531
	Behaviour_Organic_2	.776		
	Behaviour_Packaging_2	.631		
	Behaviour_Local_1	.774		
	Behaviour_Free_1	.660		
Attitude	Attitude_1	.808	0.909	0.770
	Attitude_2	.941		
	Attitude_3	.878		
Habit	Habit_2	.877	0.931	0.810
	Habit_4	.887		
Descriptive norm	DN_1	.845	0.883	0.716
	DN_2	.802		
	DN_3	.890		
Personal norm	PN_1	.882	0.873	0.683
	PN_2	.772		
Perceived behavioural control	PBC_1	.782	0.848	0.651
	PBC_2	.775		
	PBC_3	.860		
Injunctive norm	IN_1	.910	0.899	0.817
	IN_3	.898		

Table 5 Discriminant validity of measurement model with AVE (bold scores in diagonal line) and squared correlations scores

	IN scale	Behaviour scale	Attitude Scale	Habit scale	DN scale	PN scale	PBC scale
Injunctive norm (IN)	**0.904**						
Behaviour	0.661	**0.729**					
Attitude	0.536	0.636	**0.877**				
Habit	0.836	0.742	0.610	**0.900**			
Descriptive norm (DN)	0.839	0.706	0.597	0.805	**0.846**		
Personal norm (PN)	0.824	0.705	0.742	0.817	0.785	**0.827**	
Perceived behavioural control (PBC)	0.669	0.674	0.595	0.761	0.729	0.743	**0.807**

Highlighted scores indicate non-optimal discrimination between habit and behaviour.

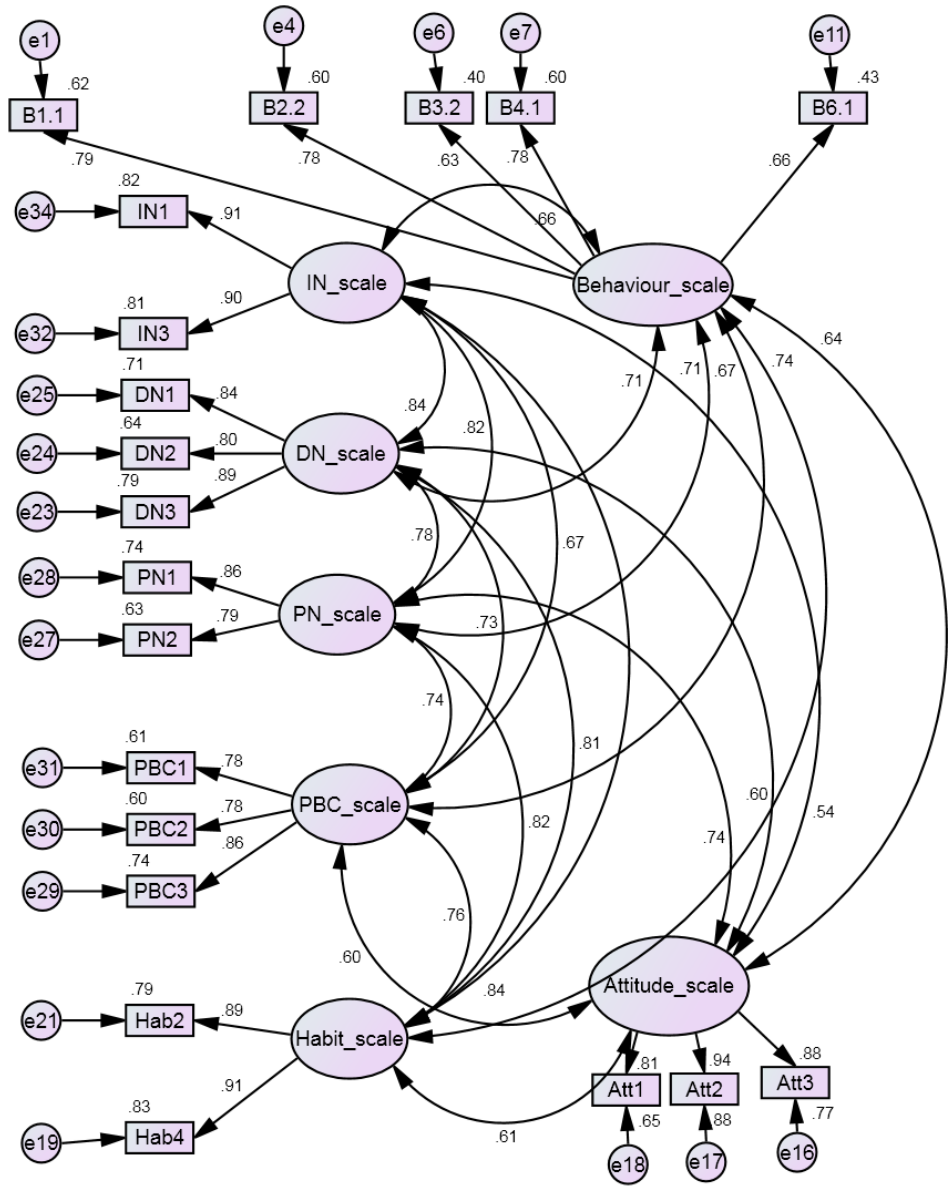


Figure 3 Final measurement model. Model depicts item-construct correlations, residuals - item correlations and construct covariances.

Construct abbreviations are: DN_scale – Descriptive Norm, IN_scale – Injunctive Norm, PBC_scale – Perceived behavioural control; PN_scale – Personal Norm

References

Byrne, B. M., 2013. *Structural equation modeling with AMOS: Basic concepts, applications, and programming*. London, UK: Routledge.

Fornell, C., 1982. *A second generation of multivariate analysis. Measurement and evaluation. Vol. 2.* CA, US: Praeger Publishers.

Fornell, C. and Larcker, D. F., 1981. Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research*, 18 (1), 39-50

Schreiber, J. B., Nora, A., Stage, F. K., Barlow, E. A. and King, J., 2006. Reporting structural equation modeling and confirmatory factor analysis results: A review. *The Journal of Educational Research*, 99 (6), 323-338.

Appendix VII: Descriptive statistics, Shapiro Wilks normality test, Q-Q plots for behaviour and social network factors

Table 1 Descriptive statistics for social network factors

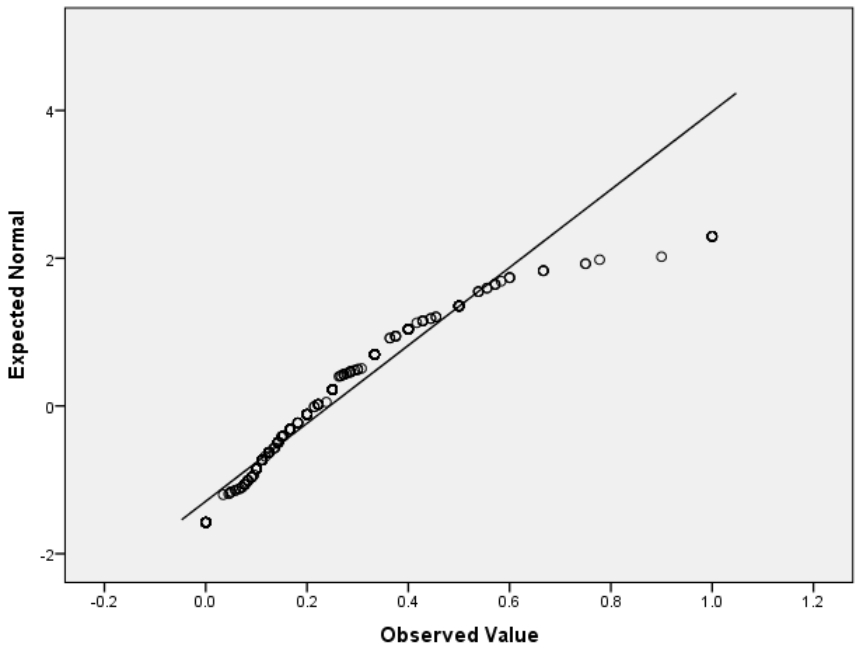
	N	Minimum	Maximum	Mean	Std. Error	Std. Deviation	Skewness Statistic	Skewness Std. Error	Kurtosis Statistic	Kurtosis Std. Error
Degree	460	2.00	30.00	7.7913	.21962	4.71034	1.481	.114	2.417	.227
Density	460	.00	1.00	.6409	.01602	.34360	-.430	.114	-1.174	.227
Sustainable shoppers %	460	.00	1.00	.3451	.01554	.33333	.575	.114	-.877	.227
Food consumption %	460	.00	1.00	.3883	.01175	.25203	.741	.114	.181	.227
Food discussion %	460	.00	1.00	.3852	.01140	.24457	.914	.114	.369	.227
Shopping influence %	460	.00	1.00	.2446	.00884	.18955	1.529	.114	3.722	.227
Closeness	460	1.00	5.00	4.0020	.03029	.64968	-.588	.114	1.205	.227
Context	460	.00	11.00	3.1304	.08819	1.89149	.808	.114	.790	.227
Valid N (listwise)	460									

Table 2 Shapiro –Wilk test of Normality for behaviour and social network characteristics

	Shapiro-Wilk		
	Statistic	df	Sig.
Behaviour	.983	460	.000

Degree	.857	460	.000
Closeness	.961	460	.000
Density	.867	460	.000
Context	.930	460	.000
	Statistic	df	Sig.
Sustainable shoppers %	.873	460	.000
Food consumption %	.940	460	.000
Food discussion %	.920	460	.000
Shopping influence %	.880	460	.000

Q-Q plots to visually assess normality



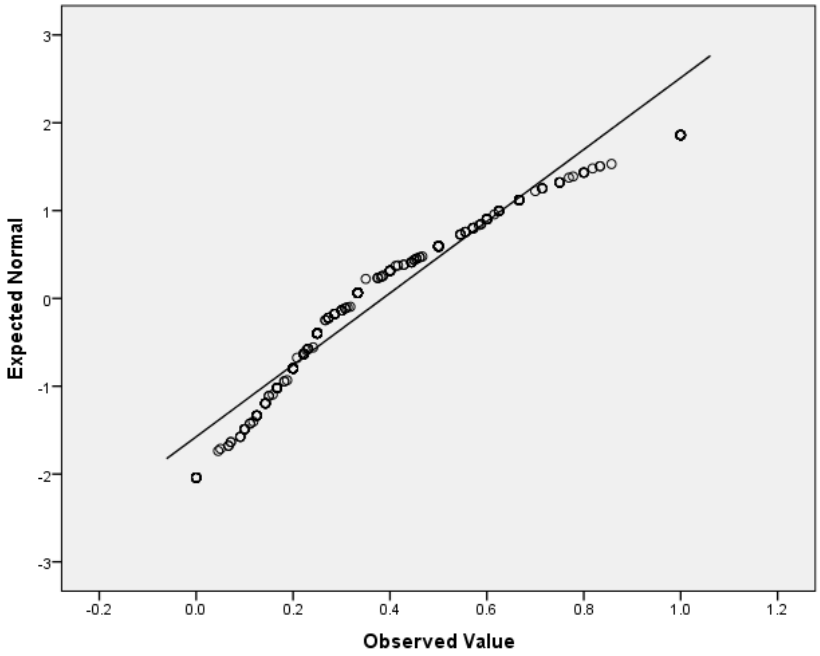


Figure 1 Q-Q plot of the % of members directly influencing shopping decisions

Figure 2 Q-Q plot of the % of food discussion members

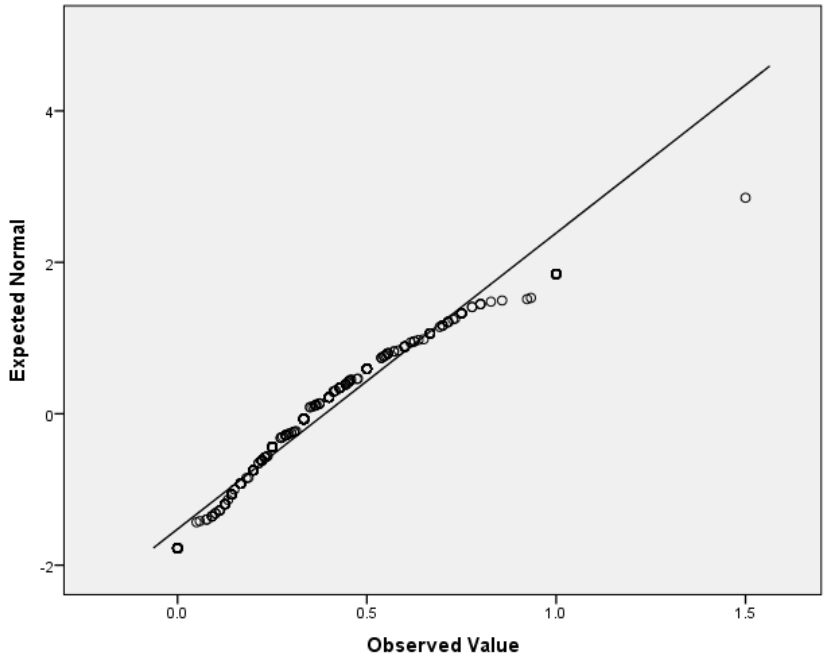


Figure 3 Q-Q plot of the percentage of food consumption members

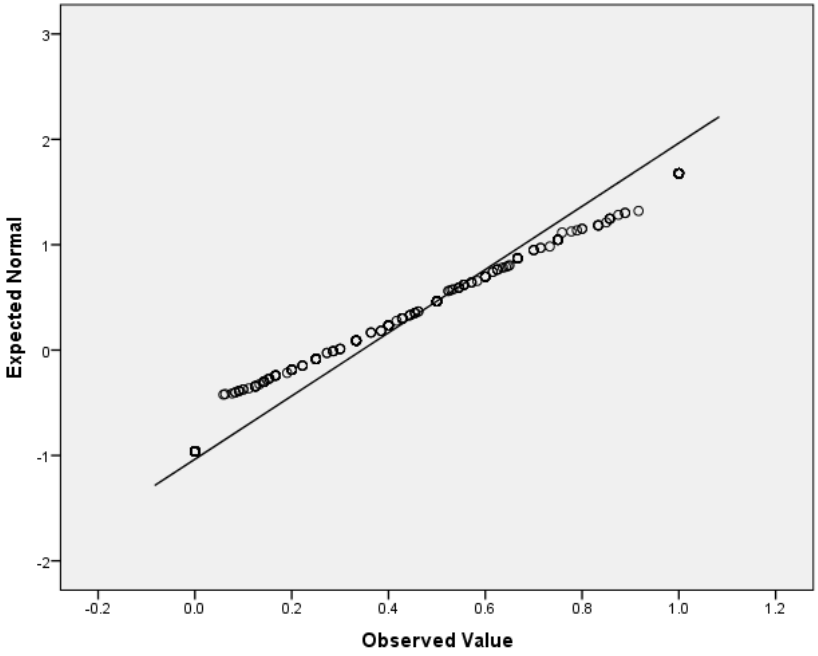


Figure 4 Q-Q plot of the percentage of sustainable shoppers

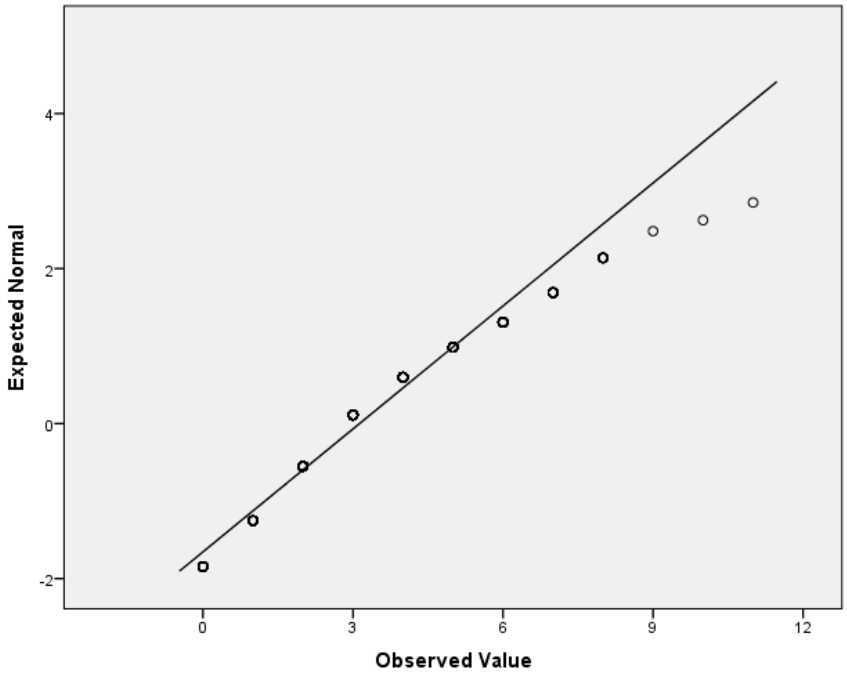


Figure 5 Q-Q plot of social context diversity

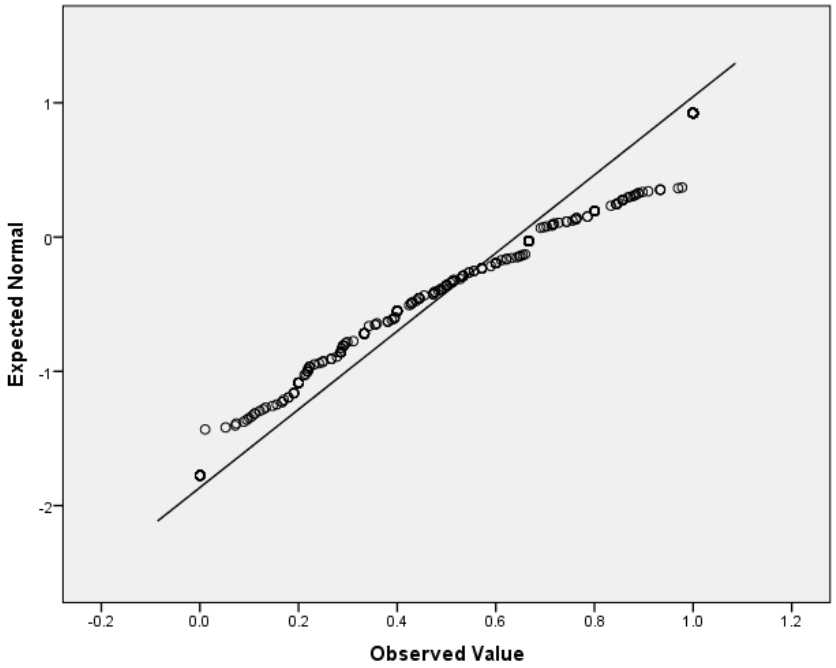


Figure 6 Q-Q plot of network density (number of links between members)

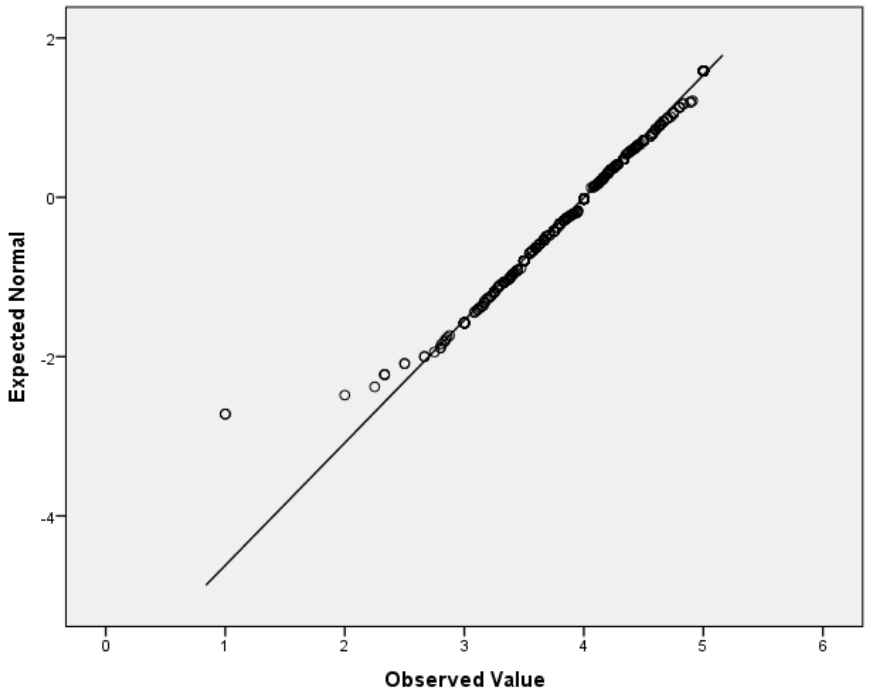


Figure 5 Q-Q plot of network closeness

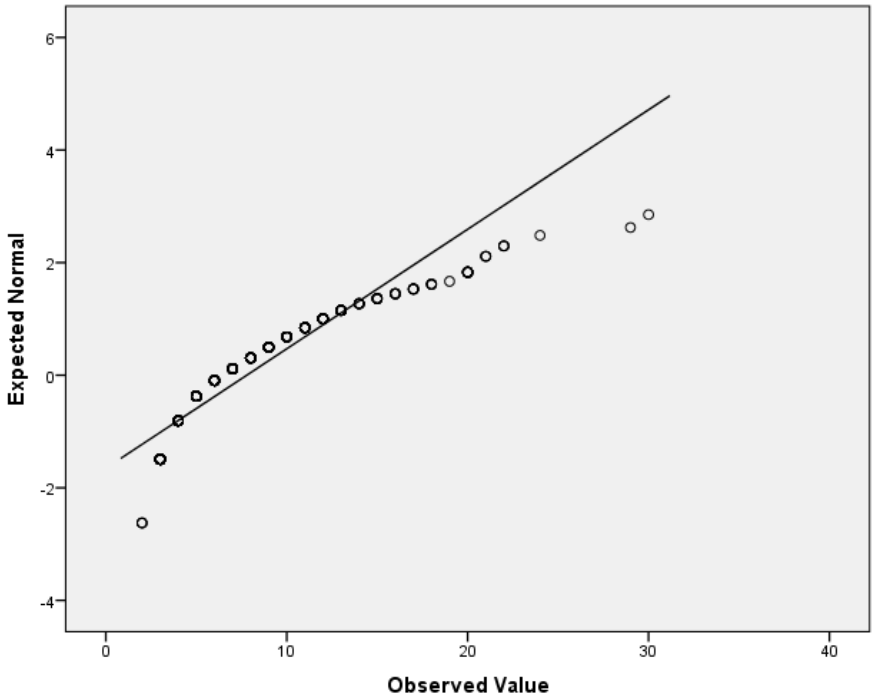


Figure 6 Q-Q plot of network degree (number of network members)

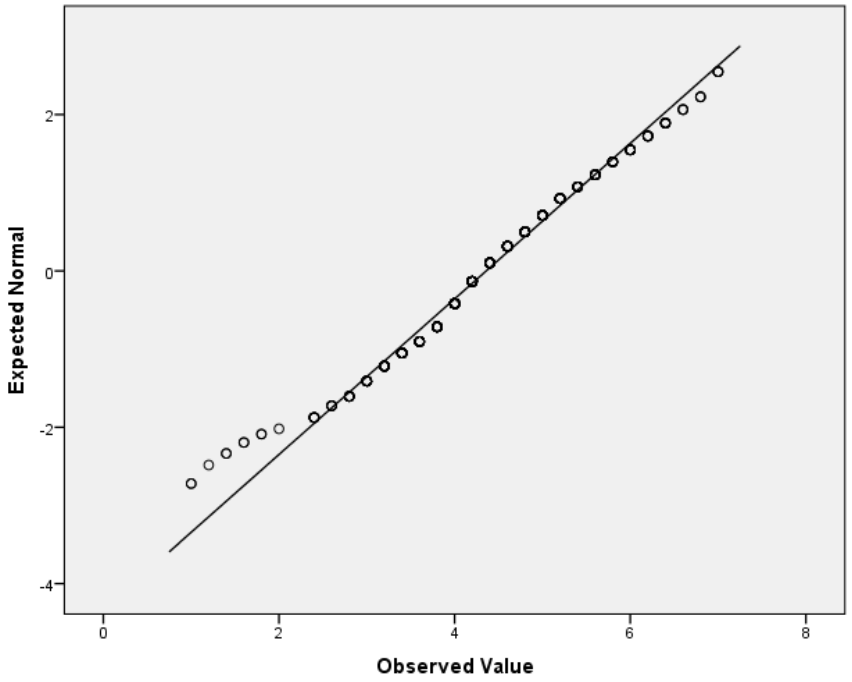


Figure 5 Q-Q plot of individual sustainable food shopping behaviour

Appendix VIII: Experiment activity information

ID_____

Bournemouth University, Festival of Learning Event: Psychological Experiment

This BU Festival of Learning Event will provide you with a first-hand experience of psychological research. The text below will briefly explain what the experiment is about.

We are going to measure your grocery shopping behaviour and will ask you a bit about your social network, i.e. your friends, family and important others such as colleagues, neighbours etc. This experiment will contain written and non-written exercises. No physical or emotional harm will come to you during this experiment. However, you are free to withdraw your participation at any time during the experiment. The exact purpose of the study, its design and results will be explained to you after your participation.

This document contains four brief exercises. Please follow them in order. Don't look at the next page until you have completed the exercise on the page before.

The information that you provide to us will be treated in the strictest confidence and you will not be identified in any way, in line with the British Psychological Society's Code of Conduct. In order for the researchers to use your anonymous data in the future we would like to ask you to provide written consent.

I confirm that I have read and understood the information about the project above.

I understand that my participation is voluntary and that I am free to stop participating at any point while completing the study, without having to give a reason and without any consequences.

I understand that any information recorded in the investigation will remain confidential and no information that identifies me will be made publicly available.

I consent to taking part in this experiment which is part of the BU Festival of Learning Event.

Signed _____ Date _____

The first set of questions will ask you about your current food shopping behaviour. This should be answered independently by each participant and forms the basis of the experiment.

Q1. How often do you buy any of the following:

I buy...	Never	Almost never	Seldom	Sometimes	Often	Almost always	Always
Fair-trade food	❍	❍	❍	❍	❍	❍	❍
Organic food	❍	❍	❍	❍	❍	❍	❍
Food with little or no packing	❍	❍	❍	❍	❍	❍	❍
Locally sourced food	❍	❍	❍	❍	❍	❍	❍

Please now compare your food shopping behaviour above with that of your discussion partner. The options above describe sustainable food shopping behaviour, e.g. buying fair-trade or organic food. Everyone shows some differences and similarities in sustainable shopping. How similar or dissimilar are you to your discussion partner in your sustainable food shopping. If you live in the same household and eat or buy the food together, would you do things differently if this was not the case? Please write down some brief notes.

Q2. How regularly do you buy sustainable food products that can be described by the categories above (i.e. fair-trade, organic, little or no packaging and locally sourced food)?

Similarities:

Differences:

Q3: How important do you think it is to buy sustainable food and why?

Similarities:

Differences:

The next set of questions should be answered independently again by each participant. The questions will ask some information about your food shopping behaviour and your social network, i.e. friends, family and important others. (This question was used as a decoy to deflect from the actual consumption data collection after the activity, hence it was not analysed**)**

Q4. Which sustainable food products do you intent to buy during your next shop?

I intent to buy...	Very unlikely	Unlikely	Somewhat unlikely	Neither likely nor unlikely	Somewhat likely	Likely	Very likely
Fair-trade food	❍	❍	❍	❍	❍	❍	❍
Organic food	❍	❍	❍	❍	❍	❍	❍
Food with little or no packing	❍	❍	❍	❍	❍	❍	❍
Locally sourced food	❍	❍	❍	❍	❍	❍	❍

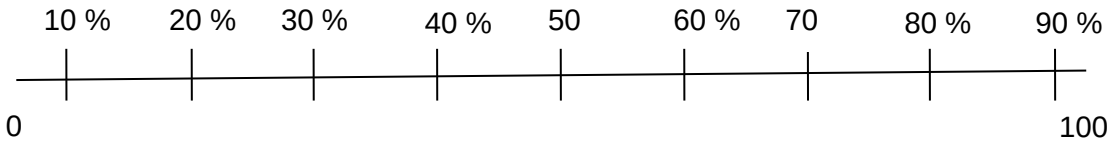
Q5. How large is the percentage of people that buy sustainable food products in your social network:

Please use the slider bar below to indicate the percentage of people that buy sustainable food products in your social network by marking your answer with an **X** in the appropriate position. Below are some guidelines:

≤ 25% indicating a minority (about ¼ or less)

≈ 50% (more or less half of the people)

≥ 75% indicating a majority (more than ¾ of the people)



Q6. How large is your social network of friends, family and important others? Please tick one of the options below.
I count _ people in my close social network

- ○ 1 – 5
- ○ 6 – 10
- ○ 11 – 15
- ○ 16 – 20
- ○ 21 – 25
- ○ 26 – 30
- ○ >30

Q7. Is the person sitting next to you included in your above estimation of your network size? (If they are not a stranger to you)

- ○ Yes
- ○ No

Q8. How long have you known the person sitting next to you?

- ○ I don't really know them
- ○ Relationship lengths in years _____

Q9. What is your current age?

_____

Q10. Are you:

- ○ Male
- ○ Female

This is the end of the experiment. Please join the researchers for a tea/coffee and biscuit to discuss the experiment.

Appendix IX: Photos of the experiment set up

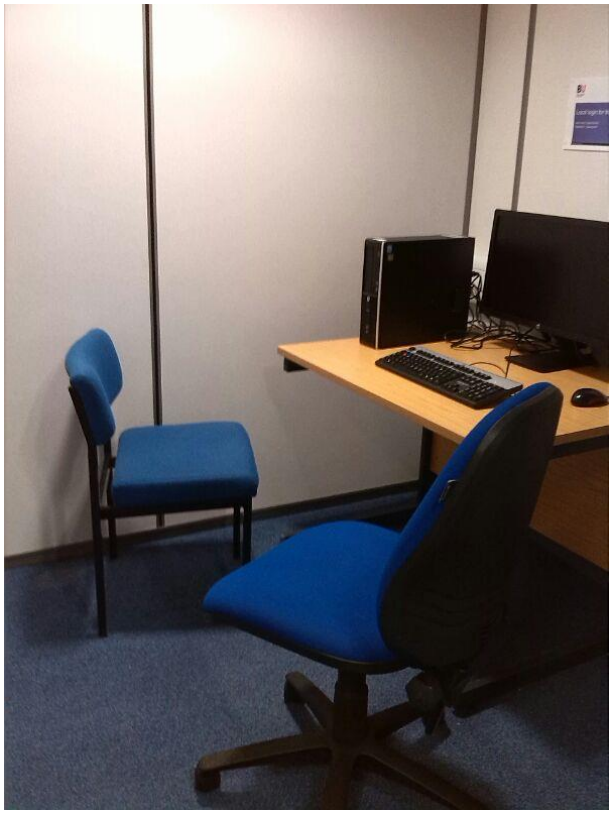


Figure 1 One of the rooms for the pair activity

Figure 2 View into the room with the consumables. Left table shows organic consumables. Right table shows non-organic consumables currently in the less convenient position.

Figure 3 Left table showing organic consumables in the easier to reach position at the front of the room

Figure 4 Feedback room

Appendix X: Testing of assumptions for t-test, chi-square tests and logistic regression

1. Checking for normal distribution of independent pre-experiment variables with the Shapiro Wilk test and histograms

The Shapiro-Wilk test is significant for all independent variables and thus indicates that all three variables are non-normally distributed (Table 1). Furthermore, the histogrammes listed below for the same variables also show some deviation from a normal distribution. Since the sample is relatively small (N=134), normality can not be assumed as might be the case larger samples as suggested by the central limit theorem. Therefore I will apply non-parametric tests for the analyses.

Table 1 Shapiro-Wilk normality test results for independent

	Shapiro-Wilk		
	Statistic	df	Sig.
Sustainable shoppers percentage	.969	161	.001
Social network size	.920	161	.000
Past sustainable shopping behaviour	.979	161	.015

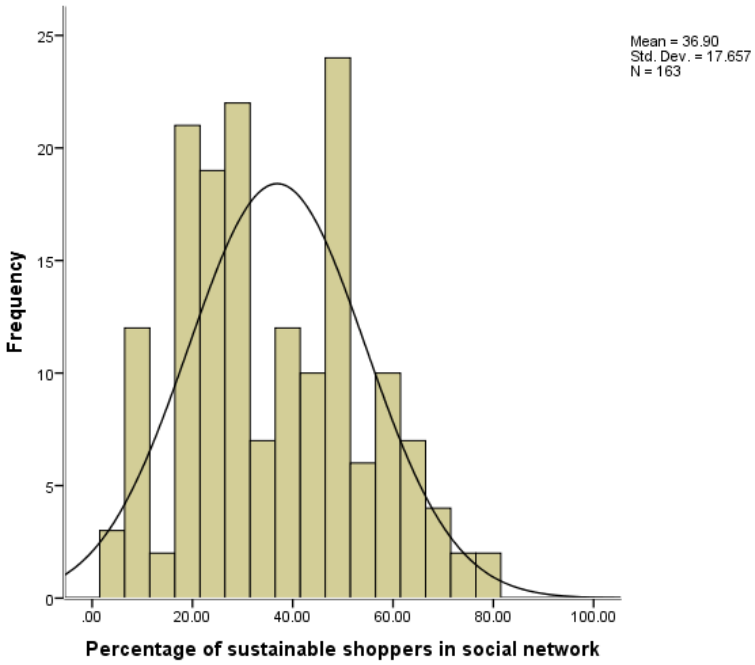


Figure 1 Distribution of scores for the percentage of sustainable shoppers in the social network in the participant sample

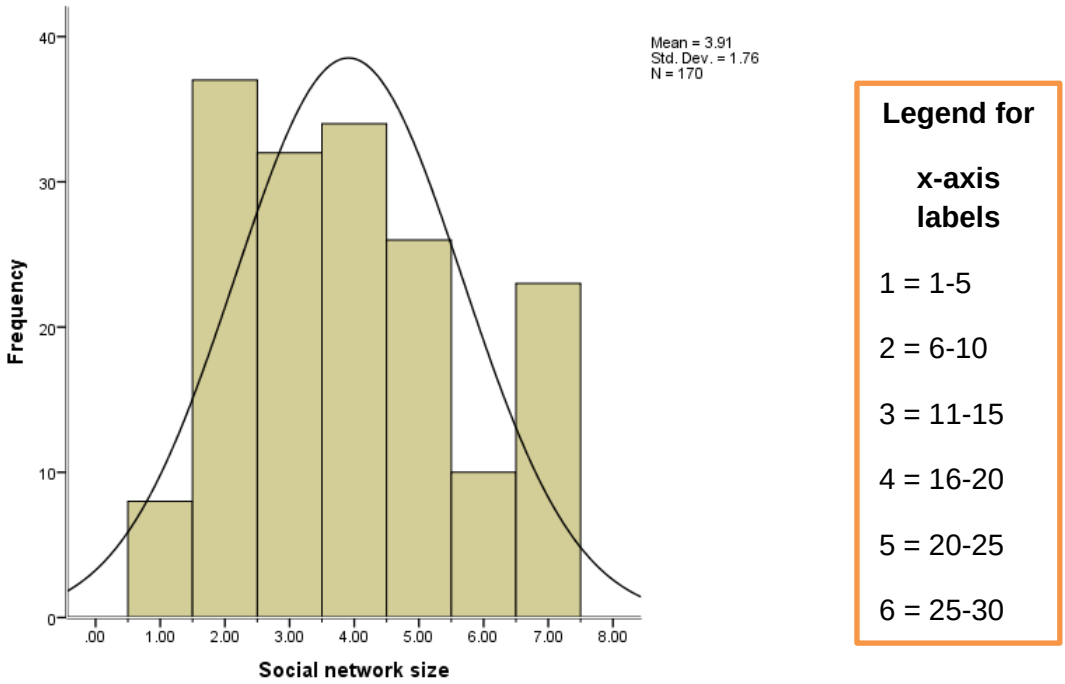


Figure 2 Distribution of scores for social network size across the participant sample

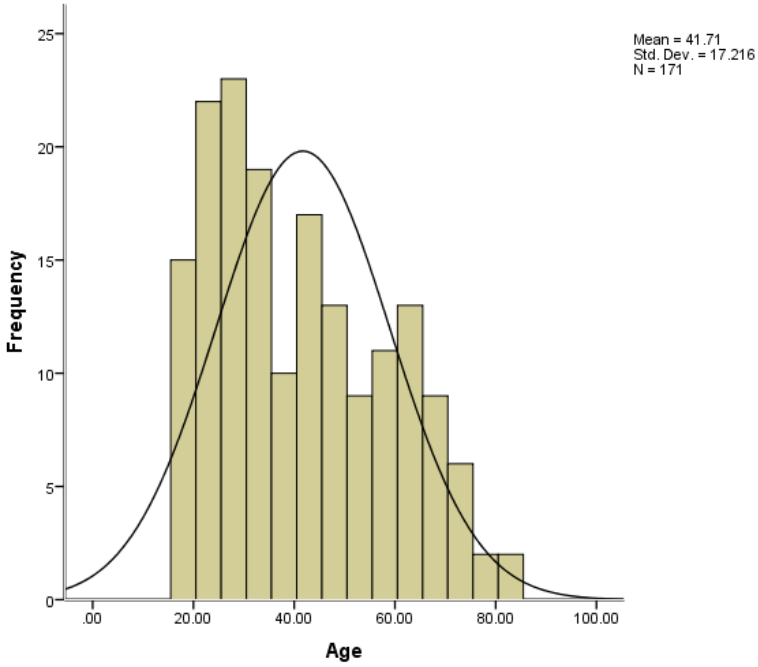


Figure 3 Distribution of age across the participant sample

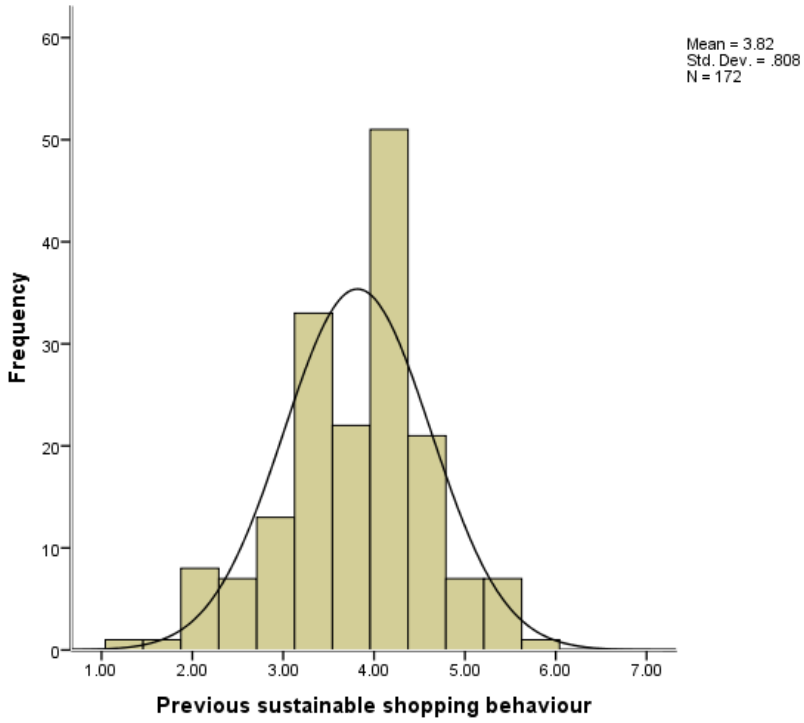


Figure 4 Distribution of previous (past) sustainable shopping behaviour across the participant sample

2. Checking for (multi)collinearity in predictor variables

Based on the collinearity statistics and the Spearman correlation results I conclude that no significant issues with collinearity are present among the variables.

Table 2 Collinearity statistics

	Collinearity Statistics	
	Tolerance	VIF
(Constant)		
Past sustainable shopping behaviour	.428	2.338
Sustainable shoppers percentage	.829	1.206
Social network size	.931	1.075
Discussion with social network members/stranger	.745	1.342

Table 3 Non-parametric correlations (Spearman's rho) between predictor variables

		Sustainable shoppers percentage	Social network size	Discussion with social network members/stranger	Past sustainable shopping behaviour
Sustainable shoppers percentage	Correlation Coefficient	1.000	-.137	-.048	.326**
	p	.	.124	.593	.000
	N	128	128	128	128
Social network size	Correlation Coefficient	-.137	1.000	.038	-.040
	p	.124	.	.662	.650
	N	128	133	133	133
Discussion with social network members/stranger	Correlation Coefficient	-.048	.038	1.000	-.061
	p	.593	.662	.	.485

	N	128	133	134	134
Past sustainable shopping behaviour	Correlation Coefficient	.326**	-.040	-.061	1.000
	p	.000	.650	.485	.
	N	128	133	134	134

Appendix XI: Checking for differences between the experiments run in 2014/2015

I repeated the binary regression analysis separately for the experiments run in 2014 and 2015. Results show the same findings for both years thus confirming the validity of the experiment results.

Table 1 Model fit for binary logistic regression models of experiment run 2014 and 2015

Year			Chi-square	df	Sig.
2014	Step 1	Step	5.738	3	.125
		Block	5.738	3	.125
		Model	5.738	3	.125
2015	Step 1	Step	8.345	3	.039
		Block	8.345	3	.039
		Model	8.345	3	.039

Table 2 Hosmer and Lemeshow test of model fit for experiment run 2014 and 2015

Year	Step	Chi-square	df	Sig.
2014	1	8.031	8	.430
2015	1	2.509	7	.926

Table 3 Explained variance of binary logistic regression models for experiment run 2014 and 2015

Year	Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
2014	1	56.742[a]	.104	.149
2015	1	84.843[b]	.104	.147

Table 4 Observed organic consumption choices and predicted choices by the logistic regression for experiment run 2014 and 2015

Year		Observed		Predicted		
				Organic consumption		Percentage Correct
				No	Yes	
2014	Step 1	Organic consumption	No	4	11	26.7
			Yes	3	34	91.9
		Overall Percentage				73.1
2015	Step 1	Organic consumption	No	4	19	17.4
			Yes	5	48	90.6
		Overall Percentage				68.4

Table 5 Wald test results for binary logistic regression predicting organic consumption behaviour from social network characteristics reported for experiment run 2014 and 2015

Year			B	S.E.	Wald	df	Sig.	Exp(B)
2014	Step 1	Discussion with network members (vs. strangers)	1.601	.719	4.960	1	.026	4.956
		Sustainable shoppers percentage	.296	.383	.598	1	.439	1.344
		Network size	-.081	.334	.059	1	.808	.922
		Constant	-.213	.582	.134	1	.715	.808
2015	Step 1	Discussion with network members (vs. strangers)	1.367	.569	5.779	1	.016	3.924
		Sustainable shoppers percentage	.466	.287	2.631	1	.105	1.594
		Network size	.055	.273	.040	1	.841	1.056
		Constant	.389	.329	1.400	1	.237	1.476